Design of a Master Plan for Regional Waterborne Transport in the Mekong River Basin

Cambodia • Lao PDR • Thailand • Viet Nam

FINAL REPORT **VOLUME II**

PORTFOLIO ACTION FILES

December 2015

Mekong River Commission

Navigation Programme

Cambodia • Lao PDR • Thailand • Viet Nam

For sustainable development

MEKONG RIVER COMMISSION

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ABBREVIATION

AARG	Annual Rate of Growth
ACDP	Acoustic Doppler Current Profiler
ADB	Asian Development Bank
ADN	Accord Européen relative au transport international des marchandises dangereuses par voie de navigation intérieure (European Agreement concerning the International Carriage of Dangerous Goods by Inland Waterways)
AIS	Automatic Identification System
ALARP	As Low As Reasonably Practicable
ASEAN	Association of Southeast Asian Nations
AtN	Aids to Navigation
Avg	Average
AutoCaD	Auto Computer Aided Design
BC	Baseline Condition
B.E	Buddhist Era
BOQ	Bill of Quantities
BOT	Build, Operate and Transfer
BTC	Belgium Technical Cooperation
BVIC	Basic Vessel Inspection Checklist
BVIG	Basic Vessel Inspection Guidebook
BVIP	Basic Vessel Inspection Procedures
BVIT	Basic Vessel Inspection Timeframe
C	Cambodia
CAI	Cai Mep
CB	Cross Border
CCNR	Central Commission for Navigation on the Rhine
CD	Chart Datum
CNMC	Cambodia National Mekong Committee
CMI	Cambodia Maritime Institute
COSR	Committee for Oil Spill Response
D	Depth
DANIDA	Danish International Development Agency
DEMP	Dredging Environmental Management Plan
DG	Dangerous Goods
DGMM	Dangerous Goods Management Manual
DOW	Department of Waterway in Lao PDR

DWT	Deadweight Ton
ECDIS	Electronic Chart Display and Information System
ECS	Electronic Chart System
EIA	Environmental Impact Assessment
EMP	Environmental Management Plan
ENC	Electronic Navigation Chart
EPC	Environmental Protection Commitment
ERM	Emergency Response Management
ESCAP	Economic and Social Commission for Asia and the Pacific
ETA	Estimated Time of Arrival
EU	European Union
EUSDR	EU Strategy for Danube Region
F/S	Feasibility Study
GDP	Gross Domestic Product
GGGI	Global Green Growth Institute
GIS	Geographic Information Systems
GMS	Great Mekong Sub region
GHG	Greenhouse Gas
GPS	Global Positioning System
GRT	Gross Register Tonnage
GT	Gross Tonnage
H	High
HCM	Ho Chi Minh City
HHW	Highest High Water
HIES	Household Income and Expenditure Survey
Hr	Hour
HSEM	Health Safety and Environmental Management
HSE	Health Safety and Environment
IALA	International Association of Lighthouse Authorities
IAI	Initiative for ASEAN Integration
ICBP	Integrated Capacity Building Program
IEIA	Initial Environmental Impact Assessment
IEE	Initial Environmental Examination
ICT	Information and Communication Technology
IDA	International Development Association
IHO	International Hydrographic Organization
IMDG	International Maritime Dangerous Goods Code

IMF	International Monetary Fund
IMO	International Maritime Organisation
IPO	Initial Public Offering
ISM	International Safety Management
IWP	Inland Waterway Police
IWO	International Workers Order
IWT	Inland Waterway Transport
IWTD	Inland Waterway Transport Department
JCCCN	Joint Committee on Coordination of Commercial Navigation (on the Lancang – MekongRiver)
JICA	Japan International Cooperation Agency
Km	Kilometer
KOICA	Korean International Cooperation Agency
L	Lao
L	Low
L	Length
Lao PDR	Lao People Democratic Republic
LAN	Long Term Aids to Navigation Action
LEN	Long Term Environmental Action
LIN	Long Term Institutional Action
LM	Lower Mekong
LMB	Lower Mekong Basin
LNG	Liquefied Natural Gas
LNS	Long Term Navigation Safety Action
LO/LO	Lift On Lift Off
LPD	Long Term Port Development Action
LRE	Long Term Regulatory Action
LSO	Long Term Social Action
LWD	Long Term Waterway Design Action
M	Medium
MARPOL	International Convention for Prevention of Pollution from Ships
MD	Marine Department
MITP	Maintenance, Inspection and Testing Program
MOE	Ministry of Environment
MOU	Memorandum of Understanding
MRB	Mekong River Basin
MRC	Mekong River Commission
MRCS	Mekong River Commission Secretariat

MPWT	Ministry of Public Works and Transport
MOL	Minimum operational water level in these impounded stretches
MONRE	Ministry of Natural Resources and Environment (Lao PDR, Viet Nam)
MOT	Ministry of Transport
MSDS	Material Safety Data Sheets
MTSM	Mekong Tanker Safety Management
NAIADES	Navigation And Inland Waterway Action and Development in Europe
NAB	Navigation Advisory Body
NAP	Navigation Programme
NAVAIDS	Navigation Aids
NCDM	National Committee for Disaster Management in Cambodia
NCI	National with Cross Border Impact
NGO	Non-Governmental Organisation
NMC	National Mekong Committee
NPA	National Protection Area
NPE	Non-Permanent Employees
NR	National Road
NTC	New Container Terminal
ODA	Official Development Assistance
ONR	Optimal Navigation Route
OSP	Office of the Secretariat in Phnom Penh
OSRP	Oil Spill Response Plan
PAT	Port Authority of Thailand
PEMSEA	Partnerships in Environmental Management for the Seas of East Asia
PIANC	World Association for Waterborne Transport Infrastructure
PLATINA	Platform for the Implementation of NAIADES).
p.mPro memoria	(to indicate that costs are expected but that the real value is not known)
PMU	Project Management Unit
PNH	Phnom Penh
PNPCA	Procedures for Notification Prior Consultation and Agreement
PPE	Personal Protective Equipment
PPP	Public-Private Partnership
PR China	People Republic of China
PRP	Police River Patrols
PSHEM	Port Safety, Health and Environmental Management
PSHEMS	Port Safety, Health and Environmental Management System
PWMM	Port Waste Management Manuals

QCB	Quan Chanh Bo
RAP	Regional Action Plan
R&D	Research and Development
RIS	River Information Services
RMNC	Regional Mekong Navigation Center
RNC	Raster Navigational Charts
RNCU	Regional Navigation Coordination Unit
SAIB	Shipping Accident Investigation Branch
SAN	Short Term Aids To navigation Action
SAR	Search and Rescue
SCB	Short Term Capacity Building Action
SEA	Strategic Environmental Assessment
SEN	Short Term Environmental Action
SEZ	Special Economic Zone
SFL	Short Term Fleet Action
SHN	Sihanouk Ville
SIMVA	Social Impact Monitoring Vulnerability Assessment
SIN	Short Term Institutional Action
SIN	Singapore
SNS	Short Term Navigation Safety Action
SOB	State of Basin Report
SOLAS	International Convention for the Safety of Life at Sea
SPD	Short Term Port Development Action
SRE	Short Term Regulatory Action
SSB	Single Side Band
SSO	Short Term Social Action
STCW	Standard of Training, Certification & Watchkeeping for Seafarer
SWD	Short Term Waterway Design Action
PPAP	Phnom Penh Autonomous Port
PSC	Port State Control
T	Thailand
TbEIA	Trans-boundary Environmental Impact Assessment
TEU	Twenty Foot Equivalent Unit
TNA	Training Needs Assessment
TOR	Term of Reference
UHA	Updating of the hydrographic Atlas (by which the first set of maps at scale 1/25,000 have been produced in the late 1980's-early 1990's.
UKC	Under Keel Clearance

UNCLOS	United Nations Convention on the Law of the Sea
UNESCO	United Nations, Education, Scientific and Cultural Organization
US	United States
USD	United States Dollar
V	Viet Nam
VHF	Very High Frequency
VIC	Vessel Inspection Checklist
VIG	Vessel Inspection Guidebook
VINAMARINE	Viet Nam National Maritime Administration
VINASHIN	Viet Nam Shipbuilding Industry Corporation
VINALINES	Viet Nam National Shipping Lines
VIP	Vessel Inspection Procedures
VIS	Vessel Inspection Scheme
VIWA	Viet Nam Inland Waterway Administration
VR	Viet Nam Register
VTS	Vessel Traffic Services
W	Width
WANDA	Waste management for inland Navigation on the Danube
WWF	World Wide Fund for Nature

1 INTRODUCTION

Projects identified in the RAP require different implementation approaches:

- National projects require national implementation (N);
- National projects with cross-border impact require national implementation but also regional coordination (NCI); and
- Cross-border projects require regional implementation and coordination (C)(such projects can involve all four countries or be bilateral only).

Lack of regional coordination can easily lead to insufficient and ineffective implementation. For cross-border projects or national projects with cross-border impact, MRC seems to be the most relevant regional institution to undertake such coordination and, with the right momentum, ensure harmonization between countries to the extent possible in areas such as regulations and standards.

Recommended implementing agencies will be responsible for implementing national projects and national projects with cross-border impact. It is proposed that a Regional Navigation Coordination Unit (RNCU) be established at the MRC Secretariat to coordinate the implementation of these projects. The assigned coordinating and working links between the RNCU and the line agencies in each MRC country will go through the Secretariats of each National Mekong Committee.

Some of these projects should preferably be implemented at the same time in all countries to obtain synergies in terms of budget savings and harmonization efforts.

It should be noted that for the stretches, where the Mekong mainstream forms the borderline between Thailand and the Lao PDR, this development can only start when the official border demarcation between the two countries is finalized.

No	Title	Type		No	Title	Type
Short term fleet actions				*Long term fleet actions*		
SFL1	Standardize vessel classification	NCI L,T,C,V		LFL1	Development of ship construction and ship yard policy	NCI T,V
SFL2	Conduct feasibility study on the use of reinforced sea-river barges	N CV		LFL2	Implementation of standards for construction of new vessels	NCI L,T,C,V
SFL3	Development of short and long-term fleet policy	NCI L,T,C,V		*Long term Waterway Design Actions*		
SFL4	Implement the Fleet Projects of the RAP for Transport of DG	NCI L,T,C,V		LWD1	Min. 500 DWT channel between Green Triangle and Vientiane	NCI L,T
Short term Waterway Design Actions				LWD2	Improve channel in the Vientiane-Savannakhet stretch	NCI L,T
SWD1	Condition survey of the dangerous areas for navigation	N L,T,C		LWD3	**(Scenario 2)** Improve channel Savannakhet-Khone Falls stretch	N L
SWD2	Standardize waterway	NCI		LWD4	**(Scenario 2)** Bypass canal at	NCI

	classification in the Upper Part of the MRB	L,T			the Khone Falls including ship locks	L,C
SWD3	Standardize waterway classification in the Lower Part of the MRB	NCI C,V		LWD5	**(Scenario 2)** Improve channel in Khone Falls-Kratie stretch	N C
SWD4	Design of river training works at the Sdao Canal in Cambodia	N C		LWD6	Improve channel Kratie-Kompong Cham stretch to 2,000 DWT	N C
SWD5	Experimental test dredging in the Tonle Sap/Great Lake	N C		LWD7	3,000 DWT channel in Kompong Cham-PPAP NTC stretch	N C
Short term Navigation Safety Actions				LWD8	Improve 500 DWT channel in Phnom Penh-Chong Kneas stretch	N C
SNS1	Introduce a vessel inspection system	NCI L,T,C,V		LWD9	3,000 DWT Channel from PPAP NTC to Cai Mep via Cho Gao Canal	N V
SNS2	Establish a framework for reporting marine accidents	NCI L,T,C,V		LWD10	10,000 DWT Channel from PPAP NTC to Quan Chanh Bo Canal	NCI C,V
SNS3	Development of a contingency plan	NCI L,T,C,V		LWD11	Morphology study in the areas between Phnom Penh and the sea	N V
SNS4	Implement search and rescue units on the Mekong River	NCI L,T,C,V		*Long term Navigation Safety Actions*		
SNS5	Introduce safety books on safety issues and safe working practices	NCI L,T,C,V		LNS1	Development of ENCs for the whole Mekong River	NCI L,T,C,V
SNS6	Introduce the obligation of AIS and VHF in the whole MRB	CB L,T,C,V		LNS2	Implementation of RIS over the total length of the Mekong River	NCI L,T,C,V
SNS7	Passenger safety between Huay Xay and Luang Prabang	NCI L,T		*Long term Aids to Navigation Actions*		
Short term Aids to Navigation Actions				LAN1	**(Scenario 1)** Compulsory GPS System Luang Prabang to Savannakhet	NCI L,T
SAN1	Reconstruction and rehabilitation of the concrete French markers	NCI L,T,C		LAN2	**(Scenario 2)** Compulsory GPS System from Savannakhet to Kratie	NCI L,T,C
SAN2	Construction of clearly visible low water alert gauges	NCI L,T,C,V		LAN3	Compulsory GPS System along the Tonle Sap River and Lake	N C
SAN3	Install a compulsory GPS System from Green Triangle to Huay Xay	NCI L,T		LAN4	Install buoys and beacons from Kratie to Kompong Cham	N C

SAN4	Improve compulsory GPS System from Huay Xay to Luang Prabang	NCI L,T		LAN5	Maintain the AtN from Kompong Cham/Cai Mep incl. Cho Gao	NCI C,V
SAN5	Install lights and marks at Mekong, Bassac and Tonle Sap bridges	NCI L,T,C,V		LAN6	Maintain the AtN on the Vam Nao Pass and the Bassac River	N V
SAN6	Upgrade AtN from Kompong Cham to mouth of the Mekong River	NCI C,V		*Long term Port Development Actions*		
SAN7	Upgrade AtN in Vam Nao Pass and Bassac River	N V		LPD1	Development of a longterm port strategy and policy	NCI L,T,C,V
Short term Port Development Actions				LPD2	Construction of five new passenger ports and landing facilities	N L
SPD1	Development of a port maintenance system	NCI L,T,C,V		LPD3	Construction of thirteen new port infrastructures for 500 DWT cargo	N L,C
SPD2	Development of a port HSEM system	NCI L,T,C,V		LPD4	Study ports to handle containers from Green Triangle to Savannakhet	NCI L,T
SPD3	For ports handling DG, implement the RAP for Transport of DG	NCI L,T,C,V		LPD5	Expansion New Container Terminal – NCT LM 17	N C
SPD4	Rehabilitation and/or reconfiguring of three existing passenger ports	N T,C		LPD6	Kratie - Development of a 2,000 DWT cargo port	N C
SPD5	Construction of ten new passenger ports and landing facilities	N L,T,C		LPD7	Kompong Cham - Development of a 3,000 DWT cargo port + domestic port	N C
SPD6	Establish standards and organize audit for L, T, C - oil ports	NCI L,T,C,V		LPD8	Kompong Chhnang - Development of a 500 DWT cargo port	N C
SPD7	Expansion of New Phnom Penh Container Terminal – NCT LM 17	N C		LPD9	Chong Kneas – Construction of a new passenger and cargo terminal	N C
SPD8	Rehabilitation of existing petrochemical transfer ports in Viet Nam	N V		*Long term Regulatory Actions*		
SPD9	Rehabilitation of existing cargo ports in Viet Nam	N V		LRE1	Full implementation of the Cambodian-Vietnamese Agreement	NCI C,V
SPD10	Update "Master Plan for Viet Nam Inland Waterway Sector"	NCI V		LRE2	Full implementation of the Quadrangle Agreement	NCI L,T

Short term Regulatory Actions				LRE3	Harmonize regulatory framework Luang Prabang to Khone Falls	NCI L,T
SRE1	Implement the Cambodian-Vietnamese Agreement	NCI C,V		LRE4	Develop a regulatory framework for ports	NCI L,T,C,V
SRE2	Enforce harmonized rules under the Quadrangle Agreement	NCI L,T		LRE5	Ensure effective enforcement of rules and regulations	NCI L,T,C,V
SRE3	Enforce harmonized safety rules for Lao PDR and Thailand	NCI L,T		*Long term Environmental Actions*		
SRE4	Adopt plans/procedures for port safety and emergency response	NCI L,T,C,V		LEN1	Trans-boundary environmental management and monitoring systems	CB L,T,C,V
SRE5	Policy/recommendations to enhance legal protection of passengers	NCI L,T,C,V		LEN2	Further SEA to determine zones for IWT or port restrictions	CB L,T,C,V
SRE6	Ensure effective law enforcement	NCI L,T,C,V		LEN3	Climate change adaptation integrated in reg. and nat. strategies	CB L,T,C,V
Short term Environmental Actions				*Long term Social Actions*		
SEN1	Develop environmental assessment guidelines for IWT	CB L,T,C,V		LSO1	Develop ten landing facilities for local passenger transport	NCI L,C
SEN2	Conduct SEA for Lancang-Mekong Development Plan	NCI L,T		*Long term Institutional Actions*		
SEN3	Optimisation study of dredging sand from the Mekong River	NCI L,T,C,V		LIN1	Study the need for a "Mekong River Navigation Commission"	CB L,T,C,V
SEN4	Determine oil spill pollution from ports, terminals and vessels	NCI L,T,C,V		LIN2	p a water monitoring and management body in Lao PDR	NCI L
SEN5	Start awareness campaigns on IWT pollution by vessels and ports	NCI L,T,C,V		LIN3	Establishment of a "Mekong Navigation Data Management Center"	N L,T,C,V
SEN6	Inventory air emissions cargo ports and energy efficiency of vessels	NCI L,T,C,V		LIN4	Establishment of a "Mekong River IWT Promotion Agency"	N L,T,C,V
SEN7	Vessel energy efficiency and most sustainable route PHN to the sea	NCI C,V		LIN5	Establishment of a "Hydrodynamic and Nautical Research Center"	CB L,T,C,V

Short term Social Actions						
SSO1	Analysis of Social Impact Monitoring Vulnerability Assessment	CB L,T,C,V		N = National, NCI = National with cross-border impact, CB = Cross-border		
SSO2	Further surveys of passengers, boat owners and rural communities	CB L,T,C,V		L = Lao PDR, T = Thailand, C = Cambodia, V = Viet Nam		
SSO3	Identify and promote eco-tourism and river-related tourism	CB L,T,C,V				
Short term Capacity Building Actions						
SCB1	Plan and implement IWT education and training actions	NCI L,T,C,V				
Short term Institutional Actions						
SIN1	Establish a "Regional Mekong Navigation Center"	CB L,T,C,V				
SIN2	Setting up "Mekong Navigation Data Management Centers"	N L,T,C,V				
SIN3	Setting up "Mekong IWT Promotion and Marketing Agencies"	N L,T,C,V				
SIN4	Study the need for cooperation on hydrodynamic research	CB L,T,C,V				

2 FLEET ACTIONS

2.1 SHORT TERM FLEET ACTION 1 (SFL1)

TITLE

Standardize the vessel classification in harmony with all the Greater Mekong River States

BACKGROUND AND RATIONALE

It is recognized that, for inland waterway navigation in the Lower Mekong Basin, there are a lack of standards and only a few harmonized regulations for safety and environment. Therefore, the measures introduced should be based on common standards as it poses problems to have different national systems on a river shared by two countries, or two countries sharing a cross-border navigation treaty. Updating and harmonizingstandards, rules and regulations to a uniform set of common standards is crucial for the development of Inland Waterway Transport on the Mekong River System. Therefore, formulating and harmonizing the different national systems will be necessaryfor ship classification and certification, and for waterway classification including bridge heights, among others.

Definition and purpose of classification of inland navigation vessels

Vessel classification provides a point of reference on ship safety and reliability for shipbuilders, ship repairers, shipbrokers, charterers, flag administrations, insurers and the financial community. It is represented by a class, entered on classification certificates and transcribed in the register of vessels published periodically by the Classification Society. Classification consists of a representation of the level of compliance of a vessel to the rules set up by the Classification Society. This is established following plan approval and surveys carried out by the Society's experts, as provided for in the rules.

Classification also means dividing vessels into categories based on their dimensions, characteristicsand cargo, which serve as a basis for Vessel Registration and Waterway Classification.

Classification also has other functions and responsibilities such as:

- To guide technical supervision, tonnage measurement and registration;
- To guide verification of design during new construction, and repairs;
- To facilitate monitoring and compilation of statistics registration;
- To assist economic and feasibility studies;
- To link classes of ships to certain cargoes;
- To facilitate investigations of shipping accidents;
- To form the foundation of ship insurance premiums;
- To inform the shipping and transport industry, determining IWT competitiveness by establishingmaximum vessel sizes thus affecting navigation costs;
- To ensure the orderly and efficient control and maintenance of waterways;
- To assist the authorities in planning and policy making by showing the missing links and bottlenecks that should be prioritized.

A brief overview of the situation on vessel classification in the four MRC Countries:

- The **Lao PDR** has no vessel classification standard for inland waterway vessels. The 2000 Quadrangle Agreement provides the vessel classification for the four Upper Lancang-Mekong Countries.
- **Thailand** has no vessel classification standard for inland waterway vessels. The 2000 Quadrangle Agreement provides the vessel classification for the four Upper Lancang-Mekong Countries.
- In **Cambodia**, in May 2009, the Navigation Coordination Committee of MPWT prepared: "Calibrating the Navigable Waterways of the Mekong River System into a Classification Standard", and proposed a Mekong Vessel Classification. This vessel classification standard is used for the Ship Registration Form.
- **Viet Nam** has issued a classification "Standards of Technical Class of Inland Waterways in Viet Nam" (Code TCVN 5664 – 1992). This classification, which differentiates between the natural rivers and the canals, identifies six categories, class I being the biggest category.

For modest inland navigation systems, which have as its biggest ships self-propelled barges of not more than 200 DWT, this classification is satisfactory. However this classification does not mention anything about pushed convoys (3,000 to 9,000 DWT), self-propelled barges of 1,500 to 2,000 DWT or river navigating seagoing vessels (1,000 to 7,000 DWT), which can surely be used in some of the river stretches of the Mekong River System all year round and in most of the Mekong stretches during the high water season.

The Viet Nam Register(VR)http://www.vr.org.vn/VRE/gioithieuE.aspx?id_news=72&id=River%20going%20Ship is a non-profit State Body which has functions and jurisdictions on the organization and performance of technical supervision and certification for quality and safety of means of transport including water-craft offshore installations, roadway and railway motor vehicles and industrial products. VRs services are for promotion of safety of life, property and protection of the environment from pollution.

The VR is also a Ship Classification Society Register of inland watercraft which carries out professional state management of safety for inland watercraft, and organizes unified survey networksthroughout the country. Establishing a registration system for inland watercraft is a part of VR functions. VR Classification and Register of river-going ships is done in the VR Head Office and VR Offices/Branches, while watercraft registration is done by the provincial authorities.

LOCATION

The short term Fleet Action will deal with the four MRC Countries. Each country will need to either introduce or improve the standards.

Preferably there will be harmonization into one system combining all six Greater Mekong Countries. Alternatively there will be two systems:

- **Upper Lancang-Mekong Region:** PR China, Myanmar, Lao PDR and Thailand as they fall under the 2000 Quadrangle Agreement.
- **Lower Mekong Region:** Cambodia and Viet Nam as they fall under the 2009 bilateral Agreement of Waterway Transportation between the two countries.

OBJECTIVES

Overall objective:

- To improve the regional trade between the six Mekong countries, and overseas partners using the navigable waterways of the Greater Mekong River System.

Immediate objectives:

- To classify the vessels into categories based on their dimensions, characteristics and cargo, which will serve as a basis for vessel registration and waterway classification.
- prepare a harmonized Vessel Classification System (one system for the Upper Greater Mekong River between PR China, Myanmar, Lao PDR and Thailand, one system for Cambodia and Viet Nam).

An adequate classification system should be based both on the characteristics of the waterway and according to the "normal" size of vessels or integrated barge tows, ensuring permanent navigability. Therefore the purpose of this study is:

- To sort all the vessels plying on the Mekong River system into a recognized classification system in accordance with their main characteristics (length, width, draught, DWT, etc.) thereby guaranteeing that these vessels can safely operate in certain types of [classified] waterways which meet the minimum geometric requirements needed to suit the corresponding "design-vessel";
- To categorize all the "navigable" stretches of waterways of the Mekong watershed into a classification system which meets over its entire length the minimum geometric requirements needed to suit a "design vessel" corresponding to a recognized category of vessels. These are mainly water depth, channel width, curvature, current velocity and air clearance under the bridges.

OUTPUTS AND DELIVERABLES

Output 1: The National Vessel Classification Systems are developed or improved according to international best practices and according to the local economic situation and capacities, and the different Vessel Classification Systems in the six Greater Mekong Countries are harmonized.

Output 2: Prepare an Action Plan for the adoption, training and implementation of the Classification System.

Output 3: Conduct training to make the Classification System operational among the relevant authorities, Classification Societies, and shipping companies.

Output 4: The Vessel Classification Standards are implemented, and after 3 years the efficiency of the new standards is evaluated.

ACTIVITIES

Under Output 1 (The National Vessel Classification Systems are developed or improved, and t**he different Vessel Classification Systems are harmonized)**

Activity 1.1 Review the Baseline Conditions of the Master Plan to prepare an inventory of the existing standards, rules and regulations on Ship Classification, the study on "*Calibrating the Navigable Waterways of the Mekong River System into a Classification Standard*", prepared by the Cambodian Navigation Coordination Committee in 2009, and additional information from the Member Countries as needed.

Activity 1.2 Obtain all existing standards, rules and regulations on Ship Classification, and translate them into English.

Activity 1.3 Analyze the existing standards, also assessing the efficiency of the system, inventory of equipment, availability of manuals, maintenance, institutional responsibility, enforcement, training, etc. Make a proposal on improving these,taking into consideration international best practices but to the level that fits the economic and capacity status of the countries to make it a feasible process, and consult with the countries.

Activity 1.4 Prepare a set of uniform standards to cover the requirements of the Upper Countries and the Lower Mekong Countries and make recommendations to harmonize the systems. If full harmonization between all four MRC Countries is not possible then it should be Lao PDR-Thailand for the Upper Region and Cambodia-Viet Nam for the Lower Region, and consult with the countries present during theregional workshop.

Activity 1.5 Prepare a set of harmonized standards to cover the requirements of the Upper Countries and the Lower Mekong Countries. If full harmonization between all four MRC Countries is not possible then it should be Lao PDR-Thailand for the Upper Region and Cambodia-Viet Nam for the Lower Region, and conduct consultations with the countries.

Activity 1.6 Organize and deliver a sub regional expert group meeting to consider and adopt the draft uniform system and recommendations. All representatives of stakeholders must participate in a national workshop before it goes to the regional level. Present the findings during the regional workshop.

Activity 1.7 Finalization of the recommended uniform system.

Activity 1.8 Once approved, translate the Vessel Classification Standards, and relevant documents, and publish.

Under Output 2 (Prepare an Action Plan for the adoption, training and implementation of the ClassificationSystem)

Activity 2.1 Make a detailed plan on how to adopt, implement, maintain and train the new system.

Activity 2.2 Liaison between the relevant authorities and the Classification Societies to agree oninspections and surveys.

Activity 2.3 Inform all the ship-owners about the new initiatives.

Under Output 3 (Training is conducted)

Activity 3.1 Following the training plan of Output 2, the relevant authorities, Classification Societies and shipping companies are trained in the use of the new system.

Under Output 4 (Implementation of the Vessel Classification Standardsand evaluation)

Activity 4.1 The Uniform Classification System is being used.

Activity 4.2 After 1 year an evaluation will be conducted to investigate the efficiency of the new standards and inspections, and needed improvements will be suggested.

BUDGET

The budget is handled partly on a national level (standards need to be established or improved on a national level) and partly on a regional level (harmonized).

Output 1: The National Vessel Classification Systems are developed or improved according to international best practices and according to the local economic situation and capacities, and the different Vessel Classification Systems in the six Greater Mekong Countries are harmonized.

For Lao PDR	US$ 10,000
For Thailand	US$10,000
For Cambodia	US$10,000
For Viet Nam(a lot already exists)	US$10,000
Regional budget(mainly for harmonizing the national standards)	US$ 50,000
Total	**US$ 90,000**

Output 2: An Action Plan for the adoption, training and implementation of the Classification System is prepared.

Regional budget	**US$20,000**

Output 3: Training is conducted to make the Classification System operational among the relevant authorities, Classification Societies, and shipping companies.

For Lao PDR	US$10,000
For Thailand	US$10,000
For Cambodia	US$10,000
For Viet Nam	US$10,000 (a lot already exists)
Regional budget	US$30,000
Total	**US$70,000**

Output 4: The Vessel Classification Standards are being implemented, and after 3 years the efficiency of the new standards is evaluated.

For Lao PDR	US$20,000
For Thailand	US$20,000
For Cambodia	US$20,000
For Viet Nam	US$30,000 (a lot already exists)
Regional budget	US$20,000 (mainly evaluation and monitoring)
Total	**US$ 110,000**
Grand TOTAL	**US$ 290,000**

HUMAN RESOURCES

International, regional and local experts.

PROPOSED EXECUTING/IMPLEMENTING AGENCY

Main executing agencies:

- **Lao PDR:** Department of Waterways, MPWT.
- **Thailand:** Marine Department, MoT.
- **Cambodia:** Inland Waterway Transport Department, MPWT.

- **Viet Nam:** VIWA-MoT.

Coordinators:

- Mekong River Commission (NAP hosting a Regional Navigation Coordination Unit RNCU).
- Vessel owners and operators, port and terminal operators, training center, National Mekong Committees.

Other implementing agencies:

- Inland Port State Control (if available).
- Shipping companies and operators, charterers.

TIME AND WORK SCHEDULE

There are two sets of timelines: one for the study introducing Inland Port State Control, and a second whenInland Port State Control is introduced.

Output 1 would take 4 months

Output 2 would take 2 months

Output 3 would take together 1 month

Output 4 would take 12 months, including 1-month evaluation and reporting

Total:only **7 months** for the formulation of the Vessel Classification including adoption and translations, then **12 months for** initial use, including evaluation (2017-2018).

SOCIAL ISSUES

This action is not expected to have any adverse social impacts.

ENVIRONMENTAL ISSUES

This action is not expected to have any adverse environmental impacts.

ECONOMIC ASSESSMENT

No measurable economic impacts.

PRIORITY OF ACTION (H/M/L)

High

FINANCING PLAN (PUBLIC/PRIVATE)

Fully public but could be assisted by the Classification Societies.

National

Regional: MRCS NAP, ADB - GMS (Greater Mekong Sub region).

International: World Bank, European Union, Flanders/Belgium, Australian aid, KOICA (Korea), JICA (Japan), ASEAN IAI (receiving funds from Australia, Japan, etc.).

PRIOR ACTIONS REQUIRED

None.

FOLLOW-UP ACTIONS REQUIRED

Evaluation mission to assess effectiveness and suggest improvements.

2.2 SHORT TERM FLEET ACTION 2 (SFL2)

TITLE

Conduct a feasibility study on the use of reinforced sea-river barges in the Lower part of the Mekong Basin, in particular for regional and coastal trade

BACKGROUND AND RATIONALE

In the Economic Assessment Report of the Master Plan it is clear that regional waterborne transportation between Cambodia and Viet Nam and between the delta and overseas ports will gain in significance. Forecasts of regional cargo traffic volumes within the Lower Mekong have been prepared for the three major traffic segments (Containers, Petroleum and General Cargo). For containers and petroleum traffic, a higher growth forecast was based on the regression of volume against real GDP, while a lower growth forecast reflects growth at the projected GDP growth rate. In the higher growth scenario, based on regression against GDP, the average annual rate of growth or AARG is 8.3% for the period 2015-2020 and 7.8% for the period 2020-2040. In the lower growth scenario, based on regression against GDP, the average annual rate of growth or AARG is 6.7 % for the period 2015-2020 and 6.9 % for the period 2020-2040.

Since 2009, maritime containers have been shipped from Phnom Penh to a new, deep-sea international container port at Cai Mep on the Sea in Vung Tau Province of Viet Nam, about 70 km by road south-east of Ho Chi Minh City. Initially, specialized motorized barges from the old Phnom Penh Port on Sisawat Quay shipped containers. However, in January 2013the Phnom Penh Autonomous Port opened a new container port at a site located 30 km from Phnom Penh on the Mekong mainstream. Self-propelled river barges connect the new port, with a capacity of 80 up to 160 TEU, to Cai Mep and, through this port, directly to mainline shipping services to the U.S.' West Coast ports.

Unfortunately, even though the cargo volumes for import and export are always increasing, road transport remains competitive. While there is a high quality road connection through NR1, which provides the new port with convenient access to container sources in and around the city of Phnom Penh, the road also presents competition given the completion of the new bridge at Neak Loeung and the probability of increased road traffic between Phnom Penh and Ho Chi Minh City.

It must be stated that IWT already faces stiff competition from road transport for general/bulk cargo traffic (cement, fertilizer, steel and coal) and from road and feeder shipping for petroleum traffic. With the opening of the new bridge over the Mekong at Neak Loeung, in the future IWT will face competition for container traffic between Phnom Penh and Cai Mep/Ho Chi Minh City.

Strong competition with other transport modes requires serious optimization of the cargo handling facilities, administrative waterway and port costs such as channel fees and gate/lo-lo charges but also, and importantly, improving the fleet. According to the Cambodian Garment Association, shipping decisions are made by buyers who choose shipping lines and ports of export. Buyers favor Singapore over HCMC owing to the greater scope Singapore offers for consolidation of shipments from Southeast Asia (Indonesia, Malaysia and Thailand, as well as Indochina). That is why it is important not to forget direct feeder trading between the delta and the Port of Singapore.

A modal share analysis was undertaken in the Master Plan design for the purpose of determining the proportions of the overall market volume which would, in the future, be served through Viet Nam or, alternatively, through Singapore or Thailand. This was done by establishing the operating cost of feeder ship movement between Sihanoukville and Singapore plus the cost of trucking between Sihanoukville and Phnom Penh, as compared with IWT movement from Nha Be to Phnom Penh. The feeder ship cost was based on the assumed operation of a 7,000 DWT vessel, while two sets of costs were calculated in the IWT case: one assuming a vessel of current size (1000DWT), and the other assuming a gradual trebling of vessel size to 3000 DWT. The results of this cost assessment were that a feeder ship plus truck option would have a weighted average cost of US$ 27.66 per '000 ton-km,

while the comparable costs for 1000DWT and 3000DWT tanker barges were respectively US$ 68.93 and US$ 36.30 per '000 ton-km.

By providing transport to fit the economies of scale, the transport costs and freight costs would also be lowered which would attract the shippers and cargo forwarders. The introduction of sea-river vessels – that can carry containers, general cargo, bulk and liquid bulk - will respond to this need for optimization, and provide incentivesto lower costs. Sea-river vessels are already being used in many parts of the world, thus solid and relatively recent second hand vessels could be procured, or new ships built specifically for the purpose. A feasibility study with clear recommendations would assist the decision-makers, shipping companies, freight forwarders and investors of the potential and corresponding costs.

LOCATION

Only Cambodia and Viet Nam. Thailand could be interested in coastal trade between Laem Chabang/Bangkok to the delta by reinforced sea-river coasters.

OBJECTIVES

The **overall objective** is to optimize the regional trade between Cambodia and Viet Nam, as well as optimize waterborne transport between the Mekong Delta and overseas mother ports.

Strong competition with other transport modes requires serious optimization of the cargo handling facilities, administrative waterway and port costs such as channel fees and gate/lo-lo charges but also, and importantly, improving the fleet.

Specific objectives of the Feasibility Study are to:

1) Investigate the technical feasibility and economic viability of operating sea-river barges in Cambodia and Viet Nam, and waterborne transport between the Mekong Delta and overseas mother ports;
2) Prepare detailed recommendations on purchasing existing sea-river vessels, custom-building new SR vessels, and best ways and routes for operation, and
3) Prepare a draft detailed procurement and implementation plan, based on the results of the F/S.

OUTPUTS AND DELIVERABLES

Output 1: Economic and Technical Viability Report clearly showing the costs/benefits and results of operating sea-river barges in Cambodia and Viet Nam, and waterborne transport between the Mekong Delta and overseas mother ports;

Output 2: Detailed recommendations on purchasing existing sea-river vessels, custom-building new sea-river vessels, and best ways and routes for operation;

Output 3: Detailed procurement and implementation plan, based on the results of the F/S.

ACTIVITIES

Under Output 1 (Economic and Technical Viability Report)

Activity 1.1 Review existing economy studies, statistical information and waterway designs, and conduct a field visit to gather information on the existing river transport management and operation methods currently used, including plans.

Activity 1.2 Desk study to analyse the possibilities of sea-rivervessels for the Mekong River.

Activity 1.3 Check the river condition and river characteristics. Investigate what possible routes can be used. Conduct discussions with the provincial and local agencies, and with cargo buyers, ship owners, freight forwarders and investors.

Activity 1.4 Investigate what is currently used and available in other parts of the world, and how effective these sea-river vessels are.

Activity 1.5 Define how much personnel would be required and what the capital and operational costs would be. Distinguish between procuring existing sea-river vessels or custom-building new ships, locally or abroad.

Activity 1.6 Detail what the capital costs would be.

Activity 1.7 Detail what the maintenance of the system hold should be and what would be the cost.

Activity 1.8 Detail what the benefits would be, both in terms of financial aspects and operational advantages.

Activity 1.9 Make a cost-benefit comparison. Take into consideration the fact that benefits should not only be expressed in financial figures but also as operational advantages.

Activity 1.10 Discuss the findings with relevant stakeholders.

Activity 1.11 Finalize the Feasibility Study.

Under Output 2 (Detailed recommendations)

Activity 2.1 Summarize the findings of Output 1 and prepare a draft report with clear recommendations on the best ways of introducing sea-river vessels to the Mekong Delta. Discuss things such as:purchasing existing sea-river vessels or custom-building? Which routes for operation?Are government Incentives available?Funding?Legal requirements (are they IMO ships or IWT barges?), etc.

Activity 2.2 Discussthe findings with relevant stakeholders.

Activity 2.3 Finalise the recommendations.

Under Output 3 (Detailed procurement and implementation plan, based on the results of the F/S)

Activity 3.1 Based on the results of the F/S and the recommendations, decide which components would be implemented, where and when. Distinguish between purchasing existing ships andcustom-building.

Activity 3.2 Prepare a Procurement Plan, but not to the engineering drawing details.

Activity 3.3 Prepare an Implementation Plan.

Activity 3.4 Submit all the documents to the relevant stakeholders.

BUDGET

This is a full regional budget unless one of the countries wishes to proceed alone, then a national budget would be required.

Output 1 (Economic and Technical Viability Report)	US$ 280,000
Output 2 (Detailed recommendations)	US$ 80,000
Output 3 (Detailed procurement and implementation plan)	US$ 20,000
Total	**US$ 380,000**

HUMAN RESOURCES

Stakeholders would be cargo buyers, ship owners, freight forwarders, port and waterway authorities and investors in Cambodia, Viet Nam and Thailand (in case the trade between Laem Chabang/Bangkok and the Mekong Delta is considered).

PROPOSED EXECUTING/IMPLEMENTING AGENCY

Best to implement the study through MRC, with direct assistance from cargo buyers, ship owners, freight forwarders, port and waterway authorities and investors in Cambodia, Viet Nam and Thailand.

TIME AND WORK SCHEDULE

The whole duration of the study would be 9 months (2017).

SOCIAL ISSUES

This policy action is not expected to have any adverse social impacts.

ENVIRONMENTAL ISSUES

This policy action is not expected to have any adverse environmental impacts. Implementing standards would improve the energy efficiency, waste management and pollution control measures for vessels.

ECONOMIC ASSESSMENT

Ultimate use of reinforced sea/river barges for container haulage between Phnom Penh and Cai Mep/Ho Chi Minh would increase average payloads per barge from 100 TEU (1500 DWT) currently to 650 TEU (10,000 DWT) in the future. The estimated savings in operating costs, fuel consumption and emission of greenhouse gases (per TEU) resulting from the fleet upgrade is provided in the table below:

Short term fleet action No.2: Economic impact of operating reinforced sea-river barges on Bassac between Phnom Penh and Cai Mep

Option	Item	Route	Annual operating cost per TEU (US$)	Fuel cons litres/TEU	GHG emissions per TEU (tonnes)*
1	Existing river barges (100 TEU)	Mekong - CG canal (371 km)	221.89	106	0.2882
2	Sea-river barges (650 TEU)	Bassac (520 km)	68.13	27	0.0738
	Economic savings: - Option 2 vs. Option 1		153.76	79	0.2144
	% saving		69.3%	74.4%	74.4%

** Emission rate = 2.72 kg per litre of diesel fuel consumed*

PRIORITY OF ACTION (H/M/L)

High.

FINANCING PLAN (PUBLIC/PRIVATE)

Fully public but could be assisted by the private sector.

PRIOR ACTIONS REQUIRED

Discussions with the private sector and stakeholders.

FOLLOW-UP ACTIONS REQUIRED

Assistance towards implementation if the net present values are positive.

2.3 SHORT TERM FLEET ACTION 3 (SFL3)

TITLE

Develop a short and long term Fleet Improvement and Modernizationpolicy

BACKGROUND AND RATIONALE

Carriage of people and goods by inland waterways is climate-friendly and energy-efficient and can significantly contribute to sustainable mobility in the Mekong Region. MRC believes that transport by inland waterways must be better used in order to relieve heavily congested roadsand transport corridors. In many parts of the world, the navigation sector attracts large-scale investments and is subsequently functioning as an important trade and transport link with regional or international infrastructure. Several studies conducted by the Mekong River Commission draw attention to the fact that the navigation potential of the Mekong is highly under-utilized and the most significant barrier to further development of the navigational uses are of institutional rather than physical character.

One such barrier is widespread misperceptions about the benefits and negative impacts of navigation. Although the advantages of investing in the waterborne transport sector are numerous, governments continue to promote road and rail transport through their development planning, policies and budget allocations. Many decision-makers and administrators lack an understanding of the navigation sector and the contribution it can make to socio-economic development. Rivers provide cheap transport of people and cargo at costs that are lower than road and air transport. The establishment and maintenance of road and rail networks are far more expensive than the equivalent cost of waterborne transport facilities.

Governments should be encouraging the public sector to invest in the waterborne transport sector, developing private-public partnerships and informing investors outside the Mekong Basin of the trade and transport opportunities on the Mekong.The navigation sector deserves more political attention and budgetary allocations.

In order to promote regional navigation, the national and regional navigation sector need to be developed in order to meet the demands and requirements of modern traders and transporters.As explained earlier, there is a definite need to promote navigation activities across the Mekong Basin. Assisting the MRC countries in compiling arguments and documentation that canattract and justify more investments and political attention, is also needed.

With the exception of some river cruise ships that ply between HCMCand Siem Reap, the fleet on the Greater Mekong River -- from house boats to passenger vessels, tug boats, ferries, container ships, and tankers -- are substandard, inadequate, unsafe, not carbon-emission-friendly, slow, and not fit to carry the amount of cargo that should normally be carried in high volumes by river.

The Master Plan therefore proposes the need for a detailed short and long term policy to improve and modernize the fleet by providing tax advantages, subsidy of IWT and scrapping subsidies, among others. To increase the use of IWT, the governments should facilitate IWT and promote the sector. Otherwise, undercapitalization by private companies, combined with insufficient investment and neglected maintenance, will contribute to the deterioration of the inland navigation fleet. The market needs special attention from governments and special financing solutions.

Examples ofspecific fleet improvement policies and instruments in other parts of the world:

- **EUROPEAN UNION - NAIADES**: by creating favorable conditions for the further development of the waterborne sector, the European Commission hopes to encourage more companies to use this mode of transport. The policy to promote inland waterway transport in Europe is encapsulated in the NAIADES Action Programme. The implementation of NAIADES (Navigation And Inland Waterway Action and Development in Europe) is supported by the implementation platform PLATINA (PLATform for the Implementation of Naiades).

- The NAIADES Action Programme comprises numerous actions and measures to boost transport on inland waterways. The programme runs until 2020 and is to be implemented by the European Commission, the Member States and the industry itself.
- The European Commission is also promoting inland waterway transport through various funding and financing programmes, such as the Connecting Europe Facility, Horizon 2020,the European Fund for Strategic Investments and through the Cohesion policy. A funding database provides an overview of available public funding for inland waterway transport.
- **PR CHINA**: in 2013 PR China unveiled a new subsidy program to encourage the scrapping of old cargo ships and tankers as part of measures to support the shipping sector. Chinese shipping companies receive 1,500 Yuan ($247) per gross ton to replace old ships registered in the country with new and more environmentally friendly vessels. This means that a shipping company that scraps and replaces a 3,000 DWT barge would receive roughly US$ 741,000 in subsidies.
- Ships must be within 10 years oftheir mandatory retirement age to be eligible. For dry-bulk ships, which carry commodities such as grain and coal, retirement is after 33 years of service. Ship owners will get half the subsidy when they finish scrapping an old ship and receive the remainder if a new ship is built. The subsidy will be valid through the end of 2015.
- **PRO DANUBE**is an example of a Private Partners Association that lobbies for FLEET improvements.
- The Danube functions as the backbone for sustainable and cost-effective logistics services in a region of almost 100 million Europeans. Pro Danube International wants to unlock this potential for the benefit of the economies and the people, in line with the view of the Danube as an important eco-system. Pro Danube International acts as a network of private businesses to promote better infrastructure and services, which result in a more intensive use of the environmentally friendly inland waterway. They adequately represent the "Danube-minded business" in the political debate on transport policy, transport technology and regional development. They do not intend to compensate for or duplicate existing initiatives but integrate and strengthen their activities.

Pro Danube International is a driving force in the development of the Danube as a competitive logistics system. Savings in logistics costs due to efficient Danube services will enable the industries of the region to stay competitive in the global economy and will also create jobs and wealth. Danube will act as a competent partner for authorities and administrations by supporting the definition and implementation of policy actions based on the experiences of the private sector.

Concrete actions for FLEET:

- Establish liner services for intermodal transport;
- State aid guidelines for support schemes;
- Support programmes to promote modal shift and facilitate investment;
- Fiscal incentives;
- Subsidy program to encourage the scrapping of old cargo ships and tankers;
- Harmonized legislation for manning, vessels, boat masters' certificates, intermodal documentation;
- Improve RIS;
- Stimulate fleet modernization and innovation;
- Targeted fleet innovations, e.g. vessel design, further automation, including ICT;
- Innovative concepts for vessels, operations and transshipment;

- The introduction of existing technology to further reduce fuel consumption and harmful emissions, e.g. hydrodynamics, improved propulsion, fuel-efficiency and filtering techniques;
- Subsidy program to encourage the scrapping of old cargo ships and tankers;
- Research into commercially viable non-carbon fuels, e.g. hydrogen fuel cells, and zero-emission engines should be actively pursued;
- The safety record of inland shipping, though exemplary, can be further improved by on-board and on-shore information technology (River Information Services);
- Innovation can take place both through the construction of new vessels (longterm approach) and the refit of existing vessels (short and midterm approach);
- To facilitate rapid market transfer of new technology, the legal framework for environmental and safety standards (engine emissions, fuel quality, waste disposal, dangerous goods transport) should be reinforced;
- R&D activities should concentrate on the development of refit concepts accompanied by support programmes (including pilot tests), fiscal incentives and training;
- Encourage use of safety-enhancing technologies;
- Encourage use of eco-efficient engines and renewable energy sources; and
- Develop refit concepts for existing vessels.

Instruments and responsibleactors:

- Develop refit concepts for existing vessels;
- State aid guidelines for support programmes;
- Support programme to facilitate efficiency, environment and safety-enhancing;
- IWT Innovation Funds;
- Funding Handbook for IWT; and
- Reinforced environmental and safety legislation (including waste disposal, dangerous goods).

Improve image and co-operation:

- Promote inland navigation as a successful partner in business;
- Support and coordinate promotion activities;
- Influence logistics decision-making by public relations;
- Set up and expand Mekong IWT promotion and development network;
- Set up national promotion and development structures;
- Provide political, practical and financial support for promotion centers;
- Appoint national focal points within administrations;
- Integrate national promotion structures and focal points into a Mekong network;
- Monitor trends and developments within the IWT market;
- Harmonize collection of data at all levels; and
- Ensure availability of compatible source data.

LOCATION

In the four MRC Countries

OBJECTIVES

Overall objective: To give the Mekong waterborne transport sector a boost by modernizing and improving the Mekong Fleet and make IWT an economically attractive, safe and reliable transport mode.

Specific Objective: To promote investments and development in the Mekong Fleet by formulating a short and long term Fleet Improvement and Modernization policy and as such provide more political attention and budgetary allocations to meet the demands and requirements that modern traders and transporters request.

OUTPUTS AND DELIVERABLES

Output 1: The Baseline Conditions and Development Scenarios of FLEET under the Master Plan for Regional Waterborne Transportation are updated, where required, to reflect the latest figures of ship characteristics, numbers, cargo carried, passengers and tourists.

Output 2: A short and long term Fleet Improvement and Modernization policy is formulated.

Output 3: Identify/establish a promotion agency to represent the public and private sectorand thereby implement the policy.

ACTIVITIES

Under Output 1 (Update of the Baseline Conditions and Development Scenarios of FLEET)

Activity 1.1 Full review of the Baseline Conditions and Development Scenarios of FLEET under the Master Plan for Regional Waterborne Transportation.Prepare questionnaires in order to update, where required, latest figures of ship characteristics, numbers, cargo carried, passengers and tourists.

Activity 2.1 Assessment of target groups. This is very important because the success of the policy will largely depend on how much capital input can be provided. Include the main investment donors such as the ADB, World Bank, JICA and PR China.

Activity 3.1 Develop promotion and information strategy in close cooperation with national and international stakeholders in order to develop the policy.

Under Output 2 (short and long term Fleet Improvement and Modernization policy)

Activity 1.2 Conduct a full analysis of the results under output 1 against the requirements for the future: what kind of vessels will be required to carry the passengers and cargo as predicted?

Activity 2.2 Formulate the draft short term (up to 2020) and the long term (up to 2040) Fleet Improvement and Modernization policy.

Activity 2.3 Conduct a regional forum with all the stakeholders (identified in act 2.1) to finalize the Fleet Improvement and Modernization Policy.

Under Output 3 (Identify the promotion agency to represent the public and private sector)

Activity 3.1 This is done in combination with Action SIN3 (*Study the need for cooperation on IWT promotion*) and LIN4 (*Establish a Mekong River IWT Promotion Agency*)

BUDGET

This is a full regional budget unless one of the countries wishes to formulate its own national policy, then a national budget would be required.

There is no budget allocated for Output 3 because this would be done in combination with Action SIN3 (*Study the need for cooperation on IWT promotion*) and LIN4 (*Establish a Mekong River IWT Promotion Agency*):

Output 1(Update of the Baseline Conditions and Development Scenarios of FLEET)	US$ 50,000
Output 2 (Short and long term Fleet Improvement and Modernization policy)	US$ 80,000
Output 3 (Identify the promotion agency to represent the public and private sector)	--
Total	**US$ 130,000**

HUMAN RESOURCES

Stakeholders would be ship owners, cruise boat operators, freight forwarders, port and waterway authorities,cargo buyers, shipyards, ship brokers, pilots and investors in the four MRC Countries.

PROPOSED EXECUTING/IMPLEMENTING AGENCY

Best to implement the policy formulation through MRC, with direct assistance from ship owners, cruise boat operators, freight forwarders, port and waterway authorities,cargo buyers, shipyards, ship brokers, pilots and investors in the four MRC Countries.

TIME AND WORK SCHEDULE

The whole duration of the study would be 9 months (2016).

SOCIAL ISSUES

This action is not expected to have any adverse social impacts. It will be important to consider opportunities for capacity building of captains and crewmembers to utilize the new vessels and equipment.

ENVIRONMENTAL ISSUES

This action is not expected to have any adverse environmental impacts. This action could have positive impacts by improving the energy efficiency of vessels and reducing the risks of shipping accidents.

ECONOMIC ASSESSMENT

No measurable economic impacts.

PRIORITY OF ACTION (H/M/L)

High.

FINANCING PLAN (PUBLIC/PRIVATE)

Fully public but could be assisted by the private sector.

PRIOR ACTIONS REQUIRED

Discussions with the private sector and stakeholders.

FOLLOW-UP ACTIONS REQUIRED

Assistance towards implementation.

2.4 SHORT TERM FLEET ACTION 4 (SFL4)

TITLE

Implement the Fleet Projects under the "Regional Action Plan for Sustainable Transport of Dangerous Goods along the Mekong River 2015-2020"

See "Regional Action Plan for Sustainable Transport of Dangerous Goods along the Mekong River 2015-2020 – Part I Implementation Strategy and Part II Portfolio of Projects for Cambodia, Lao PDR, Thailand and Viet Nam", MRCS NAP, December 2014.

BACKGROUND AND RATIONALE

In 2009, the Navigation Programme consulted with port authorities, vessel associations, petroleum companies, transport operators and relevant ministries in Cambodia, Lao PDR, Thailand and Viet Nam on increasing transport of dangerous goods along the Mekong.

Awareness of dangerous goods, environmental protection, impacts of oils spills and safety requirements are currently limited in all of the Member Countries. Public information and awareness programmes will need to be developed to raise the awareness of all waterway users.

The Member Countries decided to develop a Regional Action Plan, which would act as the guiding document for Member Countries and the MRC on navigation safety and environmental protection.

The need for a Regional Action Plan (RAP) is underlined by the continuous increase in inland waterway transport, which increases the risks of accidents such as fires, explosions and oil spillages that would require efficient emergency response. Increased transport also means increased waste generation on board vessels and in ports and terminals. If not handled properly, increased waste will result in longterm negative environmental impacts and adversely affect the livelihoods of people living along the river.

The carriage, handling and storage of dangerous goods is significant in **Cambodia**. Gasoline, diesel, jet fuel and other petroleum products are imported on inland barges from Viet Nam and primarily stored at 12 large petroleum terminals on the Mekong and Tonle Sap Rivers.

In **Lao PDR** most dangerous goods are transported by ferry crossings and include gasoline, diesel, asphalt and fertilizers. Tanker trucks containing dangerous goods load onto ferries and transport goods from Thailand to Lao PDR. The Km 4 State Port Authority has fuel-storage capacity for refueling trucks, cranes and equipment onsite. There are a number of small refueling stations along the Mekong River for cargo, passenger and small fishing and other vessels. One of the main issues identified by the Risk Analysis was the management of solid and liquid wastes and limited awareness of the risks associated with transport and storage of dangerous goods.

The transport of dangerous goods is also increasing in **Thailand** through the export of petroleum products through Keawalee Terminal in Chiang Saen, a privately-owned terminal used to transfer diesel and gasoline from tanker trucks to inland barges from the People's Republic of China and Myanmar.

Inland waterborne transport is well advanced in **Viet Nam** where there are a number of inland and maritime ports helping to boost economic growth. The transport and storage of dangerous goods is extensive in Viet Nam. There are a number of petroleum terminals that use domestic tankers to supply refueling stations and power generation industries.

An important aim of the RAP is to meet international requirements for inland navigation safety and environmental protection for ports, terminals and tankers/ships, when they exist, and to establish adapted standards in the region. Although individual countries are at different levels, they all have an interest in the compliance of neighboring countries with relevant Conventions, Regulations and other Guidelines to ensure the highest level of safety and environmental protection.

The implementation of the RAP will be an important step towards more sustainable transport of dangerous goods. Member Countries will implement the plan at the national level in close

coordination with the MRC with assistance from bilateral development partners and other agencies such as donors and development banks.

LOCATION

All MRC member countries

OBJECTIVES

The implementation of the Regional Action Plan has as its**overall objective "**to ensure efficient, safe and secure carriage, handling and storage of Dangerous Goods on the Mekong River in a sustainable manner."

The**specific objectives** relating to FLEET with regards to Cambodia, Lao PDR, Thailand and Viet Nam are to:

- Increase safety on board vessels with a special focus on tankers;
- Minimize the environmental impact of navigation on the Mekong River with improved waste management;
- Secure safe and clean navigation on the Mekong River; and
- Increase human capacity in inland waterway and environmental authorities and the private sector.

The overall and specific objectives shall be achieved by implementing national projects, national projects with cross-border impact and cross-border projects, of which five actions are related to FLEET carrying dangerous goods:

National Projects:

- **Vessels:** Implementation of the International Maritime Dangerous Goods (IMDG) Code and Provision of Material Safety Data Sheets (MSDS) for Inland Waterway Vessels.
  - ⇨ *To implement provisions of the IMDG code, the MSDS, and to ensure that the crew has the necessary knowledge, information and documentation of the dangerous goods carried on board for conducting operations in the safest possible way.*
- **Vessels:** Emergency Response Onboard Vessels.
  - ⇨ *To ensure that the shipmaster and the crew can manage and respond successfully to any emergency onboard a vessel.*

National Projects with Cross-Border Impact:

- **Vessels:** Mekong Tanker Safety Management.
  - ⇨ *To improve safety onboard inland waterway tankers through the preparation and implementation of a vessel safety management system, thereby reducing the risk of accidents.*
- **Vessels:** Minimum Standards for Vessels Design, Construction and Equipment
  - ⇨ *To reduce shipping accidents from structural and technical shortcomings and improve the safety on-board inland waterway vessels by establishing minimum standards for vessel design, ship construction and equipment, and by developing a mechanism to certify and control that these standards are complied with.*
- **Vessels:** Safe Manning on Inland Waterway Vessels
  - ⇨ *To ensure that vessels are operated safely and manned with sufficient and qualified crew to prevent accidents or pollution from the handling and transport of dangerous goods and cargo.*

- **Waterways:** Introducing Geographical Zones in the Mekong River System.
  - ⇨ *To assess, identify, define and approve the different Geographical Zones in the Mekong River system, and to ensure that the technical and operational requirements for tankers using these Geographical Zones are met.*

The ultimate objective of this Master Plan action is to implement the FLEET related projects of the Regional Action Plan on the Sustainable Transport of Dangerous Goods along the Mekong River in order to actively prevent and mitigate the environmental and safety risks associated with the carriage and handling of dangerous goods.

OUTPUTS AND DELIVERABLES

The following outputs are expected for the different projects:

Project 1: Mekong Tanker Safety Management

Output 1: Mekong Tanker Safety Management (MTSM) Sub-Decree for inland waterway tankers drafted, approved and legalized.

Output 2: Mekong Tanker Safety Management Sub-Decree between the countries harmonized, at least on a bilateral basis i.e. Cambodia/ Viet Nam.

Output 3: A Vessel Inspection System (VIS procedures) prepared for relevant inspection.

Output 4: Training conducted for ship operators, ship owners, crewmembers and authorities in the practical use of the Mekong Tanker Safety Management Sub-Decree, the Vessel Safety Management System and the Vessel Inspection System.

Output 5: Two pilot projects implemented with a shipping company/vessel operator and inspection authorities on the practical implementation of the Mekong Tanker Safety Management Sub-Decree.

Project 2: Minimum Standards for Vessel Design, Construction and Equipment

Output 1: Existing regulations on vessel design, construction and equipment reviewed and recommendations made. Harmonization process between Viet Nam and Cambodia started.

Output 2: Regulations amended and additional regulations prepared where needed, standards approved and legalized.

Output 3: Advanced training on the regulations, standards and guidelines prepared and carried out and eventually incorporated into the existing navigation training programme.

Output 4: Detailed institutional strengthening scheme for inspection and control identified and relevant agencies and operators proposed. Capacity building carried out.

Output 5: A pilot project with a shipping company/vessel operator on the practical implementation of minimum equipment requirements for existing vessels is implemented.

Project 3: Safe Manning on Inland Waterway Vessels

Output 1: Safe Manning Standards and Certification Requirements for all types of inland waterway vessels (tanker vessels, cargo vessel, passenger vessels and ferries) prepared on a national level, working towards regional harmonization.

Output 2: Training Needs Assessments for all specific subjects regarding Safe Manning on board vessels.

Output 3: Curricula, syllabi and course material regarding Safe Manning on board vessels reviewed and updated, and training is carried out.

Output 4: The training programmes on Safe Manning Standards and on the training certification process will be incorporated into the existing national maritime training portfolio.

Project 4: Implementation of the IMDG Code and provision of the MSDS for inland waterway vessels

Output 1: The International Maritime Dangerous Goods Code (IMDG Code), with regards to inland navigation, and the (Material) Safety Data Sheet ((M)SDS) are implemented.

Output 2: An Operational Manual for the use of the (M)SDS and the IMDG Code on board Inland Waterway Vessels is prepared.

Output 3: Standard transport documents and administrative procedures for practical use onboard are prepared.

Output 4: Training for vessel crew in job-specific knowledge of the IMDG Code and in the use of documents for carriage of Dangerous Goods, including the (M)SDS, are prepared and carried out.

Output 5: Two pilot projects involving a shipping company/vessel operator and inspection authorities on the practical implementation of the IMDG Code and the (M)SDS.

Project 5: Emergency Response Onboard Vessels

Output 1: Regulations for ERM on board inland waterway vessels prepared or updated.

Output 2: ERM on board inland waterway vessels is implemented.

Output 3: Operational training on handling emergencies is conducted.

Output 4: List of all necessary emergency equipment required on board vessels is prepared.

Output 5: Two pilot projects involving a shipping company/vessel operator and inspection authorities on the minimum equipment and training requirements for emergency preparedness is conducted.

Project 6: Introducing Geographical Zones in the Mekong River System, and related Technical and Operational Requirements for Tankers

Output 1: Desk study and in-depth analysis is conducted.

Output 2: Assessment, identification and definition ofthe Geographical Zones is carried out.

Output 3: Risk-mitigating measures for use by tankers on the Mekong River system are identified.

Output 4: The “National Technical and Operational Standards and Regulations” prepared under Project Document 1.1 (Mekong Tanker Safety Management), and Project Document 1.2 (Minimum Standards for Vessel Design, Construction and Equipment), to incorporate the Geographical Zone requirements, is adjusted.

Output 5: Through bilateral discussions with other Mekong member countries and assistance from MRC,the revisions to the “National Technical and Operational Standards and Regulations” are harmonized with the ones in Output 4.

Output 6: The Geographical Zones in Cambodia, and related technical and operational requirements for tankers, are approved.

Output 7: The guidelines on the new requirements for the operators of tankers are prepared.

Output 8: The "National Technical and Operations Standards and Regulations" and corresponding guidelines are incorporated into the training curricula in Cambodia and the training is carried out.

Output 9: Awareness campaigns for owners and operators of vessels, tankers and shipping lines are prepared and carried out.

ACTIVITIES

Project 1: Mekong Tanker Safety Management

Under Output 1 (Mekong Tanker Safety Management (MTSM) Sub-Decree)

Activity 1.1 Investigate in detail the needs and requirements for safety management of tanker vessels carrying dangerous goods on the Mekong River taking into consideration the kind of cargo and quantities being shipped today and those planned for the future and compare the needs with the provisions of the ISM Code.

Activity 1.2 Conduct national consultations on how to adapt the ISM Code into a Mekong Tanker Safety Management (MTSM)Sub-Decree.

Activity 1.3 Draft the MTSM Sub-Decree.

Activity 1.4 Circulate the first draft of the MTSM Sub-Decree among the relevant authorities and private shipping operators (tankers) for review and comments.

Activity 1.5 Conduct a National Workshop to discuss and finalize the MTSM Sub-Decree.

Activity 1.6 Legalize the MTSM Sub-Decree.

Under Output 2 (MTSM harmonized between the countries)

Activity 2.1 In connection with Activity 1.4, a national working group shall be established to work towards the harmonization of the Mekong Tanker Safety Management Sub-Decree with the other MRC countries. In this respect, existing bilateral agreements should be evaluated and various possible ways to harmonize the Sub-Decree should be considered, ranging from binding instruments (for instance a bilateral treaty) to non-binding soft-law instruments.

Under Output 3 (Vessel Inspection System is prepared)

Activity 3.1 Prepare a national inspection system for compliance of vessels with the Mekong Tanker Safety Management Sub-Decree based on the Mekong Vessel Inspection Scheme prepared for Chiang Saen Commercial Port in 2012, and/or the Mekong Vessel Inspection System, which is currently under preparation for Viet Nam and Cambodia (2014).

Under Output 4 (Training is conducted)

Activity 4.1 Identify relevant stakeholders for participating in training courses from the private sector (ship owners and operators and crew).

Activity 4.2 Identify relevant stakeholders for participating in training courses from national authorities.

Activity 4.3 Prepare training course (curriculum and training material) for the identified stakeholders. Evaluate the possibility to include it into existing national training requirements.

Under Output 5 (Pilot Projects are implemented)

Activity 5.1 Identify two potential shipping companies/vessel operators to participate in the pilot project.

Activity 5.2 Prepare an individual Mekong Tanker Safety Management System for the two companies and implement the requirements and procedures.

Activity 5.3 Train staff onshore and crew on board to operate the prepared system.

Activity 5.4 Carry out inspection audits of the system utilizing the authority inspection system developed, the VIC prepared, trained authority inspection staff.Evaluate results and take corrective actions.

Project 2: Minimum Standards for Vessel Design, Construction and Equipment

Under Output 1 (Existing regulations are reviewed)

Activity 1.1 Review existing national regulations, standards and guidelines regarding vessel design, as well as construction and equipment, and compare with international standards and guidelines.

Activity 1.2 Propose and agree on international standards and guidelines to be used as a reference and example.

Activity 1.3 Establish a bilateral working group between Cambodia and Viet Nam in order to establish common, harmonized standards and guidelines.

Activity 1.4 Provide harmonized recommendations for updating existing regulations, standards and guidelines according to international standards and guidelines.

Under Output 2 (Existing and additional regulations are reviewed and prepared)

Activity 2.1 Amend existing regulations according to the recommendations.

Activity 2.2 Standard approved and legalized by the Ministry of Public Works and Transport.

Activity 2.3 Define minimum equipment requirements for existing and new vessels and establish procedures on how this can be certified.

Activity 2.4 For existing vessels in service, provide a transitional period that vessel operators need to comply with and a level that is reasonably acceptable in terms of the new equipment requirements.

Activity 2.5 Inform vessel operators about the new minimum equipment requirements for existing vessels, the transitional period, the latest date for compliance and the necessary certificate they require in order to prove compliance of the vessel with the new regulations.

Activity 2.6 Establish procedures with identified and approved Classification Societies for certification.

Under Output 3 (Training on regulations, standards and guidelines are conducted)

Activity 3.1 Identify relevant stakeholders in government authorities, as well as the private sector(ship builders and owners), to participate in training courses.

Activity 3.2 Prepare and carry out a training course (curriculum and training material) for the identified stakeholders. Include (if possible) the training course into existing national training requirements.

Under Output 4 (Scheme for inspection and control is proposed and capacity building is provided)

Activity 4.1 Prepare an inspection tool that can be used to check compliance with the minimum equipment requirements for existing vessels.

Activity 4.2 Identify relevant authorities for inspection and control of vessels, and prepare a detailed capacity building program (procedures and training) regarding the inspection and control of vessels. Carry out training.

Under Output 5 (Pilot project is implemented)

Activity 5.1 Identify 3-5 potential shipping companies/vessel operators to participate in the pilot project.

Activity 5.2 Compare the conditions and the present equipment on the vessel with the prescribed minimum requirements and prepare a survey report enabling the operators to make the necessary adjustments to comply with the new regulations for existing vessels.

Activity 5.3 Assist shipping companies/vessel operators to implement recommendations from the survey report.

Project 3: Safe Manning on Inland Waterway Vessels

Under Output 1 (Safe Manning Standards for all vessels are prepared)

Activity 1.1 Identify and review existing national guidelines/standards and international standards regarding Safe Manning for vessels on inland waterways.

Activity 1.2 Compare the existing national and international guidelines/standards for Safe Manning in terms of: size and type of vessels, equipment, cargo carried, trading area, training and skill of crewmembers, experience of crewmembers, applicable work hour limits, rest requirements and operations in which the vessel is involved.

Activity 1.3 Based on this comparison, draft minimum National Standards for Safe Manning.

Activity 1.4 Liaise closely with relevant stakeholders in the public and private sectors regarding their comments to the draft minimum National Standards proposed, and work toward getting broad stakeholder approval.

Activity 1.5 Present the draft minimum National Standards to the Minister of Public Works and Transport for approval.

Activity 1.6 Initiate discussion of harmonization of the draft National Standards within MRC (or bilaterally).

Under Output 2 (Training Needs Assessments for Safe Manning are conducted)

Activity 2.1 Assess the current level of education and training of stakeholders involved in inland shipping. This includes the private sector as well as any national staff.

Activity 2.2 Determine the minimum level of education and training to be required for different stakeholders (e.g. more advanced education and training for crew/captain of inland waterway vessels).

Activity 2.3 Identify existing training facilities in Viet Nam, including maritime colleges and private training institutions, and recommend how Safe Manning training could be included in the existing training portfolio.

Under Output 3 (Training curriculum for safe manning are reviewed)

Activity 3.1 Summarize and evaluate the content of existing education programs related to safe manning in the maritime sector (public and private).

Activity 3.2 Review and update national curriculum for safe manning training in cooperation with national and international maritime training institutions and stakeholders involved in the inland shipping industry.

Activity 3.3 Initiate a process of cross-border harmonization of training standards and qualifications for crew of inland waterway vessels with the assistance of the Mekong River Commission.

Activity 3.4 Update existing education programs and training materials according to the new national curriculum, and create a specific inland navigation education program.

Activity 3.5 Draft national legislation incorporating the new education, training and certification requirements. This shall include theoretical and practical training, evaluation procedures and certification.

Activity 3.6 Introduce guidelines for stakeholders to promote the national provisions regarding safe manning as well as the importance of education and training, and launch an awareness campaign.

Activity 3.7 Carry out education and training for identified stakeholders.

Under Output 4 (Training programmes on Safe Manning Standards and Certification are provided)

Activity 4.1 Decide whether the national or private sector will carry out the new training.

Activity 4.2 Evaluate the feasibility of incorporating Safe Manning training into existing training and education programs.

Activity 4.3 Based on the conclusions from activities 4.1 and 4.2, identify a maritime training institution to anchor the Safe Manning training.

Activity 4.4 Work with the selected training institution to assess and make adjustments to accommodate, if necessary, the teaching facilities needed to start the program. This includes documentation, simulation equipment, hardware, software and technical training equipment.

Activity 4.5 Organize the training of teachers for the new training programme.

Activity 4.6 Discuss and agree with the Ministry of Education, Youth and Sport and the MPWT the official recognition of diplomas and certificates that will be awarded and their validation.

Activity 4.7 Prepare promotional materials, and plan and carry out marketing campaigns at schools and by visiting vessel operators/owners to highlight the importance of education and training for crew and shore personnel and to explain the new requirements and training and certification programmes.

Activity 4.8 Prepare a safety awareness campaign to be used by vessel operators/owners and authorities to encourage safe working conditions on board, including the use of PPE, and information on consequences of abuse of drugs and alcohol.

Project 4: Implementation of the IMDG Code and Provision of the MSDS

Under Output 1 (IMDG Code and MSDS are implemented)

Activity 1.1 Examine the existing procedures for handling Dangerous Goods, including packaging, marking, labeling and segregation, and compare the existing procedures with requirements stipulated in national regulations, the IMDG Code and the ADN regulations.

Activity 1.2 List deficiencies, inadequate procedures and operations regarding the handling of Dangerous Goods onboard vessels and liaise with stakeholders.

Activity 1.3 Prepare guidelines and improve awareness for the correct implementation of the IMDG Code and the (M)SDS.

Activity 1.4 Prepare inspection procedures for Government Inspection Authority regarding compliance with the IMDG Code and the use of (M)SDS.

Under Output 2 (Operational Manual for IMDG Code and MSDS are prepared)

Activity 2.1 Utilize the list of the most common deficiencies and inadequate procedures and activities regarding the handling of Dangerous Goods onboard from Activity 1.2 and prepare a draft Operational Manual with practical requirements, procedures and safety precautions according to the requirements of the IMDG Code. The Manual shall include highlights of the important sections of the (M)SDS.

*Activity 2.2*Present and discuss the draft Manual with relevant stakeholders for their approval.

Under Output 3 (Standard documents and practical procedures are prepared)

Activity 3.1 Examine existing transport documents and administrative procedures according to the IMDG Code requirements and the ADN, and provide recommendations for improvements.

Activity 3.2 Present, discuss and seek agreement about the recommendations with relevant stakeholders and update the transport documents and administrative procedures.

Under Output 4 (Training for vessel crews for IMDG Code and DG documents are conducted)

Activity 4.1 Prepare a Training Needs Assessment (TNA) for crew onboard vessels for a training course(s) on capacity for handling Dangerous Goods onboard vessels and the IMDG Code.

Activity 4.2 Prepare and carry out training course(s) for vessel crew according to the TNA. The training course(s) shall focus on the use of the IMDG Code, the required transport documents and the (M)SDS.

Under Output 5 (Two pilot projects for IMDG Code and DG document are implemented)

Activity 5.1 Identify two potential shipping companies/vessel operators to participate in the pilot project.

Activity 5.2 Identify the deficiencies and shortcomings of the practical implementation of the IMDG Code and the (M)SDS.

Activity 5.3 Prepare, discuss and agree upon recommendations on how to improve the practical implementation of the IMDG Code and the (M)SDS on board.

Activity 5.4 Implement the agreed recommendations.

Project 5: Emergency Response Onboard Vessels

Under Output 1 (Regulations for ERM onboard are prepared/updated)

Activity 1.1 Review the exiting national regulations and guidelines, and compare them to the international regulations and standards that addresses emergency response for tankers, general cargo vessels, container ships, passenger vessels and ferries.

Activity 1.2 Define minimum acceptable requirements for ERM, including firefighting and life-saving equipment, procedures for handling different emergencies and training.

Activity 1.3 Prepare or amend regulations concerning minimum ERM requirements for different types of vessels.

Under Output 2 (ERM onboard are implemented)

Activity 2.1 Plan and carry out an information and awareness campaign to inform vessel operators of the new/amended regulations and the minimum requirements for ERM.

Activity 2.2 Prepare an implementation plan to help vessel operators comply with the new/amended regulations and minimum requirements for ERM.

Activity 2.3 Prepare inspection procedures for IWTDto inspect vessels for compliance with the ERM regulations and to train inspectors.

Under Output 3 (Operational training on emergencies is conducted)

Activity 3.1 Conduct a training needs assessment on the ability of vessel operators and crew to respond to emergencies onboard vessels.

Activity 3.2 Prepare, according to the type of vessel, training modules for crew on handling different types of emergencies, including emergencies involving Dangerous Goods. The training should include both a theoretical and a practical component.

Activity 3.3 Evaluate the possibility of incorporating the new ERM training in the existing portfolio of training courses at the Cambodia Maritime Institute (CMI).

Activity 3.4 Carry out any training deemed necessary for vessel operators and crew and issue completion certificates.

Under Output 4 (Emergency equipment is prepared)

Activity 4.1 Prepare a practical list that includes all of the emergency equipment required onboard, according to the type of vessel. This shall include firefighting, life-saving and oil- spill equipment, and any other equipment required by the regulations on ERM.

Under Output 5 (Two pilot projects on emergency response are conducted)

Activity 5.1 Identify 3-5 shipping companies /vessel operators for potential participation in the pilot project.

Activity 5.2 Access and compare the condition of the existing emergency response equipment of the vessel and the response preparedness of the crew with the prescribed minimum requirements. Prepare a survey report in sufficient detail to enable the operators to make any necessary adjustments to comply with the new regulations. This shall be done by trained inspectors.

Activity 5.3 Assist the vessel operators in implementing the recommendations from the survey report.

Project 6:Introducing Geographical Zones in the Mekong River System, Technical and Operational Requirements for Tankers

Under Output 1 (Desk study and analysis is conducted)

Activity 1.1 Conduct a desk study on the MRC Project on the Implementation of the Cambodia – Viet Nam Navigation Agreement, specifically on NAP 2.1.6. Assist in drafting and recommending harmonized and standardized legal rules, certifications, specifications for vessel construction, rules for the transportation of Dangerous Goods and other safety standards. See sub-activities in Annex 4.

Activity 1.2 Conduct a desk study on the MRC Project on Formulating the Regional Master Plan for Waterborne Transportation. See sub-activities in Annex 5.

Activity 1.3 In-depth analysis of the "Waterway Risk Assessment" conducted during the Risk Analysis of Phase 1, taking into account the results of the MRC Projects on:

- NAP 2.1.6;
- the Directive of the European Parliament and of the Council of 12 December 2006, laying down technical requirements for inland waterway vessels, including construction and equipment standards according to Geographical Zones; and
- the Regional Master Plan for Waterborne Transportation.

Under Output 2 (Assessment, identification and definition of the Geographical Zones is carried-out)

Activity 2.1 Based on the information from Output 1, assess, identify and define the different Geographical Zones to be established in the Mekong River in Cambodia.

Under Output 3 (Risk-mitigating measures are identified)

Activity 3.1 Based on the information from the activities in Output 1, identify in detail the risk-mitigating measures for use by tankers on the Mekong River in Cambodia.

Activity 3.2 If needed, integrate these measures back into the Regional Master Plan.

Under Output 4 (National Technical and Operational Standards and Regulations are adjusted)

Activity 4.1 Revise the "National Technical and Operational Standards and Regulations" as prepared under Project Document 1.1 (Mekong Tanker Safety Management), and Project Document 1.2 (Minimum Standards for Vessel Design, Construction and Equipment) to incorporate the Geographical Zone requirements.

Under Output 5 (National Technical and Operational Standards and Regulations areharmonized)

Activity 5.1 Revise the adjustments in the "National Technical and Operational Standards and Regulations" to harmonize them with the ones in Output 4 through bilateral discussions with other Mekong member countries and assistance from MRC.

Under Output 6 (Geographical Zones in Cambodia are approved)

Activity 6.1 The responsible Cambodian government ministry, agency or department follows all procedures to ensure approval of the draft "National Technical and Operational Standards and Regulations".

Under Output 7 (Guidelines for the operators of tankers are prepared)

Activity 7.1: Prepare detailed national guidelines for the implementation and enforcement of the new regulations.

Under Output 8 (Training on technical and operational standards is conducted)

Activity 8.1 Training syllabi and curriculum shall be prepared based on the guidelines.

Activity 8.2 The Inland Waterways Transport Department of the Cambodian Ministry of Public Works and Transport ensures that the training institutes incorporate the syllabi and that the training is carried out for relevant stakeholders.

Under Output 9 (Awareness campaignsare prepared)

Activity 9.1 The Inland Waterways Transport Department of the Ministry of Public Works and Transport disseminates the guidelines to relevant stakeholders and prepares and conducts a major awareness campaign to discuss the new regulations with fleet owners, waterway users, cargo forwarders, oil refineries, and port and terminal operators.

BUDGET

Approximate budgets for each country (technical assistance, training and capacity building and equipment):

Project Title	Project Type	BUDGET USD				
		Cambodia	Lao PDR	Viet Nam	Thailand	All countries
1. Mekong Tanker Safety Management	National with Cross-Border Impacts	525,000	585,000	450,000	440,000	**2,000,000**
2. Minimum Standards for Vessel Design, Construction and Equipment	National with Cross-Border Impacts	411,000	459,000	336,000	385,000	**1,591,000**
3. Safe Manning on Inland Waterway Vessels	National with Cross-Border impacts	566,000	586,000	559,500	540,500	**2,252,000**
4. Implementation of the IMDG Code and Provision of the MSDS	National	346,500	326,500	354,500	322,500	**1,350,000**
5. Emergency Response Onboard Vessels	National	279,500	271,500	294,500	279,500	**1,125,000**
6. Introducing Geographical Zones in the Mekong River	National with Cross-Border Impact	385,000	420,000	470,000	370,000	**1,645,000**
		2,513,000	**2,648,000**	**2,464,500**	**2,337,500**	**9,963,000**

HUMAN RESOURCES

International, regional and local experts.

PROPOSED EXECUTING/IMPLEMENTING AGENCY

Project 1: **Lao PDR:** Department of Waterways, MPWT.

Thailand: Marine Department, MoT.

Cambodia: Inland Waterway Transport Department, MPWT.

Viet Nam: VIWA-MoT.

Mekong River Commission (NAP hosting a Regional Navigation Coordination Unit RNCU), vessel owners and operators, port and terminal operators, Training Center, National Mekong Committees.

Project 2:Lao PDR: Department of Waterways, MPWT.

Thailand: Marine Department, MoT.

Cambodia: Inland Waterway Transport Department, MPWT.

Viet Nam: VIWA-MoT.

Mekong River Commission (NAP hosting a Regional Navigation Coordination Unit RNCU), vessel owners and operators, port and terminal operators, Training Center, National Mekong Committees.

Project 3: **Lao PDR:** Department of Waterways, MPWT.

Thailand: Marine Department, MoT.

Cambodia: Inland Waterway Transport Department, MPWT.

Viet Nam: VIWA-MoT.

Mekong River Commission (NAP hosting a Regional Navigation Coordination Unit RNCU), vessel owners and operators, port and terminal operators, Training Center, National Mekong Committees.

Project 4: **Lao PDR:** Department of Waterways, MPWT.

Thailand: Marine Department, MoT.

Cambodia: Inland Waterway Transport Department, MPWT.

Viet Nam: VIWA-MoT.

Project 5: **Lao PDR:** Department of Waterways, MPWT.

Thailand: Marine Department, MoT.

Cambodia: Inland Waterway Transport Department, MPWT.

Viet Nam: VIWA-MoT.

Project 6: **Lao PDR:** Department of Waterways, MPWT.

Thailand: Marine Department, MoT.

Cambodia: Inland Waterway Transport Department, MPWT.

Viet Nam: VIWA-MoT.

Mekong River Commission (NAP hosting a Regional Navigation Coordination Unit RNCU), vessel owners and operators, port and terminal operators, Training Center, National Mekong Committees

TIME AND WORK SCHEDULE

All projects should start some 6 months after a **Regional Navigation Coordination Unitor Center** is established under the MRC. During these 6 months, the RNCU or RNC should try to secure funding for the Regional Action Plan, concentrating on:

- securing the financing of MRC activities (RNCU and cross-border activities);
- exploring further the possibilities of funding for all projects identified in the RAP;
- preparing a plan on how to approach and follow up with international donors;
- coordinating with national authorities regarding funding; and
- discussing new requirements for the private sector to invest in relevant improvements.

Implementation of the various projects is proposed as follows:

	Project Title	Schedule
Project 1	Mekong Tanker Safety Management	2 Years (2016-2017)
Project 2	Minimum Standards for Vessel Design, Construction and Equipment	3 Years (2018-2020)
Project 3	Safe Manning on Inland Waterway Vessels	3 Years (2017-2019)
Project 4	Implementation of the IMDG Code and Provision of the MSDS	2 Years (2019-2020)
Project 5	Emergency Response Onboard vessels	2 Years (2018-2019)
Project 6	Introducing Geographical Zones in the Mekong River System	2 Years (2017-2018)

SOCIAL ISSUES

This action is not expected to have any adverse social impacts. Preventing oil spill and water pollution will benefit local communities that depend on natural resources and fisheries for livelihoods. This action may also lead to employment opportunities at the national and local level.

ENVIRONMENTAL ISSUES

This action will have a positive impact on the environment.Improving waterway safety, contingency planning and waste management can reduce the risks of oil spills and water pollution from vessels. The action will also provide clear guidelines on preventing and responding to oil spills and waste management for all vessel operators and waterway users.

ECONOMIC ASSESSMENT

This is effectively an administrative action without any investment, an economic assessment is not necessary. In the longer term, there may be safety benefits, but these cannot be measured here.

PRIORITY OF ACTION (H/M/L)

	Project Title	Priority
Project 1	Mekong Tanker Safety Management	H
Project 2	Minimum Standards for Vessel Design, Construction and Equipment	M
Project 3	Safe Manning on Inland Waterway Vessels	M
Project 4	Implementation of the IMDG Code and Provision of the MSDS	H
Project 5	Emergency Response Onboard vessels	H
Project 6	Introducing Geographical Zones in the Mekong River System	H

FINANCING PLAN (PUBLIC/PRIVATE)

National projects and national projects with cross-border impact can be financed through national budget allocations. However, not all countries have this opportunity and need to seek external funding through donors.

Another source of funding is the private sector. Although it is not expected that it will participate in “basket funding”, some specific activities can to some extent be funded by the private sector. Such co-financing shall be seen partly as compliance to new regulations and standards being implemented.

PRIOR ACTIONS REQUIRED

None.

FOLLOW-UP ACTIONS REQUIRED

The Regional Navigation Coordination Unit or Center will need to follow-up very carefully to ensuresustainability.

2.5 LONG TERM FLEET ACTION 1 (LFL1)

TITLE

Develop a long term (Inland) Ship Construction and Ship Yard policy

BACKGROUND AND RATIONALE

This Action is to be implemented taking into account SFL3*Develop a short and long term Fleet Improvement and Modernization policy*.

With the exception of some river cruise ships that ply between HCMCand Siem Reap, the fleet on the Greater Mekong River, from house boats to passenger vessels, tug boats, ferries, container ships, and tankers are substandard, inadequate, unsafe, not carbon-emission-friendly, slow, and not fit to carry the amount of cargo that should normally be carried in high volumes by river.

The Master Plan therefore proposes that a detailed long term policy to improve and modernize and/or establish ship construction and ship yard facilities, especially the yards that cater tothe inland waterway vessels.

In the Mekong Region there are two main players regarding shipbuilding: Viet Nam and Thailand.They are both also involved in maritime shipbuilding. Cambodia and Lao PDR, except for small craft construction, lag behind. Building new ships for the Mekong Delta can be done in Viet Nam. On the other hand, the maritime shipbuilders in the Gulf of Thailand cannot do shipbuilding for the Mekong River. Ship repair facilities should be available in each country.

Background of Shipbuilding in Asia, and especially in Viet Nam

Shipbuilding was dominated by Europe at the beginning of the 20th century, holding a world market share of about 80 percent. In the 1950s, this position was gradually taken over by Japan, and by the early 1970s, Japan and Europe still dominated the world market.In the early 1970s, South Korea entered the stage. The country offered lower wages than Japan or Europe and chose to position shipbuilding as a strategic industry. Just as Japan did before, a carefully planned industrial program was successfully initiated, leading to a world market share of 25 percent by the mid-1990s and a leading global position as of 2005.

Although China has maintained shipyards since the 1940s, it only became a dominant player during the last 10 years. The country's economic boom, together with the strategic choice to develop heavy industry activities, has led to a strong increase in shipbuilding global market share. China, together with Korea now dominates the world stage.

Over the past five years, India, Viet Nam, the Philippines and Brazil have acquired substantial order books and have become larger players than most European countries. This rise can be attributed to Korean or European yards investing in facilities in these countries, as a means to combine their own high level skills with the relatively low cost of labor.

Among these newcomers, Viet Nam appears to be growing the fastest. In 2008, Viet Nam became the 4th largest shipbuilder in the world in terms of order book, mainly through Vinashin, ahead ofplayers like Germany, Italy and India. The Vietnamese order book consists mainly of bulk carriers and tankers. A specific segment is the repair and conversion industry. Although not yet a global player, yards in Viet Nam may further benefit from a long coastline along the major routes from Northeast Asia to Singapore and onwards towards the west. Furthermore, numerous small yards are focusing on repair of small inland-water vessels. The role of marine equipment manufacturers has become more important over time.

In Viet Nam the economic crisis started to become visible in terms of shipbuilding with a sharp decline of new orders starting in Q3 of 2008. By Q4, virtually no new orders were placed worldwide. Although production is relatively inefficient, wage costs are low and soViet Nam can remain competitive.

The latest Viet Nam Master Plan for shipbuilding mentions the following policy objectives:

a) To build and develop the shipbuilding industry of Viet Nam (including all the ship building and repair yards and the supporting industry) to meet with the socioeconomic development demand of the country;

b) To increase the quality of new building and repairs, with a focus on producing ship equipment and parts and increase the local content to 60 percent for new buildings;

c) To develop and improve infrastructure and renovate the training and research capacity in order to achieve self-provision of technical matters such as designs, certification and new building.

In the Delta a new shipbuilding complex in Binh Chanh (HCMC) or in Long Son (Vung Tau) to assemble diesel engines, and manufacture shipbuilding equipment would be developed.

The following institutions carry responsibilities towards the shipbuilding industry in Viet Nam:

- Ministry of Transport;
- VINAMARINE;
- Vietnam Register;
- VINASHIN;
- VINALINES; and
- Ministry of Industry and Trade.

The main strengths for Viet Nam's shipbuilding industry are based on the country's vast labor force available at low wage levels and the government's commitment to developing the sector. Furthermore, the demand for vessel capacity from the oil and gas sector and for coastal and inland shipping is an opportunity. The education institutes have skilled staff and also have numerous training facilities available.

Weaknesses in the industry mainly relate to the poor management skills, both in yard management, supply management, financial management and market strategy. These all may be affected by the strong political interference in the sector. Consequences are the weak financial position of VINASHIN and the low productivity levels at most yards. In addition to a low level of local equipment supply, Viet Nam only marginally benefits from its low labor cost advantage. The shipyards, supported by the government have been active in investing in technology (hardware at low investments) but this has not solved the software problem (management skills).

Opportunities are found in the offshore sector and the repair industry, as well as in the fact that Viet Nam's economic growth will cause an increased demand for domestic and inland coastal shipping. It is noted that the income from the oil and gas sector is declining because the sector is not active in deep water areas yet. Institutional support to develop a marine equipment industry provides additional support for increasing the value added of the industry to Viet Nam's economy.

LOCATION

In the Mekong Region there are two main players regarding shipbuilding: Viet Nam and Thailand because they are also involved in maritime shipbuilding. Cambodia and Lao PDR, except for small craft construction, lag way behind. Building new ships for the Mekong Delta can be done in Viet Nam. On the other hand, ship building for the Mekong River cannot be done by the maritime shipbuilders in the Gulf of Thailand. Ship repair facilities should be available in each country.

OBJECTIVES

Overall objective: To give the Mekong waterborne transport sector a boost by modernizing and improving the Mekong Fleet and make IWT an economically attractive, safe and reliable transport mode.

Specific Objective:To promote investments and development in the Mekong Fleet by formulating a short and long term Ship Construction and Ship Yard policy focusing on the inland fleet, thus attracting more political attention and budgetary allocations to meet the demands and requirements that modern traders and transporters request.

OUTPUTS AND DELIVERABLES

Output 1: The Baseline Conditions and Development Scenarios of ship construction and ship yards focusing on inland ships are described.

Output 2: A short and long term Ship Construction and Ship Yard policy, focusing on the inland fleet, is formulated.

Output 3: In order to materialize the policy,a promotion agency to represent the public and private sector is identified or established.

ACTIVITIES

Under Output 1 (Baseline Conditions and Development Scenarios of ship construction and ship yards focusing on inland ships)

Activity 1.1: The Baseline Conditions and Development Scenarios of ship construction and ship yards focusing on inland ships are investigated and reported. Prepare questionnaires to update, where required, the latest figures of ship construction and ship yards.

Activity 2.1: Assessment of target groups. This is very important because the success of the policy will largely depend on how much capital input can be provided. Include also the main investment donors such as the ADB, World Bank, JICA, and PR China.

Activity 3.1: Develop a promotion and information strategy in close cooperation with national and international stakeholders to develop the policy.

Under Output 2 (Ship Construction and Ship Yard policy, focusing on the inland fleet)

Activity 1.2: Conduct a full analysis of the results under Output 1 against the requirements for the future: What kinds of vessels need to be built or rehabilitated to carry the passengers and cargo as predicted?

Activity 2.2: Formulate the draft short term (up to 2020) and the long term (up to 2040) Inland Ship Construction and Ship Yard policy.

Activity 3.2: Conduct a Regional Forum with all the stakeholders (identified in act 2.1) present to finalize the Inland Ship Construction and Ship Yard Policy.

Under Output 3 (The promotion agency to represent the public and private sector is identified)

Activity 3.1: *This is done in combination with Action SFL3 (Develop a short and long term Fleet Improvement and Modernization policy),* Action SIN3 (*Study the need for cooperation on IWT promotion*) and LIN4 (*Establish a "Mekong River IWT Promotion Agency*)

BUDGET

This is a full regional budget unless one of the countries wishes to formulate its own national policy, then a national budget would be required.

There is no budget allocated for Output 3 because this is done in combination with Action SFL3 (Develop a short and long term Fleet Improvement and Modernization policy), SIN3 (*Study the need for cooperation on IWT promotion*) and LIN4 (*Establish a "Mekong River IWT Promotion Agency*).

Output 1 (Update of the Baseline Conditions and Development Scenarios of FLEET)	US$ 50,000
Output 2 (Short and long term Fleet Improvement and Modernization policy)	US$ 110,000
Output 3 (The promotion agency to represent the public and private sector is identified)	--
Total	**US$ 160,000**

HUMAN RESOURCES

Stakeholders will be ship yards, ship repair companies, ship equipment suppliers, ship owners, cruise boat operators, freight forwarders, port and waterway authorities, cargo buyers, ship brokers, pilots and investors in the four MRC Countries.

PROPOSED EXECUTING/IMPLEMENTING AGENCY

Best to implement the policy formulation through MRC, with direct assistance from ship yards, ship repair companies, ship equipment suppliers, ship owners, cruise boat operators, freight forwarders, port and waterway authorities, cargo buyers, ship brokers, pilots and investors in the four MRC Countries.

TIME AND WORK SCHEDULE

The whole duration of the study would be 10 months (2021).

SOCIAL ISSUES

This policy action is not expected to have any adverse environmental impacts. The policy should consider the technical and institutional capacity of national line agencies and private sector to implement the policy. If implemented, the policy could create significant employment opportunities.

ENVIRONMENTAL ISSUES

This policy action is not expected to have any adverse environmental impacts. The ship construction and shipyard policy should consider opportunities to promote energy efficiency and green technology in ship design and construction.

ECONOMIC ASSESSMENT

The economic benefits flowing from this action will include: induced economic growth; increased employment; positive balance of payments effects - in countries/areas/regions targeted for this initiative.

PRIORITY OF ACTION (H/M/L)

High.

FINANCING PLAN (PUBLIC/PRIVATE)

Fully public but could be assisted by the private sector.

PRIOR ACTIONS REQUIRED

Discussions with the private sector and stakeholders.

FOLLOW-UP ACTIONS REQUIRED

Assistance towards implementation.

2.6 LONG TERM FLEET ACTION 2 (LFL2)

TITLE

Implement standards for construction of new vessels

BACKGROUND AND RATIONALE

When designing and constructing a boat's hull, the materials and equipment that need to be used must be suitable for the service they are intended for, and the boat's structural strength must be adequate for the safe operation of the vessel. This refers to designing a vessel for an intended service such as oil transport (tanker), general cargo transport or passenger transport (ferry) by a naval architect according to safety rules and standards established by government agencies and Classification Societies.

There are codes, rules, or guides to be used in order to comply with operational standards for inland waterway vessels. These are relevant for vessel designers, builders, surveyors and operators of inland waterway vessels. In addition, there should be technical requirements, merchant shipping notices and regulations.

The standards for designing, constructing and maintaining the hull, main and auxiliary machinery, electrical and automatic plants of a vessel must be done with the rules in place at the date of its construction. Some types of vessels, such as passenger ships, may also have to be specified for classification by a recognizedorganization, such as a Classification Society. A Classification Society is a non-governmental organization that establishes and maintains technical standards for the construction and operation of ships. The Society will also validate that construction is according to these standards and carry out regular surveys to ensure compliance with the standards.

Confirmation of compliance is done through inspections and regular surveys. The surveys depend on the age and type of the vessel. The certificates given by the Classification Societies are normally valid for five years. During these five years different controls on the hull are made (there are three damage levels, if the vessel of the damage levels checkups, it will not receive the certificate), and on the engine. To keep a certificate all requirements are compulsory.

In the future, in order to navigate, all merchant cargo should have the following certificates: ship safety construction, ship safety equipment and ship safety radio.

An Inland Port State Control or River State Control could be introduced in the future so that the authorities can do 'spot checks'. In some cases when the conditions are substandard the vessel should be put in detention and not be allowed to navigate.

In the Greater Mekong Region there are different instruments that address the design, construction and equipment of inland waterway vessels. For some countries the instruments are very basic, while for others they are more advanced. The overall objective of this Action is that the standards are harmonized at least among the four Upper Greater Mekong Countries (PR China, Myanmar, Lao PDR and Thailand) as per stipulations in the Quadrangle Navigation Agreement, and the two Lower Mekong Countries, Cambodia and Viet Nam, as per their bilateral navigation agreement.

A brief overview of the situation in the four MRC Countries:

LAO PDR

Passenger transport, cargo transport and cargo operations on inland waterway vessels are limited to the following national regulations:

- Regulation on waterway transport no 104/CTPC
- Regulation on waterway traffic no 219/CTPC

There are no standards for safety construction, except for the ones that come under the 2000 "Regional Quadrangle Agreement[1] for Cross-border Commercial Navigation between Simao (PR China) and Luang Prabang (Lao PDR)", the navigation agreement between PR China, Myanmar, Lao PDR and Thailand. In the protocols of the Agreement there are the six relevant technical standards:

- **Annex I:**Regulations on Safe Navigation of Vessels on the Lancang-Mekong River;
- **Annex II:**Rules on Water Transport Administration on the Lancang-Mekong River;
- **Annex III:**Guidelines on the Maintenance and Improvement of the Navigability;
- **Annex IV:**Regulations on the Investigation and Handling of Waterborne Traffic Accidents;
- **Annex V:**Regulations on Management of Search & Rescue, Salvage and Wreck Removal, and
- **Annex VI:** Technical Regulations of Surveys of Commercial Ships on the Lancang-Mekong.

THAILAND

There is an Act on Navigation in Thai Waters B.E.2456 on Survey of Vessels, and Vessels Carrying Hazardous Objects. The Act consists of three parts (Part 1: General Provisions, Part 2: Regulations on Issuing of License and Part 3: Special Regulations) and provides miscellaneous regulations for all kinds of vessels on:

- General regulations to obtain a license;
- Survey of vessels; and
- Specific rules for various types of vessels.

The Thai Vessel Act B.E. 2481requires Thai vessels, in order to be registered as such, to comply withthe survey requirements under the Act on Navigation in Thai Waters.

There are also the Safety Measures for Transportation of Petroleum Products on the Mekong River (Thailand) from the Marine Department. These Safety Measures have been developed to serve as

[1]The aim of the Agreement is to develop on the Lancang-Mekong River international passenger and cargo transportation among the Contracting Parties, and to promote and facilitate trade and tourism, as well as to strengthen cooperation in commercial navigation on the basis of respect for sovereignty, equality, and mutual-benefit. Vessels of any Contracting Party are entitled to sail freely between Simao in the People's Republic of China and Luang Prabang in Lao People's Democratic Republic in conformity with the provisions of this Agreement and their relevant rules and regulations jointly adopted by the Contracting Parties. Vessels and their crew members and passengers of one Contracting Party, during their stay and passage through the territory of another Contracting Party, shall respect the common navigation rules and the laws and regulations of the country of that Contracting Party, in particular, customs and immigrations, environment protection and ecology balance and other laws and regulations concerning public order and national security. (Lancang-Mekong Agreement Art. 8).

guidelines on how to ensure safe transportation, how to respond to oil spills, and how to claim for compensation of operational expenses and damages caused by marine pollution due to an oil spill. The prescribed safety measures for tankers and LPG carriers are important.

The Regulation on Ship Survey (No. 19) B.E. 2534 refers to regulations for passenger vessels and ferries that provide, among others, regulations on construction, crew requirements, provisions for passengers, requirements when carrying dangerous cargo, and firefighting and life-saving equipment requirements.

However it seems that the standards under the 2000 Regional Quadrangle Agreement for Cross-border Commercial Navigation between Simao (PR China) and Luang Prabang (Lao PDR) are becoming the norm.

CAMBODIA

In Cambodia, legislation that concerns inland waterways transport is limited and the most relevant legislation is currently in draft form. Presently, there are no standards or regulations applicable to inland waterway vessels that cover emergency preparedness, construction, life-saving and firefighting equipment, crew standards or waste management. Apart from registration of vessels, there are no national rules or regulations with respect to inland waterway vessels or the transport by inland waterway vessels, with the exception of the Waterway Safety Report prepared by the Cambodian Navigation Coordination Committee (Executive Office), December 2009 (www.ciwn.mpwt.gov.kh) which focuses on safety of navigation, ships, crew, waterway environment, cargo, and safety of passengers.

Circular 003/MPWT on the Management of Means of Water Transport (27th June 2000), addresses design, construction, equipment and inspection of inland waterway vessels but the requirements described in this Circular that concern vessel design, construction and equipment are limited. The circular aims to ensure proper management of all kinds of vessels and/or boats navigating on the waterways, and to ensure safety, comfort, security, hygiene, and traffic order, as well as to protect the lives of crew, passengers, tourists, property, means of transport, and the environment.

The Agreement on Waterway Transportation between Cambodia and Viet Nam, signed in Phnom Penh on 17 December 2009,establishes a legal framework that effectively implements freedom of navigation in the Mekong River system, thereby implementing Article 9 of the MRC Agreement. The Cambodia-Viet Nam agreement also creates favorable conditions for transit and cross-border navigation within regulated waterways.

- **Chapter 3 describes Technical Management of Waterways, Article 26:** Each Contracting Party shall maintain in good order the regulated waterways within its territory, and provide and maintain adequate aids to navigation so as to enable vessels.
- **Chapter 5 describes Ship Navigation, from Article 25 to Article 41:**Skipper or navigator and shipping company shall be obliged to comply with the ship navigation rules, in order to prevent hazards or distress, resulting in personal injuries or loss of life, damages to or loss of properties.

VIET NAM

In Viet Nam, legislation that concerns inland waterways and transport is extensive and covers emergency preparedness, construction, life-saving and firefighting equipment, crew standards and waste management. The standards applicable for vessels regarding construction, life-saving and firefighting equipment, crew standards and waste management are regulated by the norms for classification and registration of inland waterborne transport including the following Decisions and Rules.

Rules:

1) Rules and Regulations for Construction of Wooden Boats - Technical Requirements, TCVN 3903-1984.
2) Rules for Technical Supervision and Construction of Small Steel Ship, 22 TCN 132/96.
3) Rules for Technical Safety of Pleasure Boats, 22 TCN 233/96.
4) Rules and Regulations for Construction and Survey of Glass Reinforced Plastic Ships, TCVN 6282-1997.
5) Rules and Regulations for Construction and Classification of Dangerous Chemical Small Steel Bulk Carriers, 22 TCN 281-01.
6) Rules and Regulations for Construction of HSC, TCVN 6451: 1998.

Decrees:

- Circular No. 21/2011/TT-BGTVT (rules for registration of inland vessels): this Circular provides the procedures for registration of inland waterway vehicles and the organization of registration of inland waterway vehicles.
- QCVN 72/2013/BGTVT issued with the Circular 61/2013/TT-BGTVT: National Technical Regulation on the Rule of Inland Waterway Ships Classification and Construction.
- No.72: 2013/BGTVT compiled by the Viet Nam Register, Ministry of Science and Technology and the Minister of Transport issued Circular No. 61/2013/TT- BGTVT December 31, 2013: This regulation specifies the requirements for test operations and classifications in design, building, conversion, restoration, repair and exploitation of the inland waterway transport activities on rivers, canals, lakes, marshes, breaks, bays and inland waterways transport routes along the coast, which were announced by the Socialist Republic of Viet Nam.
- Circular No. 08/2012/TT-BGTVT on the rule for implementation of the Agreement on Waterway Transportation between Viet Nam and Cambodia.

The Agreement on Waterway Transportation between Cambodia and Viet Nam, signed in Phnom Penh on 17 December 2009, as described above for Cambodia, also applies to Viet Nam.

Regarding Vessel Classification

The **Lao PDR** has no vessel classification standard for inland waterway vessels. The 2000 Quadrangle Agreement provides the Vessel Classification for the four Upper Lancang-Mekong Countries

Thailand has no vessel classification standard for inland waterway vessels. The 2000 Quadrangle Agreement provides the Vessel Classification for the four Upper Lancang-Mekong Countries.

In **Cambodia**, in May 2009, MPWT, the Navigation Coordination Committee, prepared: “Calibrating the Navigable Waterways of the Mekong River System into a Classification Standard”, and proposed a Mekong Vessel Classification. This vessel classification standard is used for the Ship Registration Form.

Viet Nam has issued a Classification “Standards of Technical Class of Inland Waterways in Viet Nam” (Code TCVN 5664 – 1992). This classification, which differentiates between natural rivers and canals, identifies six categories, class I being the biggest category.

For modest inland navigation systems which have as its biggest ships self-propelled barges of not more than 200 DWT, this classification is satisfactory, but this classification does not mention anything about pushed convoys (3,000 to 9,000 DWT), self-propelled barges of 1,500 to 2,000 DWT or river navigating seagoing vessels (1,000 to 7,000 DWT), which can surely be used in some of the river stretches of the Mekong River System all year round and in most of the Mekong stretches during the high water season.

LOCATION

The Action will deal with the four MRC Countries. Each country will need to either introduce or improve the standards.

Harmonization will be for two systems:

- **Upper Lancang-Mekong Region:** PR China, Myanmar, Lao PDR and Thailand as they fall under the 2000 Quadrangle Agreement; and
- **Lower Mekong Region:** Cambodia and Viet Nam as they fall under the 2009 bilateral Agreement of Waterway Transportation between the two countries.

OBJECTIVES

Development goal: When designing and constructing a boat's hull, the materials and equipment must be suitable for the service they are intended for, and the boat's structural strength must be adequate for the safe operation of the vessel to increase the efficiency and safety of cross-border waterborne transport.

Specific objectives:

1) Introduce, improve and harmonize the standards on ship safety construction and equipmentin order to support the legislation and law enforcement of inland waterway transport.
2) Formulate Guidebooks to support the process of conformingwithship safety construction and ship safety equipment, and provide training.
3) Prepare the framework for Classification Societies to establish themselves in the Mekong Region.
4) Propose a framework for Inland Port State Control or River State Control per country to conduct spot-checks.
5) Evaluate the efficiency of the new standards.

OUTPUTS AND DELIVERABLES

Output 1: The existing standards for ship safety construction and ship safety equipment are improved in each country, and consequently harmonized between the countries.

Output 2: The Guidebooks on how to conform withship safety construction and ship safety equipment are formulated, and training on complying with the standards is conducted.

Output 3: The framework for entry of Classification Societies in the Mekong Region is established.

Output 4: The framework for Inland Port State Control or River State Control per country to conduct spot-checks is prepared.

Output 5: The efficiency of the new standards is evaluated.

ACTIVITIES

Under Output 1 (Standards for ship safety construction and ship safety equipment are improved and harmonized)

Activity 1.1 Review the Baseline Conditions of the Master Plan to prepare an inventory of the existing standards, rules and regulations on ship safety construction and ship safety equipment, and complement with additional information from the Member Countries.

Activity 1.2 Obtain all existing standards, rules and regulations on ship safety construction and ship safety equipment, translate them into English.

Activity 1.3 Analyze the existing standards and make a proposal on improvements needed taking into consideration international best practices but to a level that fits the economic and capacity status of the countries in order to make it feasible, and consult with the countries.

Activity 1.4 Prepare a set of harmonized standards to cover the requirements of the Upper Countries and the Lower Mekong Countries. If full harmonization between all 4 MRC Countries is not possible then it should be Lao PDR-Thailand for the Upper Region, and Cambodia-Viet Nam for the Lower Region, and consult with the countries. Present during a regional workshop.

Activity 1.5 Once approved, translate the standards.

Under Output 2 (Guidebooks on how to conform to the standards)

Activity 2.1 Prepare first draft of the Guidebooks based on the results of Output 1, and discuss with the relevant line agencies;

Activity 2.2 Adjust according to comments, inputs and recommendations, and finalise the Guidebooks;

Activity 2.3 Translate the Guidebooks and present to the stakeholders in workshops.

Under Output 3 (The framework for entry of Classification Societies – and surveys)

A Classification Society is a non-governmental organization that establishes and maintains technical standards for the construction and operation of ships and offshore structures. The Society will also validate that construction is according to these standards and carry out regular surveys in order to ensure compliance. Classification Societies set technical rules, confirm that designs and calculations meet these rules, survey ships and structures during the process of construction and commissioning, and periodically survey vessels to ensure that they continue to meet the rules. Classification surveyors inspect ships to make sure that the ship, its components and machinery are built and maintained according to the standards required for their class.

Confirmation of compliance is done through inspections and regular surveys. The surveys depend on the age and type of the vessel. The certificates given by the Classification Societies are normally valid for five years. During these five years different controls on the hull are made (there are three damage levels, if the vessel of the damage levels checkups, it will not receive the certificate), and on the engine. To keep a certificate all requirements are compulsory.

Activity 3.1 Make a comparative study on the functioning of Classification Societies in other countries, and prepare a plan on how to introduce the Classification Societies into the MRC countries where they are not present.

Activity 3.2 Liaison between the relevant authorities and the Classification Societies to agree on the inspections and surveys.

Activity 3.3 Inform the ship-owners about the new initiatives.

Activity 3.4 The Classification Societies start inspecting and surveying according to the standards agreed in Output 1, and Guidebooks in Output 2.

Under Output 4 (The framework for River State Control)

Adopting Inland Port State Control or River State Control basedon Port State Control (PSC) should be studiedand, if found feasible, established and implemented.

Port State Control is the inspection of foreign ships in other national ports by PSC officers (inspectors) for the purpose of verifying the competency of the master and officers on board, as well as checking

that the condition of the ship and its equipment comply with the requirements of international conventions (e.g. SOLAS, MARPOL, STCW, etc.) and that the vessel is manned and operated in compliance with applicable international law. This could be used as model for adopting an Inland Port State Control or River State Control.

An Inland Port State Control could be introduced in the future so the authorities can do 'spot checks'. In some cases when conditions are substandard, the vessel should be put in detention and not be allowed to navigate.

Activity 4.1 Study the feasibility of introducing Inland Port State Control or River State Control for the Mekong Region.

Activity 4.2 If found viable, then the Inland Port State Control or River State Control should be established.

Under Output 5 (efficiency of the new standards is evaluated)

Activity 5.1 After 3 years, a thorough evaluation should be conducted to investigate the efficiency of the new standards and inspections, and evaluate improvements needed.

BUDGET

The budget is handled partly on a national level (standards need to be established or improved on a national level) and partly on a regional level (harmonized).

Output 1: The existing standards for ship safety construction and ship safety equipment are improved in each country, and consequently harmonized between the countries.

For Lao PDR	US$30,000
For Thailand	US$30,000
For Cambodia	US$30,000
For Viet Nam	US$25,000 (much already exists)
Regional budget	US$50,000 (mainly for harmonizing national standards)
Total	**US$ 165,000**

Output 2: The Guidebooks on how to conform withship safety construction and ship safety equipment are formulated, and training on complying with the standards is conducted.

Regional budget	**US$90,000** (because it should be a harmonized version, also translated)

Output 3: The framework for entry of Classification Societies in the Mekong Region is established.

Regional budget	**US$50,000**

Output 4: The framework for Inland Port State Control or River State Control per country to conduct spot-checks is prepared.

Regional budget	**US$90,000** for the study
	US$300,000 if Inland Port State Control or River State Control is actually implemented

Output 5: The efficiency of the new standards is evaluated.

Regional budget	**US$20,000** for the evaluation mission
Grand TotalA	**US$ 415,000**

Grand Total B	**US$715,000** if Inland Port State Control or River State Control is actually implemented

HUMAN RESOURCES

International, regional and local experts.

PROPOSED EXECUTING/IMPLEMENTING AGENCY

Main executing agencies:

- **Lao PDR:** Department of Waterways, MPWT.
- **Thailand:** Marine Department, MoT.
- **Cambodia:** Inland Waterway Transport Department, MPWT.
- **Viet Nam:** VIWA-MoT.

Coordinators:

- Mekong River Commission (NAP hosting a Regional Navigation Coordination Unit RNCU).
- Vessel owners and operators, Port and terminal operators, Training Center, National Mekong Committees.

Other implementing agencies:

- Waterway police, Inland Port State Control (if available).
- Waterway users and crew.
- Shipping companies and operators, charterers.

TIME AND WORK SCHEDULE

There are two separate times: one for the study of introducing Inland Port State Control, and one when Inland Port State Control is actually introduced.

Output 1 would take 6 months

Output 2 would take 3 months

Output 3 would take together 3 months but can be done simultaneously with Outputs 1 and 2

Output 4 (only for the study) 3 months but can be done simultaneously with Outputs 1 and 2

Output 4 (for the implementation) 15 months

Output 5 is 1 month but can only be done after 3 years

Total:

For A:9 months if only the study for the Inland Port State Control is done

For B: 24 months if the Inland Port State Control is to be included

Preparations, formulations, training and operational schedule would take 24 months in addition to the above.

SOCIAL ISSUES

This policy action is not expected to have any adverse social impacts.

ENVIRONMENTAL ISSUES

This policy action is not expected to have any adverse environmental impacts. Implementing standards will improve the energy efficiency, waste management and pollution control measures for vessels.

ECONOMIC ASSESSMENT

New vessel construction standards will lead, in the longer term, to vessel safety improvements, but the community benefits arising from such safety improvements are not readily measurable.

PRIORITY OF ACTION (H/M/L)

Medium (2029-2032).

FINANCING PLAN (PUBLIC/PRIVATE)

Fully public but could be assisted by the Classification Societies.

PRIOR ACTIONS REQUIRED

None.

FOLLOW-UP ACTIONS REQUIRED

1) Depends on whether Inland Port State Control is going to be developed or not.
2) Evaluation mission to measure effectiveness and assess what to improve.

3 WATERWAY DESIGN ACTIONS

3.1 SHORT TERM WATERWAY DESIGN ACTION 1 (SWD1)

TITLE

Condition survey of the dangerous areas for navigation between the Green Triangle and Huay Xay and between Sanakham and Kratie in order to have recent information on the needed optimization works

BACKGROUND AND RATIONALE

In 2009 MRC carried out two important projects on the condition survey of dangerous areas for navigation between Luang Prabang and Pakxe and between Huay Xay and Luang Prabang. Between Huay Xay and Luang Prabang 26 dangerous areas were condition surveyed, and between Luang Prabang and Pakxe 22 dangerous areas were surveyed, totaling 48.

However, there are many more places that require surveying along the entire Mekong and the stretches that have not been covered are:

- **Green Triangle – Huay Xay:**300 Km
- **Sanakham – Kratie:**859 Km

In the first stretch (Green Triangle – Huay Xay) 61 rapids/dangerous areas have been identified by the Chinese study for the Lancang/Mekong.

A major part of the second stretch between Sanakham – Kratie has been covered by the condition survey between Luang Prabang and Pakxe. Meanwhile downstream from Pakxe to the Khone Falls many more shoals and rapids exist. However, the Latsua dam and particularly the Bankoum dam will flood a great number of rapids and dangerous areas (impounded area), which would no longer need a costly condition survey.

The same applies for the rapids and dangerous area between the Khone Falls and Kratie. With the exception of the stretch between the Sambor dam and Kratie,the Stung Treng and the Sambor damwill flood major parts (impounded areas). Condition survey in these stretches will be limited to identifying the obstacles for navigation under 4 meters of water from the lowest operating level of the dams.

It is imperative that these dangerous areas, which will not be flooded by 4 meters of water, be condition surveyed, with priority to those situated in the free flow sections.

In brief, they are numbered as follows:

- Between the **Green Triangle and Huay Xay:**61 dangerous areas;
- (identified in the Chinese project for theLancang/Mekong study); and
- Between **Sanakham and Kratie**:
    - **Sanakham – Pakxe:**66 dangerous areas(Still to be conditions surveyed, while 11 have already been finished);
    - **Pakxe – Khone Falls:**10 dangerous areas(there are a number of shallows to be surveyed at a lower level in the Siphandone area); and
    - **Khone Falls – Kratie:** 6 dangerous areas(all downstream the Sambor damsite) 13 scattered rocks.

LOCATION

1) Between the Green triangle and Huay Xay:
   - The Green triangle is situated at the confluence of the Nanja River (left bank) and the Lancang River and the three land borderpoints between China, Myanmar and Lao PDR. Its coordinates are: Lat. = 21º 33'56.43"N, Long. = 101º 08'35.80"E.
   - Huay Xay is situated at Km 2,313 of the MRC's UHA-map (the port is at Km 2,315).
2) Between Sanakham and Kratie:
   - Sanakham (damsite) is situated at Km 1,728 of the UHA Mekong maps.
   - Kratie is situated at Km 561 of the UHA Mekong maps.

OBJECTIVES

In the long term, the **ultimate objective** is to create a safe navigation channel for vessels of 500 DWT over the total distance of the Mekong from the Green Triangle to Kratie.

The **immediate objective** is to have a detailed condition survey of these dangerous areas for navigation as preparation to clearing these reefs and rapids and removing all obstacles, hidden or not, which are endangering or which may endanger navigation for vessels of 500 DWT.

Hydrographic and topographic surveys of these areas may or may not be accompanied by ADCP surveys.

OUTPUTS AND DELIVERABLES

The **outputs** are from every dangerous area for navigation detailed maps 1/2000 and adequate cross sections following the condition survey. If necessary (depending on the strong currents at these places), ADCP work may be accompanied in the shape of a graphical report but this is to be decided on a case-by-case basis.

The consultant or survey company carrying out the condition surveys will also make recommendations for channel improvements, including indicating the areas and locations where the debris from rock clearance may be disposed of.

ACTIVITIES

Activities for this condition survey project comprise:

- Definition and location of every dangerous area identified in the above-mentioned stretches. This comprises the upper and lower limits of the survey (topographic and hydrographic), including the limits of the river banks (right and left bank);
- Decision whether ADCP survey has to be carried out or not, and in which cross section[s];
  - Prepare the job description and the technical specifications on how detailed these surveys have to be and how the deliverables have to be presented (AutoCad, electronic drawing, etc.);
  - Carry out the conditions surveys, as they will be requested in batches;
  - Prepare the outputs; and
  - Make recommendations on how to clear the dangerous area (reefs, rapids, rock outcrops, etc.) which have been condition surveyed.

BUDGET

Based on previous contracts for condition survey of dangerous areas between Huay Xay and Luang Prabang and between Luang Prabang and Pakxe, the cost estimate for a rapid of big to medium size is 18,000 US$. For a minor rapid (small area to be surveyed), the cost is approximately14,000 US$.

For screening the riverbed (as has been done between Huay Xay and Luang Prabang), the cost is approximately900 US$/km.

The total estimated cost for the entire stretches mentioned above will be:

(61 + 66 + 10 + 6) = 143 rapids x 16,000 US$/rapid	2,288,000 US$
13 scattered rock outcrops x 5,000 US$/rock outcrop	65,000 US$
Screening the riverbed 1,159 km x 1,900 US$/km	2,202,100 US$
Total:	**4,555,100 US$**

HUMAN RESOURCES

- Surveyors
- Labor
- Engineers and survey experts
- ADCP experts
- AutoCAD specialists
- Waterway expert

PROPOSED EXECUTING/IMPLEMENTING AGENCY

In Lao PDR, between the Green Triangle and the Golden Triangle:

- Ministry of Public Works and Transport's Waterway Department (supervision)and private survey company as implementing agency.

In theMekong border between Lao PDR and Thailand: from Golden Triangle to Huay Xay:

- Jointly both Ministries from Thailand and Lao PDR for border crossing survey operations (supervision) and private survey company as implementing agency.

In the Mekong border between Lao PDR and Thailand: from Sanakham to Kong Chiam:

- Jointly both Ministries from Thailand and Lao PDR for border crossing survey operations (supervision) and private survey company as implementing agency.

In the Mekong between Kong Chiam and Khone Falls:

- Ministry of Public Works and Transport's Waterway Department (supervision)and private survey company as implementing agency.

In the Mekong between Khone Falls and Kratie:

- Ministry of Public Works and Transport from Cambodia: Waterway Department (supervision)and private survey company as implementing agency.

TIME AND WORK SCHEDULE

As this work wouldprecede all other physical implementations and projects, it is recommended to start as soon as funds are available.

Dangerous areas for navigation are surveyed in batches. A sufficiently important number of dangerous areas to be surveyed will be tendered together and carried out over a full season (dry season and flood season) in case ADCP work is required. Otherwise, the dry season is the most appropriate time to do this kind of survey.

SOCIAL ISSUES

This action is not expected to have any adverse social impacts.

ENVIRONMENTAL ISSUES

The condition survey is not expected to have any significant environmental impacts. The information should be incorporated into the optimization study of dredging sand from the Mekong River (see short term environmental action 3 - SEN3).

ECONOMIC ASSESSMENT

Probable impact in terms of safety improvement, the economic benefits of which are not readily measurable.

PRIORITY OF ACTION (H/M/L)

High (2017-2018) given that all other physical improvement works to the navigation channels depend on these surveys.

FINANCING PLAN (PUBLIC/PRIVATE)

Funding could be obtained from international donors, perhaps together with the engineering and environmental solution being funded (and carried out).

PRIOR ACTIONS REQUIRED

Prepare tentative list of dangerous areas to be surveyed based on the decisions on hydropower dam construction.

FOLLOW-UP ACTIONS REQUIRED

The output of this project will serve as a basis for physical implementation andenvironmental screening.

3.2 SHORT TERM WATERWAY DESIGN ACTION 2 (SWD2)

TITLE

Standardize waterway classification in harmony with the Chinese waterway classification in the Upper Mekong Basin related to modern shipping

BACKGROUND AND RATIONALE

It is a fact that for a considerable time to come, navigation connection between the upper part of the Mekong, upstream of the Khone Falls,and the downstream sections of the Khone Falls,will not be possible.

Even if the multi-modal solution (rehabilitation and upgrading) of bringing goods and cargoes up or downstream of the Khone Falls were carried out, continuous navigation would still not be possible. Navigation would only be continuous if there wasconstruction of a shortcut canal that would bypass the Khone falls and connect the upper and lower stretches via two ship locks.

Waterway classification is geographically bound to well-known areas that respond to similar standards of waterway dimensions needed to accommodate the design ship that has been accepted.

For the time being, there is no waterway classification for inland waterwaysin the Lao PDR or in Thailand. Only China has a waterway classification that is uniform over the whole Chinese territory. As China is a major driving force for improving and upgrading its waterway connections with its neighboring countries (in this case via the Lancang-Mekong River) it is indicated that the Chinese waterway classification should be taken over in the Mekong stretches up to the Khone Falls. There are various reasons for this, amongst others the Mekong Quadrangle Agreement which is a navigation agreement between the four upper Mekong countries: China, Myanmar, Lao PDR and Thailand. Article 2 of the *Channel Description* specifies the maintenance requirements that have to be respected. However, this Agreement does not make any reference to a specific waterway classification that should be accepted amongst the subscribing members.

Waterway classification entails country responsibilities. When a waterway classification is accepted by a nation and its waterways are categorized, the relevant country authority assures the shipping industry and the waterway users that the waterway characteristics of a specific class are available and applicable over the entire length of this waterway.

LOCATION

The entire upper part of the Mekong under the actual Master Plan, starting from the Green Triangle on the Lancang/Mekong until the Khone Falls.

The Green triangle is situated at the confluent of the Nanja River (left bank) and the Lancang River and the three land border-points between China, Myanmar and Lao PDR. It's coordinates are: Lat.= 21º 33'56.43"N, Long. = 101º 08'35.80"E.

The Khone Falls are at Km 735 of the Mekong UHA atlas.

OBJECTIVES

The **ultimate objective** is to provide all waterway users a legal platform by which a country guarantees that the given waterway characteristics are available over the entire length of the given waterway.

The **immediate objective** is to obtain from the four quadrangle countries the approval and the acceptance to use for the classification of their Mekong waterway system the Chinese waterway classification.

OUTPUTS AND DELIVERABLES

An agreement that all four upper Mekong countries, namely China, Myanmar, Lao PDR and Thailand accept the Chinese waterway classification.

ACTIVITIES

In order to reach such an agreement (acceptance of the Chinese Waterway classification) negotiations between the members of the quadrangle Mekong agreement will have to take place under the auspices and patronage of the Quadrangle Commission, or the MRC, whichever is deemed to be more appropriate.

These meetings will have to be attended by the various waterway departments in the four upper Mekong member countries.

BUDGET

A limited budget for gathering the four member countries around the negotiating table will be required consisting of fees, travel costs and per diems.

Travel costs: (estimated over two plenary sessions)4 countries x 4 persons/country x 2 plenary sessions x 250 US$ (average)	8,000 US$
Per Diems and Hotel costs:4 countries x 4 persons/country x 2 plenary sessions x 5 days x 200 US$ (average)	32,000 US$
Fees: 4 countries x 4 persons/country x 2 plenary sessions x 3 days x 500 US$/day	48,000 US$
Legal expert: total cost	10,000 US$
Total:	**98,000 US$**

HUMAN RESOURCES

Country and waterway officials from the 4 member countries.

Waterway experts and navigation experts.

International legal expert (1).

PROPOSED EXECUTING/IMPLEMENTING AGENCY

To be initiated by the MRC.

The four Ministries of Public Works and Transport (from the 4 member countries under the quadrangle Mekong agreement).

The four Ministries of Foreign Affairs (from the 4 member countries under the quadrangle Mekong agreement).

TIME AND WORK SCHEDULE

As soon as possible.

Two plenary sessions can be organized between the four Upper Mekong countries: China, Myanmar, Lao PDR and Thailand, e.g. during or simultaneously with the yearly meeting under the quadrangle navigation agreement. Prior negations can be conducted/handled through other means of communications and an agenda can be agreed upon for each of the plenary sessions.

SOCIAL ISSUES

This action is not expected to have any adverse social impacts.

ENVIRONMENTAL ISSUES

This action is not expected to have any adverse environmental impacts.

ECONOMIC ASSESSMENT

No economic impact.

PRIORITY OF ACTION (H/M/L)

Negotiations between the waterway departments of the four quadrangle countries: China, Myanmar, Lao PDR and Thailand. Arranging and agreeing on an agenda for the two plenary sessions between the officials from the member countries (2018).

FINANCING PLAN (PUBLIC/PRIVATE)

- A donor country could be asked for sponsoring.
- MRC resources.

PRIOR ACTIONS REQUIRED

Technical meetings between the waterway departments of the four member countries.

FOLLOW-UP ACTIONS REQUIRED

After signing the agreement, adapting the waterway regulations of each of the member states under the quadrangle countries.

3.3 SHORT TERM WATERWAY DESIGN ACTION 3 (SWD3)

TITLE

Standardize the waterway classification in harmony with the Vietnamese waterway classification in the lower part of the Mekong Basin related to modern shipping

BACKGROUND AND RATIONALE

It is a fact that for a considerable time to come, navigation connection between the upper part of the Mekong, upstream of the Khone Falls,and the downstream sections of the Khone Falls, will not be possible.

Even if the multi-modal solution (rehabilitation and upgrading) of bringing goods and cargoes up or downstream of the Khone Falls were carried out, continuous navigation would still not be possibleandtransshipments would be necessary. Navigation would only be continuous if there was construction of a shortcut canal that would bypass the Khone falls and connect the upper and lower stretches via two ship locks.

Waterway classification is geographically bound and limited to well-known areas in which the waterways will respond to similar standards of dimensions and geometrical characteristics needed to safely accommodate the design ship that has been accepted.

For the time being, there is no waterway classification in Cambodia for inland waterways. Viet Nam has a waterway classification that is uniform over its entire territory. As the Mekong Delta in Viet Nam is the center of gravity of all navigation activities in the Mekong, it is indicated that the Vietnamese waterway classification should be taken over in the Mekong stretches downstream of the Khone Falls in Cambodia. There are various reasons for this, amongst others the Mekong navigation agreement between Cambodia and Viet Nam. However, this agreement does not make any reference to a specific waterway classification that should be accepted amongst the subscribing members.

Waterway classification entails countryresponsibilities. When a waterway classification is accepted by a nation and its waterways are categorized according to the different classes, then the relevant country authority assures the shipping industry and the waterway users that the waterway characteristics of a specific class are available and applicable over the entire length of this waterway.

LOCATION

The Vietnamese waterway classification should be applicable between the Khone Falls and the river mouths from the Mekong in the sea (including the entire Mekong Delta which is already in accordance with the Vietnamese waterway classification).

The Khone Falls are at Km 735 along the Mekong UHA atlas. This corresponds with the Cambodia-Lao PDR border.

OBJECTIVES

The ultimate objective is to provide all Mekong waterway users in Cambodia and Viet Nam a legal platform by which the relevant country guarantees that the given waterway characteristics are available over the entire length of the given stretch.

The immediate objective is to obtain from the two countries the approval and the acceptance to use for the classification of their Mekong waterway system the Vietnamese waterway classification.

OUTPUTS AND DELIVERABLES

An agreement that the two downstream Mekong countries, namely Viet Nam and Cambodia, accept the Vietnamese waterway classification.

ACTIVITIES

In order to reach such an agreement (acceptance of the Vietnamese Waterway classification) negotiations between Cambodia and Viet Nam will have to take place under the auspices and patronage of the Special Commission on Border Traffic between the two countries, or under the MRC Secretariat, whichever is deemed to be more appropriate.

These meetings will have to be attended by delegates from the Waterway Department under the Ministry of Public Works and Transport from Cambodia, the Phnom Penh Autonomous Port and VIWA and VINAMARINE from Viet Nam.

BUDGET

A limited budget for gathering the two member countries around the negotiating table will be required consisting of fees, travel costs and per diems.

Travel costs: (estimated over two plenary sessions) 2 countries* x 4 persons/country x 2 plenary sessions x 200 US$ (average) [*= *only one country has to travel*]	1,600 US$
Per Diems and Hotel costs:2 countries x 4 persons/country x 2 plenary sessions x 5 days x 200 US$ (average)	16,000 US$
Fees: 2 countries x 4 persons/country x 2 plenary sessions x 3 days x 500 US$/day	24,000 US$
Legal expert: total cost:	10,000 US$
Total:	**51,600 US$**

HUMAN RESOURCES

Country and waterway officials from the 2 member countries.

Waterway experts and navigation experts from MPWT, PPAP and VIWA, VINAMARINE.

International legal expert (1).

PROPOSED EXECUTING/IMPLEMENTING AGENCY

Negotiations have to take place between the MPWT'sWaterway Department of Cambodia, the PPAP, VIWA and VINAMARINE. Establishing and agreeing on an agenda for the two plenary sessions between the officials from the two countries is a prerequisite.

TIME AND WORK SCHEDULE

As soon as possible.

SOCIAL ISSUES

This action is not expected to have any adverse social impacts.

ENVIRONMENTAL ISSUES

This action is not expected to have any adverse environmental impacts.

ECONOMIC ASSESSMENT

No economic impact.

PRIORITY OF ACTION (H/M/L)

High (2018).

Acceptance of the Vietnamese waterway classification in Cambodia will be a guidance for the physical waterway improvements under the Master Plan.

FINANCING PLAN (PUBLIC/PRIVATE)

- A donor country could be asked for sponsoring.
- MRC resources.

PRIOR ACTIONS REQUIRED

Technical meetings between the Cambodian WaterwayDepartment under the Ministry of Public Works and Transport, PPAP, VIWA and VINAMARINE.

FOLLOW-UP ACTIONS REQUIRED

After signing the agreement, the waterway regulations and classification of the Cambodian waterways from the Mekong River system will have to be adapted accordingly.

3.4 SHORT TERM WATERWAY DESIGN ACTION 4 (SWD4)

TITLE

Design of river training works at the Sdao Canal in Cambodia

BACKGROUND AND RATIONALE

The Sdao canal is an artificial dredged channel or gully in the middle of a huge sand deposit at Km 387 between Kompong Cham and Phnom Penh. The Mekong River at this place is about 3 km wide and the natural channel shifts from the left bank (at Km387) to the right bank (at Km 384). The river flow passes from an 820 meters narrow but deep section at Km 390 to a 3,000 m wide-open and shallow section at Km 384. The result is a serious slowing down of the water current and progressive deposit of suspended materials such as sand and mud. The channel has no stable location and moves each flood season. Its main direction from South East to North West is accentuated by massive yearly maintenance dredging which directs the current to the right bank at Km 384, provoking heavy erosions.

As this location is about the only main obstacle for bigger ships and barges reaching the Tonlé Bet port, many waterway users and the shipping industry would like to find a proper and sustainable solution.

All past projects for improving this situation were based on dredging and bank protection but none has proven sustainable so far or worth the money spent. It looks like river training works may be the long term sustainable solution even though the groynes to be constructed may have lengths of several kilometers. These groynes should be overflow dikes during the flood season, but sufficiently high to direct and concentrate the flood current into scouring a specific channel. They should also be sufficiently strong and resistant for the overflow not to be washed away after a flood season.

For the purpose of a cost estimate in comparison with the yearly maintenance dredging budget, a tentative design for such groyne/overflow dike has been assumed as follows:

- **Width at the basis:**18.00 to 20.00 meters
- **Average height:**5.00 m
- **Fill:**rip rap and/or heavy gravel
- **Armoring:**geotextile ballasted with0.30 m rockstone 5–25 kg
- **Slopes:**6/4 at the upstream side8/4 at the downstream side
- **Body:**53 à 58 m^3 rip-rap or gravel
- **Armoring:**24.0 m^2 geotextile per m^1 and 11 ton of 5–25 rock stone/m^1

At the end of each overflow dike/groyne there is a steel lattice tower to be constructed on a heightened platform that will indicate the boundaries of the channel.

LOCATION

The project starts at the bottle neck at Km 390 and ends at Km 376 (Ph. Russei Chroy) over a total channel distance of 17 km.

OBJECTIVES

The **overall objective** is to provide a safe navigation channel in the stretch between Phnom Penh and Kompong Cham for barges of 2,000t and sea going vessels with limited superstructure of 3,000 DWT.

The **immediate objective** is to find a sustainable solution for the Sdao canal's costly maintenance dredging by designing suitable and low-cost, but stable, river training works aimed at substantially reducing, if not totally omitting, the yearly maintenance dredging of the Sdao channel.

OUTPUTS AND DELIVERABLES

The consultancy study of the river training works will result in a full and comprehensive report on the works to be carried out, including drawings, cross sections and details, BOQ's and cost estimates and the preparation of full tender documents. The study will comprise the environmental screening or impact assessment of the works on the river behavior and the sediment transport and river morphology. It will compare the cost-benefits of the project versus the traditional yearly dredging of the Sdao canal.

ACTIVITIES

As for every study project the project will start with:

- Data collection of all works and dredging in the past, including the results in a baseline study;
- Reporting and assessing previous morphology studies or sediment studies if any in the area;
- Detailed hydrographic survey including the river banks and the sand banks in the river;
- Sediment transport measurements at the site throughout a full season;
- Detailed design of the river training works;
- Mathematical model testing (2D or 3D) or physical scale model testing;
- Adapt the design in coherence with the results of the model testing;
- Prepare detailed drawings and environmental impact assessment from the approved design;
- Prepare full set of tender documents, including BOQ and cost estimates.

BUDGET

Two different budgets have to be addressed:

- For data collection and field surveys;
- For design and consultancy studies (structural engineering, morphology, sedimentology, hydraulic engineering, geotechnical engineering, river engineering, environmental studies and detailed impact assessment, economical study of the investment and its rentability for the shipping industry, etc.).

A one full season data collection and field survey is estimated at	100,000 US$
All further study-work from international experts and consultants is estimated at 5 man months or another	100,000 US$
Testing the model (mathematical or physical scale model*): [** = scale modeling may cost tenfold of mathematical modeling*]	100,000 US$
Total:	**300,000 US$**

HUMAN RESOURCES

- Surveyors (topographic and hydrographic).
- ADCP experts.
- Sedimentology, morphology, geotechnical and geology experts.
- Consultancy services specialized in river training works.
- Consultancy services specialized in environmental impact assessments.
- Experts in 2D or 3D mathematical modeling, or experts in physical scale modeling.

PROPOSED EXECUTING/IMPLEMENTING AGENCY

Ministry of Public Works and Transport, Waterway Department – PPAP – MRCNAP.

TIME AND WORK SCHEDULE

This study project can start any time, the sooner the better.

First there is a one year survey and data collection followed by 5 manmonths of a consultancy study and 6 months of modeling (testing). In total there is less than 24 months (overlapping is possible).

SOCIAL ISSUES

The social impacts of people in the project area and local waterway users would also need to be assessed under the Cambodian Environment Protection Law 1996 and theDraft EIA Law 2015.

ENVIRONMENTAL ISSUES

An initial environmental assessment would need to be undertaken to ensure compliance with the Cambodian Environment Protection Law 1996 and theDraft EIA Law 2015. The analysis should also compare the environmental impacts of the yearly dredging compared to river training works. It may be more feasible and sustainable to adopt the river training works. The action includes the participation of an environmental expert specializing in EIA for river training works and navigation projects.

ECONOMIC ASSESSMENT

No economic impacts (reduced costs for maintenance dredging works should be compared with investment costs of the training works).

PRIORITY OF ACTION (H/M/L)

High priority (2016-2017).

While every year maintenance dredging is carried out, there is no certainty that the dredging formula is the most economical one. The continuous modest success of dredging could lead to scrapping the navigation class of the waterway between Phnom Penh and Kompong Cham. With the existing low-level bridge at Prek Tamaek, sea-going vessels are close to being unable to use the Mekong mainstream between Phnom Penh and Kompong Cham. In this eventuality, heavy loaded barges of 2,000 DWT would be affected.

FINANCING PLAN (PUBLIC/PRIVATE)

This is a study project and could be financed by the international donor community if the economic and environmental results are positive.

Another way of financing this project is to link the study to the implementation as a conditional turn-key project (approvals needed from the Cambodian relevant authorities). Financing by the World Bank and ADB are possibilities.

PRIOR ACTIONS REQUIRED

The only prior action that may be considered is to keep records of all past works, surveys and groundings in the Sdao channel.

FOLLOW-UP ACTIONS REQUIRED

Look for donors and continue with the implementation as soon as possible.

3.5 SHORT TERM WATERWAY DESIGN ACTION 5 (SWD5)

TITLE

Experimental test dredging in the Tonle Sap and the Great Lake

BACKGROUND AND RATIONALE

Under the MRC-Belgian navigation program, a study on the feasibility of dredging a channel in the Tonlé Sap and the Great Lake was carried out in September 2008, in cooperation with Budapest University of Technology and Economics, Environment Impact Assessment center of Finland Ltd., Finnish Environmental Institute and the Helsinki University of Technology. A major recommendation in the study was to carry out an experimental test dredging and deposition test, including a couple of trapping observations by placing special collector tubes, in order to study the bed-load movement of the Great Lake.

This test dredging could be done in one of the most difficult stretches of the channel between Snoc Trou and the entrance to the Great Lake. Skippers have been complaining about groundings and difficult passages and tourists are increasingly claiming their money back after these bad experiences.

The choice of suitable dumping areas for the dredged materials in the Great Lake is of high importance. Therefore, this experimental dredging must be carried out taking into account the general movement of sediments in order to evaluate the probability that they may return into the dredged gully in a foreseeable time. It is recommended to use radioactive tracers (radioisotopes), which will allow to study, in situ, these transfer properties under seasonal flows and currents of fine sediments re-suspended during the release. In this way, parameters such as transport axis, mean velocity, dispersion, dilution and bed-load transport rates can be determined.

LOCATION

As the Tonlé Sap delivers a great amount of deposits and sediments every year near its entrance, it is recommended to carry out the test dredging preferably nearby the entrance of the Lake, i.e.in the most South-Eastern part.

The experimental dredge channel should therefore be situated between these two GPS point:

Between Snoc Trou and the lake:

- **Upstream:**Lat. = 12º 31’23.67”NLong. = 104º 25’53.87”E
- **Downstream:**Lat. = 12º 31’47.10”NLong. = 104º 23’48.65”E

Both points are in, or close to, the navigation channel in use and in a distance of about 4 km.

OBJECTIVES

The objectives of this test dredging are multiple:

1) Checking the channel fill-up rate and the behavior of the deposited sediments in-situ.
2) Carry out deposition tests to determine the complex set of factors affecting the bottom process.
3) Determine the wall slopes of the dredged channel[s] and examine the possibility of depositing the dredged sediment on the lake bed in order to determine the distance from where no significant amounts of deposit are moved by flows and waves back to the channel.

OUTPUTS AND DELIVERABLES

- A dredged channel of 400-600 m long, bottom width of 30m and wall slopes of 1/10 to 3/10.
- Sediment deposits at carefully chosen various distances from the experimental dredged channel.

- A couple of special collector tubes to be placed on the bottom of the Lake in order to study the bed-load movement of the Great Lake.
- A comprehensive report on the fill-up rate of the experimental channel and the follow up of the catch in the collector tubes (at regular interval) during a full cycle.

ACTIVITIES

- Detailed hydrographic survey of the test area and its surrounding (sufficiently far away from the future test dredging). This survey should also comprise the soil investigation, bed load, soil sampling at various depths between 0 and 2.0 meter, granulometry of the samples, etc.).
- Experimental dredging of a 400-600 meter long channel with slopes from 1/10 to 3/10 (in well determined areas), and depositing the dredged material at various distances from the experimental dredged channel. This experimental dredging should also comprise the study of the dredged materials (composition, granulometry, chemical composition, etc.). It is recommended to use radioactive tracers (radioisotopes).
- Place two collector tubes in the vicinity (one upstream and one downstream the dredged channel) in order to trap the sediment and collect at regular intervals the quantity and composition (granulometry) of the trapped sediment.
- Monitor the dredged channel at regular intervals during at least one full cycle of the Tonlé Sap.
- Submit a comprehensive report on the findings with updated recommendations for the final channel dredging in the Great Lake between Snoc Trou and Chong Kneas.

BUDGET

The entire study will take about one year of preparation, implementation and study. Although the surveys may be carried out with simplified methods (from the use of radioactive tracers), analyzingthe results will necessitatehighly professional expertise for at least 1 manmonth.

Dredging the gully:	400,000 US$
Preparative surveys and surveys during the test-season:	250,000 US$
International expertise:	20,000 US$
Total:	**670,000 US$**

HUMAN RESOURCES

International and local experts as follows:

- 1 international expert in sedimentology and dredging.
- 6 local surveyors in hydrography and the use of radioactive tracers.
- 4 local monitoring staff during one year.
- 2 divers (during the full cycle for collecting the special collector tubes).
- 1 laboratory in soil mechanic.

PROPOSED EXECUTING/IMPLEMENTING AGENCY

MRC-NAP in cooperation with the Cambodian National Mekong Committee.

TIME AND WORK SCHEDULE

During one full cycle of the Tonlé Sap (1 year) + 3 months to prepare the detailed report and make the recommendations for the final dredging of the navigation channel in the Great Lake. Overlapping activities (surveying, reporting, measuring, etc.) are possible.

Total duration = 13 months.

SOCIAL ISSUES

The social impacts of people living in the project area and in the Tonle Sap Lake would be also assessed under the IEIA. The impacts of reduced fisheries, sediment and water quality may impact on local livelihoods.

ENVIRONMENTAL ISSUES

Even though this project is for test dredging, it could have significant environmental impacts on the Tonle Sap Lake which is a UNESCO biosphere reserve and critical for fisheries and livelihoods. This may require an EIA to be conducted and approved prior to test dredging in line with the Environmental Protection Law 1996. The Draft EIA Law 2015 would require:

- Initial Environmental Impact Assessment (IEIA);
- Full EIA report;
- The approved environmental protection contract (EPC); and
- EMP and monitoring.

An environmental management and monitoring program for fisheries, sediment and water quality would be critical to determine the environmental impacts for future dredging strategies. This action should be completed prior to LWD9.

ECONOMIC ASSESSMENT

Dredging of the Tonle Sap and Great Lake is unlikely to result in increased IWT cargo traffic owing to much shorter travel times and zero transfer costs of road transport. Given the lack of demand for IWT cargo transport and the probable high capital and maintenance costs of dredging, the project is unlikely to be justified in economic terms.

PRIORITY OF ACTION (H/M/L)

Medium (2018-2019).

Although exciting interest has been shown from the tourist sector in bothCambodia and Viet Nam (cruise ships, luxury hotel ships), it is not expected that this project will benefit from the government's interest due tothe questionable environmental impact it may produce. However every reasonable project should be given a chance through an objective study and thorough environmental impact assessment. Based on the high interest of the tourist sector, being the driving force behind this project, and subject to proper funding, the study could start at once.

FINANCING PLAN (PUBLIC/PRIVATE)

- International donor[s].
- Ministry of Public Works and Transport – Waterway Department.
- Tourism Companies running the shipping of VIP-tourism between Viet Nam or any other place of origin (Phnom Penh) towards the port of Chong Kneas and the archeological sites of Angkor Wat.

PRIOR ACTIONS REQUIRED

Negotiate with the potential donors from the private sector and the Cambodian authorities for co-financing this experimental dredging, with an eye on the eventual implementation of dredging the entire channel between Snoc Trou and Chong Kneas.

Inform the local fishermen-society/ies that are operating on the Great Lake of the project by duly informing them about the environmental impacts of this experimental dredging and, eventually, the final dredging.

FOLLOW-UP ACTIONS REQUIRED

Study the impact of this experimental dredging project on the local population's opinion and media and anticipate/correct wrong information and unjustified objections or protests from local fishermen societies by providing more detailed information on social benefits (tourism) and improved waterborne transport systems.

3.6 LONG TERM WATERWAY DESIGN ACTION 1 (LWD1)

TITLE

The Mekong River provided with a minimum 500 DWT navigation channel between the Green Triangle and Vientiane through dredging and/or excavating:

1) Between the Green Triangle and Huay Xay;
2) In the free flow section upstream the Pak Beng hydropower dam;
3) In the free flow section upstream the Luang Prabang dam;
4) In the free flow section upstream the Xayabury dam;
5) In the free flow section upstream the Paklay hydropower dam;
6) In the free flow section upstream the Sanakham hydropower dam;
7) In the section between the Sanakham hydro-power dam and Vientiane.

BACKGROUND AND RATIONALE

The Mekong River's navigation potential has never been properly addressed in its entirety. Such evaluation of the navigation potential requires enormous resources and lengthy study. Waterways are a cheap, efficient and environmental friendly way of transporting goods and passengers. However, most of their interest and benefits are realized when entire sections are made navigable, thereby connecting economical centers with each other, connecting people and urban areas and enabling transport continuity over long distances. A number of previous studies have demonstrated this navigation potential,including the condition surveys of the Mekong between Huay Xay and Pakse.

In terms of navigation, the Mekong Basin has to be divided into two major parts: upstream and downstream of the Khone Falls. The actual design section refers only to the upstream part of the section situated between the Green Triangle and Vientiane over a total distance of 244 Km + 788 Km = 1,032 Km. This stretch has also been divided into seven sections mentioned in the title of this chapter.

Apart from contemplating the pros and the cons of building hydropower along the Mekong mainstream, an undisputed advantage is the impounded areas that the hydropower dams will create. Dangerous areas for navigation, rock-outcrops, rapids, reefs and shoals will all disappear under water. However, there will still remain a number of free-flow sections that will never be impounded and a number of free-flow sections that from time to time will surface when the water levels in the impounded section will be low due to dam operations or low flow.

LOCATION

At the time of writing this report, the exact location of every hydropower dam is not yet known. Moreover, the highest operational water levels and lowest operational water levels in the impounded areas are not known with precisionyet. Hence, the limits of the free-flow sections and the excavation works for rock and reef clearance are only approximate.

The following locations are identified:

1) Between the **Green Triangle and Huay Xay:** 303 km

   The stretch between the Green Triangle and the Golden Triangle (244 Km) is out of the MRC mandated Mekong River and flows entirely between Myanmar and Lao PDR until it reaches the border with China (see short term waterway design action nr.1 above). Most of the time, the Lancang River coincides with, or is close to, the boundary lines between Lao PDR and Myanmar. There is no hydropower dam scheduled or planned in this section and the entire stretch is a free-flow section.

2) The free flow section between Huay Xay and the Pak Beng hydropower dam.

3) The free flow section between the Pak Beng hydropower dam and the Luang Prabang hydropower dam.

4) The free flow section between the Luang Prabang hydropower dam and the Xayaburi hydropower dam.

5) The free flow section between the Xayaburi hydropower dam and the Paklay hydropower dam.

6) The free flow section between the Paklay hydropower dam and the Sanakham hydropower dam.

7) The free flow section between the Sanakham hydropower dam and Vientiane. Also this entire stretch is composed of free flow sections as there is no dam planned there. The Mekong flows on the borderline between Thailand and Lao PDR.

OBJECTIVES

The **ultimate objective** is to create an all-year round navigable waterway between the Green Triangle and Vientiane for vessels up to 500 tons. Hydropower dams are all assumed to be constructed and operational, thereby allowing the maximum benefit from the impounded areas.

The **immediate objective** is to create and improve the navigation channel in the free-flow sections of the various stretches by clearing obstacles, reefs and rapids in an environmental friendly way.

OUTPUTS AND DELIVERABLES

A safe and well-designed navigation channel for vessels of up to 500 ton between the Green Triangle and Vientiane.

ACTIVITIES

For every of the enumerated sections, the following activities are identified:

1) A detailed condition survey of all navigation obstacles in the river, found in the free-flow sections identified above. This survey should also include obstaclesunder than 4 meters submerged underwater in the navigation channel and its immediate vicinity. Thesurvey also needs to include all the low water wet-flow sections, including the water level difference between up and downstream and the surveyed rapids and reefs.

2) Prepare a proper and economical channel design for vessels up to 500 ton and, if possible, up to 1,500 tons (the vessel dimensions for the latter should be approximately: L = 110 a 115 m, B = 11.50 m. [maximum], D = 3.00 m.). Channel dimensions should be in accordance with waterway classification of China (see short term waterway design action nr.2 above).

3) Prepare for every single obstacle (or string of obstacles) in the navigation channel (prepared under activity 1 here above) an engineering clearance plan indicating the volumes of excavation (rock above or under water, bedrock deepening, sand, gravel boulders, etc.), the proposed location where the debris will be stored or dumped, the navigational aids to be constructed or adapted and a cost estimate of the works.

4) Prepare tender documents, including technical specifications, drawings, volume-calculations, BOQ and estimates.

5) Call for tenders to clear and improve an entire waterway section as per the seven headlines in this chapter.

6) Implement the works by the successful bidder and quantity surveying.

7) Prepare a comprehensive report in which the results of the physical improvement works will be described including mentioning the problems encountered and the proposals for further work to improve safety of navigation.

It is obvious that every one of these activities described will need the approval of the relevant authorities.

BUDGET

The needed budgets are estimated from two project files:

(i) the project estimate of the draft Chinese project entitled: Development Plan on International Navigation on the Lancang – Mekong River (2014-2015), and

(ii) the navigation channel improvement estimated cost in the studies *Condition Survey of dangerous areas for navigation (ii-a) between Huay Xay and Luang Prabang and (ii-b) between Luang Prabang and Pakxe*.

Comparison between the cost estimates in both of the above-mentioned project studies could only be done in one single section which is covered by both of the projects, namely: Huay Xay – Luang Prabang. It is important to remember that these figures are rough estimates and the price for the implementation could be higher or lower, as much as 35%.

As detailed engineering studies and a systematic environmental screening, or in some cases an EIA, will be needed, each of the mentioned sections will precede with the consultancy study, being estimated at an average of 500 US$ per km waterway. It is therefore important to know the length of each identified section, in other words to know the correct location of the hydropower dams and their operational levels, while for the downstream end it will be necessary to know the minimum operational level of the hydropower dam (to determine the free flow section):

1) **Between the Green Triangle and Huay Xay**

   - Distance = 303 km, containing 47 rapids (between Green Triangle and Golden Triangle) + 6 rapids (between Golden Triangle and Huay Xay) = 53 rapids between Golden Triangle and Huay Xay.
   - Average cost per rapid: 1,600,000 US$ (including studies, plans, drawings and tender documents): 53 x 1,600,000 = **84,800,000 US$**+ study cost **150,000 US$** = **84,950,000 US$**

2) **In the free flow section upstream the Pak Beng hydropower dam**

   - Distance (of the free flow) = 2,318 – 2,296 = 22 Km, containing two shallow areas of 300 m, respectively 200 m long (Hat Kham at Km 2,310 and Hat Thai Ban Dan at Km 2,297) and two rapids (Hat Pak Ing at Km 2,305 and Khone Yen Ian at Km 2,300).
   - Average cost per rapid: 1,600,000 US$ (including studies, plans, drawings and tender documents): 2 x 1,600,000 = **3,200,000 US$**
   - Average cost per shallow (bedrock excavation a 90 US$/m^3): 1,125,000 US$ (250 meter length over 50 meter wide): 2 x 1,125,000 =**2,250,000 US$**
   - Study cost: 22 km x 500 US$/km = **11,000 US$**
   - Total estimated expense = **5,461,000 US$.**

3) **In the free flow section upstream the Luang Prabang hydropower dam**

   - Distance (of the free flow) = 2,188 – 2,142 = 46 Km, containing 8 rapids and 2 shallow areas (Keng Ken: 50 m respectively Keng Khone Sa Nak: 300 m). The rapids are: Don Ngeun (Km 2,182), Keng Sen Khi Koa (Km 2,181), Keng Kwai (Km 2,175), Keng Eui (Km 2,169), Hat Ngum (Km 2.156), Keng Pang (Km 2,147), Keng Khan (Km 2,145), Khone Ta Van (Km 2,144).
   - Average cost per rapid: 1,600,000 US$ (including studies, plans, drawings and tender documents): 8 x 1,600,000 = **12,800,000 US$**
   - Average cost per shoal (bedrock excavation a 90 US$/m^3); (300 + 50 = 350 meter length over 50 meters wide): =**1,575,000 US$**

- Study cost: 46 km x 500 US$/km = **23,000 US$**
- Total estimated expense = **14,398,000 US$**

4) In the free flow section upstream the Xayaburi hydropower dam:

- Distance (of the free flow) = 2,010 – 1,995 = 15 km, containing one single rapid at Km 1,995: Keng Khik.
- Average cost per rapid: 1,600,000 US$ (including studies, plans, drawings and tender documents): 1 x 1,600,000 = **1,600,000 US$**
- Study cost: 15 km x 500 US$/km = **7,500 US$**
- Total estimated expense = **1,607,500 US$**

5) In the free flow section upstream the Paklay hydropower dam:

- Distance (of the free flow) = 1,930 – 1,911 = 19 km, containing one single rapid at Km 1922: Keng Houng.
- Average cost per rapid: 1,600,000 US$ (including studies, plans, drawings and tender documents): 1 x 1,600,000 = **1,600,000 US$**
- Study cost: 19 km x 500 US$/km = **9,500 US$**
- Total estimated expense = **1,609,500 US$**

6) In the free flow section upstream the Sanakham hydro-power dam:

- Distance (of the free flow) = 1,818 – 1,774 = 44 Km, containing 6 rapids amongst which Keng Noun (Km 1,811), Keng Sao (Km 1,792), Don Sang (Km 1,786), Don Phung (Km 1,782)
- Average cost per rapid: 1,600,000 US$ (including studies, plans, drawings and tender documents): 6 x 1,600,000 = **9,600,000 US$**
- Study cost: 44 km x 500 US$/km = **22,000 US$**
- Total estimated expense = **9,622,000 US$**

7) In the free flow section Between the Sanakham dam downstream and Vientiane:

- Distance (of the free flow) = 1,736 – 1,580 = 156 km, containing 14 medium sized rapids (M) and 3 big rapids (B): Pak Nam Heung rapid (M = Km1,726), Hat Tieng (M = Km1,727), Keng Khout Khou (M = Km 1,711), Keng Fa (B = Km 1,684), Kenh Phung sa Phang (M = Km1,669), Keng Pha Xo (M = Km 1,663), Keng Lat (M = Km1,658), Keng Chan (B = Km 1,657), Keng Phan (B = Km1,641), Kenh Uie (M = Km1,638), Hat Sa Kai (M = Km1,626), Keng Kay (M = Km1,623), Don Khang Khong (M = Km1,622), Keng Pak Nam Ton (M = Km1,621), Keng Mo (M = Km1,614), Hat To Ken Lon (M = Km1,599) and Keng Mou Phung (M = Km1,594)
- Average cost per big rapid: 1,600,000 US$ (including studies, plans, drawings and tender documents): 3 x 1,600,000 = **4,800,000 US$**
- Average cost per medium sized rapid: 1,200,000 US$ (including studies, plans, drawings and tender documents): 14 x 1,200,000 = **16,800,000 US$**
- Study cost: 156 km x 500 US$/km = **78,000 US$**
- Total estimated expense = **21,678,000 US$**

General Total: 139,326,000 US$

HUMAN RESOURCES

River engineers, environmental specialists, hydraulic engineers, construction site managers and dredging experts, rock excavation specialists, skippers and helmsmen and required manpower for the construction site.

PROPOSED EXECUTING/IMPLEMENTING AGENCY

Lao PDR Ministry of Public Works and Transports Waterway Department (for the preliminary survey of the river, the design of the channel, the preparation of the tender documents and the follow-up and supervision of the physical implementation of the channel improvement).

The Lao PDR Ministry of Water Resources and Environment (for the approval of the channel design and the method of implementing the reef-clearances).

TIME AND WORK SCHEDULE

In close coordination with the construction of the dams. Reef clearances usually take place during the low water regime.

SOCIAL ISSUES

The social impacts would also be assessed under the Lao PDR Environmental Protection Law 2013 and Thailand National Environmental Quality Act 1992.

ENVIRONMENTAL ISSUES

The environmental impacts of clearing obstacles, reefs and rapids to improve navigation between the Green Triangle and Vientiane would need to be assessed in respect to the environmental protection law in Lao PDR and Thailand:

- **Thailand**: Requirements for EIA and environmental management plan (EMP) and monitoring under the National Environmental Quality Act 1992; and
- **Lao PDR:** The navigation improvement in Lao PDR may require an Initial Environmental Examination (IEE) under the Environmental Protection Law 2013 to determine whether an Environmental Impact Assessment (EIA) or Environmental Protection Commitment (EPC) is required.

The sections of the river on the Lao/Thai border would require consideration of the environmental protection law in both countries and may initiate PNPCA under the 1995 MRC Agreement. This project should also incorporate findings from SEN3 to determine the critical habitats and ecosystem in certain stretches of the Mekong River. The cumulative impacts of navigation improvement works would also need to be considered.

ECONOMIC ASSESSMENT

Provision of a navigation channel for operation of 500 DWT vessels will reduce the operating costs and improve the competitive position of IWT versus road transport for the transport of cargo between the Green Triangle and Luang Prabang. The economic benefits of this project may be measured in terms of the reduced operating costs of 500 DWT vessels versus those of existing 100 DWT vessels and of semi-trailer trucks with a 25 ton payload capacity. *These benefits were measured only between Simao and Luang Prabang, since it was concluded that there would be very little potential for IWT traffic between Luang Prabang and Vientiane.*

The economic benefits generated by the project include:

- **reduced operating costs** of 500 DWT vessels as compared with 100 DWT vessels (a saving of US$ 14.76 per ton of cargo, or 54%) and with road semi-trailers (a saving of US$ 18.96 per ton of cargo, or 60%) and
- **reduced greenhouse gas emissions** of 500 DWT vessels as compared with 100 DWT vessels and road semi-trailers, calculated respectively as 0.0141 tons (40% saving) and 0.0145 tons (40% saving) per ton of cargo carried.

Detailed economic benefit calculations are given in the table below.

Long term waterway design action No.1: Provide the Mekong River with a minimum 500 DWT navigation channel between the Green Triangle and Vientiane through dredging and/or excavating

Option	Item	Route	Operatinng cost per tonne (US$)	Fuel cons. Litres/ tonnes	GHG emissions per tonne (tonnes)*
1	Existing river barges (100 DWT)	Simao-Luang Prabang via Mekong (890 km)	27.52	12.97	0.0353
2	Future river barges (500 DWT)	Simao-Luang Prabang (890 km)	12.76	7.80	0.0212
3	Road transport	Simao-Luang Prabang via Route 13N (510 km)	31.72	13.12	0.0357
	Economic savings: - Option 2 vs. Option 1 - Option 2 vs. Option 1 (% saving)		14.76 53.6%	5.17 39.9%	0.0141 39.9%
	Economic savings: - Option 2 vs. Option 3 - Option 2 vs. Option 3 (% saving)		18.96 59.8%	5.32 40.5%	0.0145 40.5%

* *Emission rate = 2.72 kg per litre of diesel fuel consumed.*

PRIORITY OF ACTION (H/M/L)

These works will be preferably carried out in the same sequence of the hydropower dam construction.

FINANCING PLAN (PUBLIC/PRIVATE)

The Ministry of Public Works and Transport, Waterway Department's budget, or the donor community, or government-to-government loan.

PRIOR ACTIONS REQUIRED

Every reef clearance will need a preliminary condition survey (see short term waterway design action 1 above) which will allow the river-engineer-expert to prepare a detailed design of an improved channel by which the excavated debris (rock) or the dredged materials (sand, gravel) will have to be dumped in well-designed areas that will cause the minimum possible disturbance to the water table up and downstream. This detailed design will be submitted to the environmental specialist for approval before being carried out.

FOLLOW-UP ACTIONS REQUIRED

Detailed survey of the water tables up and downstream the construction area will be observed BEFORE and AFTER the works are carried out. ADCP survey will equally be compared in the situations BEFORE and AFTER the reef clearance and a substantial report will have to be prepared in which the findings are mentioned and the rate of success for navigation is evaluated. Eventual corrections may be adapted if it appears that the results are not meeting the expectations.

3.7 LONG TERM WATERWAY DESIGN ACTION 2 (LWD2)

TITLE

The navigation channel improved and cleared of the rapids in the Vientiane – Savannakhet stretch:

1) Keng Sam Hong (Km 1,288)
2) Keng Muoang (Km 1,214)
3) Keng Ka Phouang (Km 1,156)
4) Keng Ka Bao (Km 1,151)

BACKGROUND AND RATIONALE

The navigation channel between Vientiane and Savannakhet is perhaps the most beautiful channel that naturally exists in the Mekong River over a total distance of over 450 km. The river is wide (350 m to 500 m), deep, straight and with little or no strong currents. Some minor obstacles have to be mentioned (e.g. Keng A Nong t Km 1,444), but nevertheless offer easy passage without too many problems. A few sandbanks have shifted several tens of meters throughout the years but equally do not constitute a major problem for navigation. Only in the last 165 km before reaching Savannakhet some four rapids are causing more serious disturbances to navigation.

It is recommended to clear these four above-mentioned reefs for safe navigation between Vientiane and Savannakhet -- the third most populated city in Lao PDR after Vientiane and Pakxe.

LOCATION

The four above-mentioned rapids are all situated in the last 165km upstream of Savannakhet. There was a river port just upstream of Keng Kabao, some 28 km from Savannakhet, but the port silted up, became gradually inaccessible and the two port side cranes were decommissioned and sold. Precise location is provided above.

OBJECTIVES

The **ultimate objective** is to create an all year-round navigable waterway between Vientiane and Savannakhet for vessels up to 500 tonnes. There are no planned hydropower dams in this stretch.

The **immediate objective** is to clear all navigation obstacles in this stretch, mainly consisting of the above mentioned rapids.

OUTPUTS AND DELIVERABLES

A safe and well-designed navigation channel for vessels of up to 500 ton between Vientiane and Savannakhet.

ACTIVITIES

For every of the four above-mentioned dangerous areas, the following activities are identified:

1) A detailed condition survey of the four rapids has been carried out. However, the remaining navigation obstacles in the river, found in the sections between these rapids,have not been surveyed. A survey should also include the low water wet-flow sections including the water level difference between up and downstream of the four surveyed rapids and reefs.
2) A channel design has been prepared under the "Condition Survey of Dangerous areas for Navigation between Luang Prabang and Pakxe" in October 2009, with the following result:
   a) **Keng Som Hong, Km 1288:** 93,000 m^3 to excavate from which 3,262 m^3 bedrock deepening.
   b) **Keng Mouang, Km 1214:** 215 m^3 to excavate, partly from chiselling the channel width and partly for bedrock deepening.

c) **Keng Ka Phouang, Km 1157:** 18,382 m^3 of rock excavation from which 13,850 m^3 for bedrock deepening.

d) **Keng Ka Bao, Km 1151:**32,448 m^3 of rock excavation, from which 26,400 m^3 for bedrock deepening.

These channels are proposals and may be subject to revise or modification, depending on the result of the environmental screening.

3) Prepare a proper and economical channel design for vessels up to 500 ton and, if possible, up to 1,500 tons which is the case for the four above-mentioned reefs (the vessel dimensions for the latter should be approximately: L = 110 a 115 m, B = 11.50 m. [maximum], D = 3.00 m.). Channel dimensions should be done in accordance with waterway classification of China (see short term waterway design action 2 above).

4) For every of the four above-mentioned reefs, prepare an engineering clearance plan indicating the volumes of excavation (rock above or under water, bedrock, sand, gravel boulders, etc.), the location where the debris will be stored, the navigational aids to be constructed or adapted and a cost estimate of the works.

5) Call for tenders to clear and improve an entire waterway section as per the seven headlines in this chapter.

6) The successful bidder implements the works.

7) Prepare a comprehensive report in which the results of the physical improvement works will be described including mentioning the problems encountered and the proposals for further work to improve safety of navigation.

It is obvious that every one of these activities will need the approval of the relevant authorities.

BUDGET

As volumes of excavation are quite detailed from the previous MRC-project, estimates are as follows:

Keng Som Hong (km 1288):	
Bedrock: 3,262 m^3 x 95 US$/$m^3$ =	310,000 US$
Chiselling: 89,738 m^3 x 80 US$/$m^3$ =	7,180,000 US$
Keng Mouang (Km 1214):	
Bedrock: 115 m^3 x 95 US$/$m^3$ =	10,000 US$
Chiselling: 100 m^3 x 80 US$/$m^3$ =	10,000 US$
Keng Ka Phouang (Km 1157):	
Bedrock: 13,850 m^3 x 95 US$/$m^3$ =	1,320,000 US$
Chiselling: 4,532 m^3 x 80 US$/$m^3$ =	360,000 US$
Keng Ka Bao (Km 1151):	
Bedrock: 26,400 m^3 x 95 US$/$m^3$ =	2,510,000 US$
Chiselling: 6,048 m^3 x 80 US$/$m^3$ =	480,000 US$
Total:	**12,180,000 US$**

HUMAN RESOURCES

River engineers, environmental specialists, hydraulic engineers, construction site managers and dredging experts, rock excavation specialists, skippers and helmsmen and required manpower for the construction site.

PROPOSED EXECUTING/IMPLEMENTING AGENCY

Lao PDR Ministry of Public Works and Transports Waterway Department (for the eventual revise of the design of the channel, for the preparation of the tender documents and the follow-up and supervision of the physical implementation of the channel improvement).

The Lao PDR Ministry of Water Resources and Environment (for the approval of the channel design and the method of implementing the reef-clearances).

TIME AND WORK SCHEDULE

Every of the four reef clearances has been condition surveyed and these surveys should allow the river-engineer-expert to eventually prepare alternative detailed designs of an improved channel by which the excavated debris (rock) or the dredged materials (sand, gravel) will have to be dumped in well-designed areas that will cause the minimum possible disturbance to the water tables up and downstream. This detailed design will be submitted to the environmental specialist for approval before being carried out.

SOCIAL ISSUES

The social impacts would also be assessed under the Lao PDR Environmental Protection Law 2013 and Thailand National Environmental Quality Act 1992.

ENVIRONMENTAL ISSUES

The environmental impacts of excavation, dredging and clearing obstacles, reefs and rapids to improve navigation between Vientiane and Savannakhet stretch would need to be assessed with regards to the environmental protection law in Lao PDR and Thailand:

- **Thailand**: Requirements for EIA and Environmental Management Plan (EMP) and monitoring under the National Environmental Quality Act 1992; and
- **Lao PDR:** The navigation improvement in Lao PDR may require an Initial Environmental Examination (IEE) under the Environmental Protection Law 2013 to determine whether an Environmental Impact Assessment (EIA) or Environmental Protection Commitment (EPC) is required

The sections of the river on the Lao/Thai border would require consideration of the environmental protection law in both countries and may initiate PNPCA under the 1995 MRC Agreement. This project should also incorporate findings from SEN3 to determine the critical habitats and ecosystem in certain stretches of the Mekong River. The cumulative impacts of navigation improvement works would also need to be considered.

ECONOMIC ASSESSMENT

Potential demand for IWT on this stretch has been estimated as very limited and therefore the economic benefits of this project will be close to zero. Both Vientiane and Savannakhet are served by high quality roads from Thailand and the costs of transferring cargo between road vehicles and barges would negate any benefits associated with linehaul movement of cargo by IWT between these two ports.

PRIORITY OF ACTION (H/M/L)

Medium (2029-2030). These works fit in the general improvement of the entire Mekong River to be made accessible for ships and vessels up to 500 ton, or passenger vessels on cruises along the Mekong. As the condition surveys have already been completed and a preliminary channel design has been made, it would be wise to start the reef clearance with these four rapids as plot projects.

The cost is moderate and the output impressive (455 km of navigable waterway for boats up to 2,000 ton).

FINANCING PLAN (PUBLIC/PRIVATE)

The Ministry of Public Works and Transport, Waterway Department's budget, or the donor community, or government-to-government loan.

PRIOR ACTIONS REQUIRED

Every reef clearance has been condition surveyed, and this will allow the river-engineer-expert to eventually prepare an alternative design of an improved channel. In any case, the excavated debris (rock) or the dredged materials (sand, gravel) will have to be dumped in well-designed areas that will cause the minimum possible disturbance to the water table up and downstream. This detailed design will then be submitted to the environmental specialist for approval (or eventual adaptation) before being carried out.

FOLLOW-UP ACTIONS REQUIRED

Detailed survey of the water tables up and downstream the construction area should be observed BEFORE and AFTER the works are carried out. ADCP survey of the currents should equally be compared in the situations BEFORE and AFTER the reef clearance and a substantial report will have to prepared in which the findings are mentioned and the rate of success for improvement of navigation is evaluated. Eventual corrections may be adapted if it appears that the results are not meeting the expectations.

3.8 LONG TERM WATERWAY DESIGN ACTION 3 (LWD3)

TITLE

(Scenario 2)Rapids and dangerous areas between Savannakhet and the Khone Falls cleared and channel improved, through excavation, dredging, rock blasting, removal of scattered rock outcrops, bedrock deepening and/or river training works

BACKGROUND AND RATIONALE

The navigation channel between Savannakhet and the Khone falls is tricky and full of rapids and dangerous areas during both the dry season and the high water season. This 390 km long stretch could be separated into two stretches: Savannakhet – Pakxe (256 km) and Pakxe – Khone Falls (134 km).

Two hydropower dams are planned in this section: Latsua (Km 855) and Ban Koum dam (Km 928.5). Both of these dams will have substantial impounded areas that will flood a number of rapids, reefs and shoals. However, the Latsua planned hydropower dam will have little or no impact on the rapids since the MOL of the impounded area is at about the same level as the low water line with no dams constructed in Pakxe. After construction of these dams and calibration of the river between Savannakhet and the Khone Falls, navigation for 500 ton boats will become attractive and possible in this section, subject to improving the navigation channel in the free-flow sections in both of the impounded areas of the dams.

Downstream of the planned Latsua dam (Km 855) there remains some 131 km of Mekong River, which offers a huge potential for eco-tourism (Khong island and Siphandone). However, the Mekong River in the last 50 km upstream of the Khone Falls has many shallow non-navigable branches and the total width of the river reaches 12 km. If navigation for boats of 500 ton is to be possible, substantial river training works will have to be done to guarantee at least one channel of sufficient sustained depth through scour.

LOCATION

All rapids are situated between Km 1125 (Savannakhet – Mukdahan) and the Cambodian-Lao border (Khone Falls), Km 723. There are 77 rapids between Savannakhet and Pakxe, of which 11 are big ones (condition surveyed) and 66 are smaller ones. However, in the remaining free flow sections the number of rapids is reduced to 7 big ones and 49 small ones. Between the Latsua dam (Km 855) and the Khone Falls (Km 723) some 10 more rapids and reefs hindering navigation have been identified, but many more exist in branches that are not navigable for bigger boats. All of these rapids, even those in the impounded stretch of the Latsua dam, have to be cleared as the MOL of the Latsua dam will not be high enough to sufficiently flood these rapids. These 10 rapids have not been surveyed or listed.

OBJECTIVES

The **ultimate objective** is to create an all-year round navigable waterway between the Green Triangle and the Khone Falls for vessels up to 500 tons. There are only two planned hydropower dams in this stretch: Ban Koum and Latsua.

The **immediate objective** is to clear all navigation obstacles in this stretch and design appropriate river training works between Pakxe and the Khone Falls.

OUTPUTS AND DELIVERABLES

A safe and well-designed navigation channel for vessels of up to 500 tonbetween Savannakhet and the Khone Falls.

ACTIVITIES

For every of the56 remaining dangerous areas (in the free flow sections), the following activities are identified:

1) A detailed condition survey of the rapids needs to be carried out, including the low water wet-flow sections and the water level difference between up and downstream of the rapids and the reefs. Eleven of these rapids (from which 7 remain in the free flow section) have been partly condition surveyed and have to be completed during this activity. ADCP survey seems to be necessary in some of the rapids where strong currents exist.
2) For every rapid, a channel design has to be preparedwith a proposal to dump the excavated rocks from chiseling and bedrock deepening in well-designed locations that will have the least disturbance to the water table levels up and downstream of every rapid.
3) The channel proposals have to be screened by environmental specialists and approved or amended.
4) Tender documents have to be prepared for each of the rapids or for a series of rapids (according to the availability of funds).
5) Reef clearance, dredging and rock excavation need to be supervised.
6) Prepare a substantial report assessing the benefits for the navigation from the implemented works.

BUDGET

49 moderate rapids or reefs at 900,000 US$/rapid:	44,100,000 US$
7 bigger rapids or reefs at 1,600,000 US$/reef:	11,200,000 US$
10 rapids between Latsua dam and Khone Falls of medium size 10 x 1,200,000 US$:	12,000,000 US$
Estimated amount for constructing river training works (groynes and overflow dikes):50 units x 400 meter x 550 US$/m (5 meters high with armouring of rockstones 5-25 kg):	11,000,000 US$
Total estimate:	**78,300,000 US$**
Contingencies 20%:	15,660,000 US$
Total:	**93,960,000 US$**

HUMAN RESOURCES

River engineers, environmental specialists, hydraulic engineers, construction site managers and dredging experts, rock excavation specialists, skippers and helmsmen and required manpower for the construction site.

PROPOSED EXECUTING/IMPLEMENTING AGENCY

Lao PDR Ministry of Public Works and Transports Waterway Department (for the eventual revision of the design of the channel and the river training works, for the preparation of the tender documents and the follow-up and supervision of the physical implementation of the channel improvement).

The Lao PDR Ministry of Water Resources and Environment (for the approval of the channel design and the method of implementing the reef-clearances).

TIME AND WORK SCHEDULE

It's necessary to start the works during the low water season after all the studies have been completed and the design has been approved. River training works in the downstream sections nearby the Khone Falls have lesser priority. They are more vulnerable to adverse effects of blocking (partly or fully) some minor channels to increase scour in the remaining navigation channel in order to keep it at a sustainable depth.

SOCIAL ISSUES

The social impacts would be assessed under the Lao PDR Environmental Protection Law 2013 and Thailand National Environmental Quality Act 1992.

ENVIRONMENTAL ISSUES

The environmental impacts of excavation, dredging, clearing obstacles, reefs and rapids and river training works to improve navigation between Savannakhet and the Khone Fallswould need to be assessed with regards to the environmental protection law in Lao PDR and Thailand:

- **Thailand**: Requirements for EIA and environmental management plan (EMP) and monitoring under the National Environmental Quality Act 1992; and
- **Lao PDR:** The navigation improvement in Lao PDR may require an Initial Environmental Examination (IEE) under the Environmental Protection Law 2013 to determine whether an Environmental Impact Assessment (EIA) or Environmental Protection Commitment (EPC) is required.

The sections of the river on the Lao/Thai border would require consideration of the environmental protection law in both countries and may initiate PNPCA under the 1995 MRC Agreement. This project should also incorporate findings from SEN3 to determine the critical habitats and ecosystem

in certain stretches of the Mekong River. The cumulative impacts of navigation improvement works would also need to be considered.

ECONOMIC ASSESSMENT

There is unlikely to be any significant demand for IWT in this stretch, other than for local and very limited tourism transport, but this project will contribute to safer navigation. The community benefits are not possible to evaluate here.

PRIORITY OF ACTION (H/M/L)

Low (2037).

Every physical construction, dredging, rock excavation or river training work start with a condition survey of the construction area. See the Short term action plan nr. 1 above.

This survey can be completed with ADCP measurements if necessary.

The results are used for designing a navigation channel through every one of these rapids and detailed calculation of the volumes to be dredged or excavated and the volumes of rock debris to be dumped in the well specified areas of the river and in the river training works.

The completed design is submitted to the environmental experts for screening and approval or eventual amendments.

Once the design is approved, the tender documents are prepared for the implementation of the works including the technical specifications.

After the contract awarding, physical implementation starts with a construction survey and quality control.

At the end of each work (or the totality of the works), a substantial report is prepared with an assessment of the results for navigation.

FINANCING PLAN (PUBLIC/PRIVATE)

The Ministry of Public Works and Transport, Waterway Department's budget, or the donor community, or government-to-government loan

PRIOR ACTIONS REQUIRED

Detailed condition survey of the rapids and reefs including measurements of the water tables up and downstream the construction area BEFORE and AFTER the works are carried out. No physical work can start without explicit approval of the ministries concerned (Public Works and Transport, Environment, Finance, etc.) and the downstream country Cambodia to whom it should be made clear that the works will not affect in any way the water flow or the behavior of the river.

FOLLOW-UP ACTIONS REQUIRED

After the full implementation of the entire section, a substantial report should be prepared following the survey of the improved navigation section and the ADCP work measuring the currents BEFORE and AFTER the implementation. The report should objectively assess the benefits for navigation in terms of safety and efficiency.

3.9 LONG TERM WATERWAY DESIGN ACTION 4 (LWD4)

TITLE

(Scenario 2)An 11 km long bypass canal around the Khone Falls, including bank protection, two or three ship locks with dimensions of the lock chamber 120 x 12 x 4 meters

BACKGROUND AND RATIONALE

A solution for bypassing the Khone Falls for navigation starts to be attractive and interesting when all sections up, but more importantly downstream, of the Khone Falls are calibrated for 500t boats.This opens a potential window since modest sea-going vessels (requiring little air clearances of max. 20 meters) during the low water regime can reach Kompong Cham (Tonlé Bet). River barges, in a first instance of max. 500t could reach the Viet Nam Delta starting from the upper stretches of the Mekong.

From the two possibilities of bypassing or passing the Khone Falls (i) by rehabilitation and upgrading of the former dilapidated rail-connection between two ports, or (ii) by digging a 11 km long navigation canal between the upstream part of the Khone Falls and the downstream part with the construction of 2 or 3 ship-locks, the latter is technically the most reliable and efficient but by far the most expensive as well. However, in the eventuality of the other Mekong River sections being calibrated up and downstream and made accessible for bigger ships, traffic could be attracted and navigation be rendered fluent between Cambodia-Viet Nam and Lao PDR-Thailand-Myanmar-China.

The mining zones of Champassak with their potential heavy transport of ores or semi-refined products could add weight to this solution.

LOCATION

Although geographical and geotechnical studies have to precede the project regarding the location of the navigation canal and the ship locks, it is most likely that this canal will be created at the left bank of the Mekong (east of the Khone Falls), while the location of the ship locks will be chosen to fit as much as possible the natural geography of the terrain.

- Entry point of the canal at the Mekong bank: Lat. = 14º 00’09.90” N
  Long. = 105º 56’30.82” E
- Exit point of the canal in the Mekong: Lat. = 13º 57’00.65” N
  Long. = 105º 59’18.88” E

OBJECTIVES

The **ultimate objective** of this project is to create comfortable continuity for navigation of big vessels and boats, of minimum 500 tons in a first instance,between the southern part of the Mekong System (Cambodia and Viet Nam) and the northern part (Thailand, Lao PDR, Myanmar and China). Locks however, with a view to the future, would have the same dimensions as all other locks bypassing the hydropower dams: 120 x 12 x 4 m.

The **immediate objective** of this project is to create a bypass navigation channel suitable for barges of 2,000 DWT between the upper part of the Khone Falls and the downstream part, including the construction of two ship locks 120 m x 12 m x 4 m, road networks and bridges.

OUTPUTS AND DELIVERABLES

A navigation channel accessible for ships of 2,000 t and equipped with ship locks for 2,000 t vessels between the upstream part of the Khone Falls and the downstream part. In the first instance the channel characteristics will suit the boats of 500t,with a final objective of the long term vision of this Master Plan.

ACTIVITIES

- A thorough geographical and geomechanical investigation of the subsoil along the trajectory with special emphasis to the location of the fault line which is the creator of the falls.
- Full topographic survey of the entire area, including the ADCP measurements of the currents in the Mekong at entry and exit points.
- Prepare engineering design of the canal with options of 2 and/or 3 ship locks, supported by cost feasibility study. Evaluate the resettlement.
- Submit the project to environmentalist specialists for screening en eventual adaption.
- Study alternative proposals, if required, for the implementation of the project.
- Prepare tender documents.
- Contract negotiation and awarding.
- Construction and construction supervision.
- Project assessment and evaluation.

BUDGET

According to J-L Maturin (Compagnie Nationale du Rhone) in his October 2008 study: "Standard Specifications for Ship Locks on Mekong Mainstream Dams", the following cost estimates prevail for overcoming a lift of about 30 metres:

2 shiplocks of about 15 m lift: 2 x 57,000,000 US$:	114,000,000 US$
11 km canal for vessels up to 2,000t:	316,000,000 US$
Bridge over the canal (15,00 m air clearance):	31,000,000 US$
Road works (move the NR3):	8,000,000 US$
Total:	**469,000,000 US$**

HUMAN RESOURCES

River engineers, structural engineers, electromechanically engineers, environmental specialists, geographic engineers, geologists, construction site managers and dredging experts, rock excavation specialists and required manpower for the construction site.

PROPOSED EXECUTING/IMPLEMENTING AGENCY

Lao PDR Ministry of Public Works and Transports Waterway Department.

Lao PDR Ministry of Water Resources Environment (for the approval of the canal and ship lock design and the method of implementing the excavation);

Both Ministries of Foreign Affairs (Lao PDR-Cambodia)

TIME AND WORK SCHEDULE

Only when implementation of waterway improvements up and downstream the Khone Falls have been pledged and financially committed, and subject to a reasonable economicand environmental feasibility, this bypass canal can be envisaged and implemented. However, the need will come from transport demand of heavy goods (e.g. mining industry, ores, fertilizers, sand, gravel, construction materials, etc.) in a North-South corridor, which for the imminent future is not very likely.Implementation for this infrastructure is minimum 5 years.

SOCIAL ISSUES

The project may have significant impact on fisheries in the Khone Falls, critical for livelihoods and food security. The social impacts would also be assessed under the Initial Environmental Examination (IEE) under the Environmental Protection Law 2013.

ENVIRONMENTAL ISSUES

The bypass canal around the Khone Falls may have significant and irreversible impacts on the biodiversity, fisheries, water quality and geomorphology of this area.The environmental impacts would trigger an IEE under the Environmental Protection Law 2013 to determine whether an Environmental Impact Assessment (EIA) or Environmental Protection Commitment (EPC) is required. The project will also initiate PNPCA under the 1995 MRC Agreement and require consultation with Cambodian line agencies and key stakeholders.

ECONOMIC ASSESSMENT

There is unlikely to be any significant demand for IWT in the stretch between Savannakhet and Kratie, other than for local and very limited tourist transport. While it is close to the large mineral reserves of the Bolovens Plateau these, if ever deemed suitable for commercial exploitation, are likely to be transported by heavy haul railway to ports in Viet Nam (or possibly Cambodia). Given the very limited outlook for cargo traffic in this stretch, coupled with the high capital cost of the project, it is unlikely that the bypass canal can be economically justified.

PRIORITY OF ACTION (H/M/L)

Low priority (2033-2040).

FINANCING PLAN (PUBLIC/PRIVATE)

If reasonable transport prospects are established, a Public-Private Partnership could be a successful financing option. Fees would then be applied to the shippers using the canal and the shiplocks.

PRIOR ACTIONS REQUIRED

Full topographic survey including geologic survey of the fault line at the Khone Falls and geotechnical soil investigations with borehole drillings.Cross-border negotiations for cross-border constructions

FOLLOW-UP ACTIONS REQUIRED

Statistics of users of the shortcut or bypass canal.

3.10 LONG TERM WATERWAY DESIGN ACTION 5 (LWD5)

TITLE

(Scenario 2) The navigation channel between the Khone Falls and Kratie is improved by dredging, rock excavation and bedrock deepening, clearance of reefs and rock outcrops, and river training works like groynes and overflow dikes

BACKGROUND AND RATIONALE

Downstream of the Khone Falls, the Mekong is characterized by a great number of parallel canals and river branches, some of which are not navigable and others that have lots of rapids and reefs or shoals.

Sandbanks are often popping up at river splits and creating shoals in the smaller arms.

This stretch, just down the Khone Falls is also home to many rare bird and fish species,including the Irrawaddy soft water dolphin, thus making it a tourist attraction.

Navigation has never been an issue in this stretch although there is potential. The Khone Falls, constituting a navigationdead-end, does not make waterway transport attractive. However, the final goal is to create a navigation channel in the Mekong between the Golden Triangle and the sea for vessels of minimum 500tons and to create continuity over the Khone Falls.

Two hydropower dams are projected in this stretch: one at Stung Treng (Km 688) and one at Sambor (Km 594). Most of the rapids, reefs and shoals would be sufficiently flooded so as to no longer hinder navigation in the impounded areas.

LOCATION

The upstream part of his project is the border between Lao PDR and Cambodiadownstream the Khone Falls (Km 723), while the downstream part of this stretch ends at Kratie (Km 561).

OBJECTIVES

The **ultimate objective** is to create an all-year round navigable waterway between the Green Triangle and Phnom Penh for vessels up to 500 tonnes. There are only two planned hydropower dams in this stretch: Stung Treng and Sambor. Both of the tail waters of these dams reach the Khone Falls, specially the Stung Treng dam.

The **immediate objective** is to clear all remaining navigation obstacles in the free flows of this stretch and eventually designing appropriate river training works between the Sambor hydropower dam and Kratie.

OUTPUTS AND DELIVERABLES

A safe and well-designed navigation channel for vessels of up to 500 ton vessels between the Khone Falls and Kratie.

ACTIVITIES

- Topographic survey of the entire stretch with the aim to identify in the navigation channel the obstacles which will not be submerged by 3 meters of water during the low operational level (LOL).
- Condition survey of these [future submerged] obstacles (with the aim to remove them) -- See short term waterway design action 2 above.
- Condition survey of the rapids and reefs between Sambor dam (Km 594) and Kratie (Km 561) -- a total distance of 33 km. This is the area where the protected soft water dolphins (Kampi)are found and home to a great number of rare and protected bird species and aquatic animals.

- For every rapid, a channel design has to be preparedwith a proposal to dump the excavated rocks from chiseling and bedrock deepening in well-designed locations that will create the least disturbance to the water table levels up and downstream of every rapid.
- Downstream of the Sambor dam, where the Mekong River has multiple branches and side arms, river training works have to be considered rather than dredging and reef or rapid clearance.
- The channel proposals have to be screened by environmental specialists and approved or eventually amended.
- Tender documents have to be prepared for each of the rapids or for a series of rapids and shoals (according to the availability of funds).
- Reef clearance, dredging and rock excavation need to be supervised.
- Prepare a substantial report assessing the benefits for navigation based on the implemented works.

BUDGET

6 bigger rapids (some of them being very long): 6 x 1,600,000 US$ =	9,600,000 US$
A number of scattered rocks in the channel 13 x 400,000 US$ =	5,200,000 US$
River training works (groynes and overflow dikes) 12 units x 400 meter x 600 US$/m =	2,880,000 US$
Total	**17,680,000 US$**

HUMAN RESOURCES

River engineers, environmental specialists, hydraulic engineers, construction site managers and dredging experts, rock excavation specialists, skippers and helmsmen and required manpower for the construction site.

PROPOSED EXECUTING/IMPLEMENTING AGENCY

Cambodia's Ministry of Public Works and Transport Waterway Department(for the eventual revision of the design of the channel[s] and the river training works, for the preparation of the tender documents and the follow-up and supervision of the physical implementation of the channel improvement).

Cambodia's Ministry of Environment (for the approval of the channel design and the method of implementing the reef-clearances).

MRCS-NAP.

TIME AND WORK SCHEDULE

To be implemented during the dry season.

SOCIAL ISSUES

The social impacts should be included in the Initial Environmental Impact Assessment (IEIA), particularly the impacts on local livelihoods on fisheries, water quality, riverbank gardens and agriculture.

ENVIRONMENTAL ISSUES

Improving the navigation channel between the Khone Falls and Kratie is likely to have significant environmental and social impacts. The project would trigger an EIA under the Cambodian Environmental Protection Law 1996. Under the Draft EIA Law 2015 the following may be required:

- Initial Environmental Impact Assessment (IEIA)
- Full EIA report

- The approved Environmental Protection Contract (EPC)
- EMP and monitoring

The IEIA would need to consider that downstream of the Khone Falls is a critical habitat for the WWF flagship species, the Irrawaddy dolphin, and that there are national protected areas (NPA) near Stung Treng and Kratie.There is also a decree for the conservation of Irrawaddy dolphins that restricts the use of vessels.

ECONOMIC ASSESSMENT

This stretch is unlikely to generate any significant demand for IWT, other than for local and very limited tourist traffic. For this reason, the project is unlikely to be justified in economic terms, although it can be expected to have major safety benefits. The community benefits are difficult to measure.

PRIORITY OF ACTION (H/M/L)

Low priority (2037-2038): Its importance, seen the environmental adverse effects and the endangered species downstream the Sambor hydro-power dam, is depending on approval and progress of works downstream the subject area.

FINANCING PLAN (PUBLIC/PRIVATE)

The Ministry of Public Works and Transport, Waterway Department's budget, or the donor community, or government-to-government loan or Public-Private Partnership with shipping associations.

PRIOR ACTIONS REQUIRED

A detailed condition survey of the rapids and reefs, including measurements of the water tables up and downstream the construction area BEFORE and AFTER the works, should be carried out prior to the planned implementation and during the dry season. No physical works can start without explicit approval of the ministries concerned (Public Works and Transport, Environment, Finance, etc.).

FOLLOW-UP ACTIONS REQUIRED

After the full implementation of the entire section, a substantial report should be prepared following the survey of the improved navigation section and the ADCP work measuring the currents BEFORE and AFTER the implementation. The report should objectively assess the benefits for navigation in terms of safety and efficiency.

3.11 LONG TERM WATERWAY DESIGN ACTION 6 (LWD6)

TITLE

Improved navigation channel between Kratie and Kompong Cham up to 2,000 DWT through dredging and excavation including eventual river training works

BACKGROUND AND RATIONALE

Downstream from Kratie, the Mekong navigation potential increases considerably. Navigation obstacles mainly relate to shoals, moving sandbanks and bank erosion. In many cases, capital and maintenance dredging may be the right engineering solution but river training works are a sustainable way to reduce obstacles, even making maintenance dredging superfluous. They deserve the necessary attention from an economical point of view.

This stretch has drawn the attention of KOICA (Korea International Cooperation Agency). This agency intends to carry out substantial dredging works between Kratie and the New Phnom Penh Container Terminal for navigation of ships and barges up to 2,000t and 3,000t (the latter being the size of sea going vessels with low superstructures).

LOCATION

Kratie is at Km 561 and Kompong Cham Km 448. Total distance = 113 Km

OBJECTIVES

The **ultimate objective** is to create an all-year round navigable waterway between Kratie and Kompong Cham for vessels and barges up to 2,000 ton. There are no planned hydropower dams in this stretch.

The **immediate objective** is to clear all the navigation obstacles between Kratie and Kompong Cham and make the stretch accessible for barges of 2,000t.

OUTPUTS AND DELIVERABLES

A safe and well-designed navigation channel for vessels and barges of up to 2,000 ton between Kratie and Kompong Cham.

ACTIVITIES

- Hydrographic survey of the entire stretch with the aim to identify the obstacles in the navigation channel. KOICA is initiating this survey with the most modern equipment and, if successful, this activity might be considered as obsolete.
- Detailed condition survey of these obstacles and shoals (sand bars and sand banks that move between two flood seasons) over a distance of 113Km. The same observation for the KOICA survey applies.
- Prepare a channel design, with proposal to either dump the excavated materials or store them in case they should be considered re-usable in construction (the estimated cost of quality sand in Cambodia is between 2.00 and 2.50 US$/m^3). Attention should be given to possible alternative solution(s) consisting of river training works where scour would eliminate the maintenance dredging.
- The proposed channel has to be screened and approved by environmental specialists or eventually amended.
- Tender documents have to be prepared for each of the difficult areas for navigation or for its totality.
- Dredging needs to be supervised.
- Prepare a substantial report assessing the benefits for navigation based on the implemented works.

BUDGET

According to the preliminary study from KOICA, the following dredging volumes are applicable:

- Between Kratie and Kompong Cham for barges of 2,000t: 8,810,000 m^3
- Yearly maintenance dredging: 2,210,000 m^3
- River training works consisting of groynes with the following dimensions:
  Height: 5m, width at basis: 18m, width at crest: 3m,Body consisting of rip-rap on top of geotextile;Armouring of 0.30m thick rock stone of 5-25 kg or in average 5.4 m^3 rockstone per linear meter groyne.

  Cost per linear meter = 600 US$/$m^1$

Estimated accumulated length of groynes: 5,000 m x 600 US$/$m^1$	3,000,000 US$
Estimated volume of capital dredging cost: 8,810,000 m^3 x 3.00 US$/$m^3$	26,430,000 US$
Total estimate of the project:	**29,430,000 US$**

HUMAN RESOURCES

River engineers, environmental specialists, hydraulic engineers, construction site managers and dredging experts, quantity surveyors, skippers and helmsmen and required manpower for the construction site.

PROPOSED EXECUTING/IMPLEMENTING AGENCY

Cambodia's Ministry of Public Works and Transport's Waterway Department (for the eventual revision of the design of the channel and the river training works, for the preparation of the tender documents and the follow-up and supervision of the physical implementation of the channel improvement).

Cambodia's Ministry of Industry, Mines and Energy and the Ministry of Environment (for the approval of the channel design and the method of dredging and disposal of the dredged materials).

MRCS-NAP.

TIME AND WORK SCHEDULE

As soon as the downstream section is tackled (Kompong Cham – Phnom Penh). The works can be carried out in the dry season (say 10 months).

Every physical construction in the river, every dredging, rock excavation or river training work starts with a condition survey of the construction area.

This survey can be completed with ADCP measurements, if necessary.

The results are used for designing a navigation channel and calculating the volumes to be dredged or excavated,and/or for the eventual design of river training works if yearly maintenance dredging is esteemed too expensive. A financial plan is established in which the possibility is examined whether the dredged materials can be commercialized (market price for dredged sand in Cambodia is between 2.00 and 2.50 US$/$m^3$ for big quantities).

The completed design is submitted to the environmental experts for screening and approval or eventual amendments.

Once the design is approved, the tender documents are prepared for the implementation of the works including the technical specifications.

After the contract awarding, physical implementation starts with construction survey and quality control.

At the end of each work (or the totality of the works), a substantial report is prepared with assessment of the results for navigation.

SOCIAL ISSUES

The social impacts should be included in the Initial Environmental Impact Assessment (IEIA), particularly the impacts on local livelihoods on fisheries, water quality, riverbank gardens and agriculture.Sand mining and dredging in the area has already led to local reports of riverbank erosion, affecting housing and infrastructure.

ENVIRONMENTAL ISSUES

Improving the navigation channel between Kratie and Kompong Cham is likely to have significant environmental and social impacts. The project would trigger an EIA under the Cambodian Environmental Protection Law 1996 and under the Draft EIA Law 2015 the following may be required:

- Initial Environmental Impact Assessment (IEIA)
- Full EIA report
- The approved Environmental Protection Contract (EPC)
- EMP and monitoring

The IEIA would need to consider that downstream of Kratie is a critical habitat for fisheries and other wildlife and an area for ecotourism. The draft 'Prakas Procedure of a Dredging Management on the Waterways of the Kingdom of Cambodia', specifies that an EIA needs to be conducted for dredging and waterway improvement works if the volumes will exceed 50,000m^3.

ECONOMIC ASSESSMENT

Improvement of the navigation channel to allow passage of 2,000 DWT vessels would have to be justified by the potential for export of agricultural commodities from Kratie. The volumes of agricultural commodities produced around Kratie are unlikely to be sufficient to generate a high volume export trade and therefore it is unlikely that the channel improvement project can be justified in economic terms.

PRIORITY OF ACTION (H/M/L)

Medium (2025-2028).

Much depends on the progress of works being made downstream of Kompong Cham and the economical attractiveness of the entire stretch between Phnom Penh and Kratie.

FINANCING PLAN (PUBLIC/PRIVATE)

International grant/loan.

PRIOR ACTIONS REQUIRED

Detailed hydrographic survey of the entire stretch and soil mechanical examination of the dredged materials.

FOLLOW-UP ACTIONS REQUIRED

After the full implementation of the entire section, a substantial report should be prepared following a new survey of the improved navigation section and, eventually,the ADCP work measuring the currents BEFORE and AFTER the implementation. The report should objectively assess the benefits for navigation in terms of safety and efficiency.

3.12 LONG TERM WATERWAY DESIGN ACTION 7 (LWD7)

TITLE

Improved navigation channel for sea going vessels up to 3,000 DWT between Kompong Cham and the New Container Port of Phnom Penh, due to dredging and river training works

BACKGROUND AND RATIONALE

Kompong Cham used to be accessible for sea going vessels in the 1990s. Tonlé Bet was the port for loading and unloading (left bank opposite the city of Kompong Cham). The most frequent commodities were agricultural products and firewood. However, the wooden portconstruction collapsed in the early 1990s due to heavy erosion of the left bank and the ongoing erosion made a new port construction economically non feasible.

In 2010 a low level bridge was built in Prek Tameak, obstructing seagoing vessels with super structures of over 22 meters to the upper parts of the Mekong *during the low water season* (beyond the Prek Tameak bridge). Nevertheless, some sea going vessels continued to call the Tonlé Bet installations (conveyor belts) to load cassava. It has recently been confirmed by the agricultural stakeholders that if [new] port installations would be constructed and were deemed adequate, the entire cassava production of this area would be shipped (to China) at Tonlé Bet.

The river clearly has the potential to accommodate seagoing vessels of 2,500 to 3,000t up to Tonlé Bet and only a few [important] shoals are actually seriously hampering navigation and limiting the allowable draught of these vessels (in particular the Sdao canal and in Phnom Penh the Chaktomuk area). It is therefore unfortunate that a low level bridge has been built in Prek Tameak and it looks like all future bridges over the Mekong in this stretch will continue to be built with the same small air clearances of only 15,00 m above the HHW, thereby blocking thefuture prospect of having bigger seagoing vesselscome through this stretch.

KOICA, the Korean development agency, has prepared a project for dredging this stretch but failed to properly address more persistent and viable solutions like river training works, groynes and overflow dikes to tackle the sedimentation problems. Substantial and costly yearly maintenance dredging is the result of such an approach and, in the long term, not economically viable. Moreover, the dredging volumes estimated in this KOICA project differ dramatically from those calculated in the Master Navigation Plan for Cambodia (2008). Although the channel width in the KOICA project has been designed at 100 meter and dredging at -6.50m, while the Cambodian Navigation Master Plan has a channel width of 60 meters and dredging to -7.00m, volumes differ from 5,440,000 m^3 (KOICA) to 1,377,000 m^3 (MRC). It is true that since 2008 major dredging works have been carried out and the real dredging volume is actually much less than 1,377,000 m^3, which may explain the huge difference. On the other hand, KOICA mentions that the dredging volumes have been estimated from Google Earth while MRC's 2008 Master Plan derived the estimate from the UHA-maps.

Since then many hydrographic surveys of the Sdao canal have been carried out and it cannot be denied that an increase of the channel depths is likely.

This project aims to make the Tonlé Bet port accessible for sea going vessels (with limited super-structure of not more than 20-22 meter) of 3,000 DWT during the 8 months of low water season and accessible for barges of 2,000 t throughout the year.

LOCATION

The project starts at the old Tonlé Bet port site at Km 446 in front of Kompong Cham, situated at the left bank and ends at the New Container Terminal of the Phnom Penh Port at Km 324, a total distance of 122 Km.

OBJECTIVES

The **ultimate objective** is to create a navigable waterway between Kompong Cham and Phnom Penh for seagoing vessels (*with low superstructure and during low water season*) of 3,000 DWT and river barges up to 2,000 tons, all year round.

The **immediate objective** is to eliminate all navigation obstacles in the stretch Phnom Penh – Kompong Cham, either by dredging or by river training works.

OUTPUTS AND DELIVERABLES

A safe and well-designed navigation channel for sea-going vessels with low super-structure of up to 3,000 ton during the low water season between Kompong Cham and Phnom Penh.

A safe and well-designed navigation channel for river barges of up to 2,000 ton, all year round, between Kompong Cham and Phnom Penh.

ACTIVITIES

- Similar to the KOICA project, the activities start with a detailed hydrographic and topographic survey of the entire area, eventually carried out under the KOICA project.
- Next is the design of a waterway channel with characteristics accommodating the design vessel[s]: 3,000 DWT sea-going vessels and 2,000t river barges.
- The engineering drawings of the navigation channel should also consider the alternative of river training works aimed at substantially reducing the yearly maintenance dredging (see action 4 under the short term activities for the solution to the Sdao channel). A comparative study between the two solutions (dredging only, or dredging as complement to river training works) should to lead to the most economic decision for the long-term project.
- Environmental considerations and screening of the dredging and river training works is recommended, in particular in view of the deposit of dredged materials which can either be marketable (temporary storage areas), or, if unsuitable as construction material or as reclamation soil, has to be dumped on sand banks or on other designated areas.
- Preparation of tender documents.
- Implementation of the works and construction supervision.
- Prepare substantial report assessing the economic results of the project and the anticipated impact on future navigation in this stretch.

BUDGET

Various "hot spots" in this stretch have been identified, mostly in line with the findings of the KOICA project proposal location but different in volumes. For a 60-meter wide channel and 7 m depth, the following estimates were made in the Cambodian Navigation Master Plan for the Mekong:

Minor spots at Km 447, Km 417 and downstream at Km 365, Km 355-354, are totaling a dredging volume of:	243,700 m^3
Hot spot at Km 420:	405,500 m^3
Sdao canal at Km 386 (only dredging):	728,000 m^3
Total:	**1,377,200 m^3**

It is perfectly possible that after a new hydrographic survey is carried out these volumes will be less (not more!)

Furthermore, to reach the Phnom Penh New Container Terminal at Km 325 (Km 30 along the NR1 between Phnom Penh and Neak Lueng), there are a few more places that need to be dredged:

Chaktomuk area a Km 347-346 over a distance of approx 2,000 m:	126,000 m^3

Km 342: a shallow of only 3.50m over a distance of 2,200 m:	543,000 m^3
Km 340: a shallow of 5.50m over 1,000 m:	97,000 m^3
Total:	**766,000 m^3**

Also in this stretch, substantial maintenance dredging has been carried out by PPAP and it is important to check whether the volumes are still accurate or have to be reduced:

General total:	**2,143,200 m^3**
Cost estimate:2,143,200 m^3 x 3.00 US$/$m^3$	6,430,000 US$

Finally, some bank protections are necessary to protect the right riverbanks downstream of the Sdao Canal between Km 385 and Km 383 over a total distance of approx. 2,300 m:

Cost estimate:2,300 m^1 x 2,800 US$/$m^1$	6,440,000 US$
Total:	**12,870,000 US$**

It should be observed that this cost estimate *does not include any river training works* especially not for the Sdao canal at Km 386. It is therefore estimated that the yearly maintenance may yield about 12,000 to 15,000 m^3.

The estimate also does not include the eventual *commercialization of the dredged material*, should it be quality sand suitable for construction or for reclamation of commercial, industrial or residential areas, from which the project would benefit.

HUMAN RESOURCES

River engineers, environmental specialists, hydraulic engineers, construction site managers and dredging experts, quantity surveyors, skippers and helmsmen and required manpower for the various construction sites.

PROPOSED EXECUTING/IMPLEMENTING AGENCY

Cambodian Ministry of Public Works and Transport's Waterway Department (for the eventual revision of the design of the channel, for the preparation of the tender documents and the follow-up and supervision of the physical implementation of the channel improvement).

The Cambodian Ministry of Industry, Mines and Energy and the Ministry of Environment (for the approval of the channel design and the method of dredging and the suggested disposal or commercialization of the dredged materials).

PPAP.

MRC – CNMC.

TIME AND WORK SCHEDULE

The works are estimated to be completed in 30 consecutive months.

SOCIAL ISSUES

The social impacts should be included in theInitial Environmental Impact Assessment(IEIA), particularly the impacts on local livelihoods, fisheries, water quality, riverbank gardens and agriculture.

ENVIRONMENTAL ISSUES

Improving the navigation channel between Kompong Cham and Phnom Penh is likely to have some environmental and social impacts. The project would trigger an EIA under the Cambodian Environmental Protection Law 1996.Under the Draft EIA Law 2015 the following may be required:

- Initial Environmental Impact Assessment (IEIA)
- Full EIA report

- The approved Environmental Protection Contract (EPC)
- EMP and monitoring

The IEIA would need to consider that downstream of Kratie is a critical habitat for fisheries and other wildlife and an area for ecotourism. The draft *'Prakas Procedure of a Dredging Management on the Waterways of the Kingdom of Cambodia'*, specifies that an EIA should be conducted for dredging and waterway improvement works if the volumes exceed 50,000m^3. Riverbank erosion associated with reduced sediment load has already occurred in this stretch and implementing a dredging environmental management plan (DEMP) will be critical. The dredging and waterway improvement works may also trigger a PNPCA or consultation with Viet Nam on the potential downstream impacts.

ECONOMIC ASSESSMENT

The proposed project should permityear-round navigation of vessels of up to 3,000 DWT. Currently, seagoing vessels of more than 3,000 DWT navigate as far Tonle Bet to the south of Kompong Cham, but can only navigate for five months of the year as they are unable to pass under the Prek Tameak bridge during the high water season. Kompong Cham Province produces much of Cambodia's high quality cassava crop; direct exports to China commenced from Tonle Bet in 2015. The improvement of the channel for navigation of vessels of up to 3,000 DWT would result ineconomic benefits associated with this cassava trade, which is forecasted to grow to 225,000 tons by 2040. These benefits would include:

- Savings in the operating costs of transporting agricultural commodities from Kompomg Cham by direct barge/ship movement as compared with movement by road to Phnom Penh and from there by barge.
- Reduced emissions of greenhouse gases due to direct movement by barge from Kompong Cham as compared with joint road/barge movement through Phnom Penh.

PRIORITY OF ACTION (H/M/L)

Medium (2025-2027).

FINANCING PLAN (PUBLIC/PRIVATE)

Possible investors are:

- Ministry of Public Works and Transport.
- International multinational donor community such as ADB, World Bank, etc.
- International donor agencies: JICA, KOICA, DANIDA, etc.
- The port of Phnom Penh (PPAP).
- The shipping lines.

PRIOR ACTIONS REQUIRED

Survey (hydraulic, topographic) and soil investigations (borehole drilling, dredged materials, soil sampling, etc.).

Investigate the availability of dumping terrain for the dredged materials and the commercial conditions.

Investigate the commercial value of the dredged materials (marketable?) and map the possible parties interested in buying the sand.

Investigate the commercial interest of the private sector in co-financing the project, such as shipping lines, PPAP, agricultural producers, etc., and discuss the conditions for co-financing.

FOLLOW-UP ACTIONS REQUIRED

After the full implementation of the entire section, a substantial report should be prepared following a new survey of the improved navigation section and eventually the ADCP work measuring the

currents BEFORE and AFTER the implementation. The report should objectively assess the benefits for navigation in terms of safety and efficiency.

3.13 LONG TERM WATERWAY DESIGN ACTION 8 (LWD8)

TITLE

Improved navigation channel all-year round for vessels up to 500 DWT between Phnom Penh (Chaktomuk) and Chong Kneas (Siem Reap) by dredging the Tonle Sap

BACKGROUND AND RATIONALE

The Tonlé Sap (122 Km) and the Great Lake (122 Km) offer a navigable waterway between the Phnom Penh (Chaktomuk) area and Chong Kneas over a total distance of 244 Km. However, during the low water season the Chhnoc True entrance to the lake is very shallow and only small vessels and fishing boats are able to barely pass the mud-banks at the entrance of the Great Lake.

Chong Kneas is a river port along the Great Lake (Siem Reap) suitable for cargoes such as construction materials, agricultural products, fertilizers, fuel, and passengers. Several development plans have been prepared for the construction of an all-year round commercial port with a passenger terminal to accommodate the important and rapidly expanding city of Siem Reap. Unfortunately, passengers transport is on the decline for its discontinuity and its poor infrastructure at the port of departure (Phnom Penh) and the port of arrival (Chong Kneas), and problems encountered, particularly during the low water season.

A substantial study on the dredging of the Great Lake, "Technical Feasibility of Dredging the Tonlé Sap Lake for Navigation" was completed in September 2008 by the Budapest University of Technology and Economics, the Environmental Impact Assessment Center of Finland Ltd., the Finnish Environment Institute and the Helsinki University of Technology, under the MRC-Belgian Navigation Program. The overall conclusionof this study is that it is technically feasible to dredge a channel of 30 meters wide and with slopes of 1/10 to 3/10 depending on the consistency of the soil being dredged. Average depth to dredge (according to this study) is 1.30 meter and the total volume between 5,100,000 m^3 and 6,700,000 m^3.

A major problem is the disposal of the dredged materials and the environmental consequences of dumping the dredged materials sufficiently far from the dredged channel in the lake in order to avoid the return of mud into the channel.

The tourism industry (particularly from Viet Nam) is eager to financially contribute to this project but the environmental screening will determine whether the project is possible. Hotel ships could be deployed to Chong Kneas if sufficient water depth is guaranteed all-year round.

The project would be in line with the development of the Chong Kneas port.

LOCATION

The project starts at Km 0 of the Tonlé Sap in the Chaktomuk area. Chhnoc Trou is at Km 140.

There is another 104 Km distance over the Great Lake towards Chong Kneas.

Total distance of the channel = 244 Km.

OBJECTIVES

A year-round navigation channel between Phnom Penh (Chaktomuk area) and the new port of Chong Kneas, navigable for boats up to 500 tons and passenger vessels of the same size and draught.

OUTPUTS AND DELIVERABLES

- A dredged channel 104 Km long, bottom width of 30m and wall slopes of 1/10 to 3/10.
- An improved channel in the Tonlé Sap of 140 km length suitable for the same kind of 500ton design vessel that is used for defining the dredging volumes in the Great Lake.

- A number of sediment deposits at various hydrological approved locations in the lake sufficiently distant from the dredged channel in the Great Lake and alongside the Tonlé Sap between Chhnoc Trou and the Chaktomuk area in Phnom Penh.
- A comprehensive report on the navigation improvements from the dredged channel, which should also comprise recommendations for some river training works at the entrance of the Great Lake to reduce the maintenance dredging between Chhnoc Trou and the entrance to the lake.

ACTIVITIES

Following the study on the chart datum at Kompong Luong, and the technical results from the experimental dredging at the entrance of the lake (see short term action nr. 4 above), and following the recommendations of the environmental screening and eventually a hydraulic study to assess the influence of dredging a navigation channel at the entrance of the Great Lake, engineering drawings have to be prepared for:

- The channel between the Chaktomuk Area (Phnom Penh) and Chhnok Trou;
- The channel between Chhnoc Trou and the entrance to the Great Lake (approximately 15 km);
- The channel in the Great lake (deepening through dredging) until the new port of Chong Kneas.

These engineering drawings will also indicate the approved locations for dumping the dredged materials in both the Great Lake and alongside the Tonlé Sap River, following negotiations with landowners and the Ministry of Public Works and Transport's Waterway Department.

Environmental disturbances will be closely monitored in cooperation with the Ministry of Water Resources, the Ministry of Environment and the Ministry of Public Works and Transport.

The technical design will furthermore comprise recommendations for the construction of a number of river training works such as groynes and/or overflow dikes with an aim to reduce the yearly maintenance dredging, especially at the entrance of the lake.

BUDGET

For the purpose of the estimate, the navigation channel in the Great Lake is designed at 30 m wide and 1/10 under water slopes. In the Tonlé Sap River, this channel is designed at 30 m wide and 3/10 to 4/10 under water slopes.

Depending on the results of the study for determining the correct water depths during the low water seasonin the Great Lake, the corresponding volumes will be between 6,700,000m^3 (Technical Feasibility of Dredging in the Tonlé Sap Lake for Navigation, 2008) and 14,470,000 m^3 (Cambodian Navigation Master Plan, 2006).

An additional 2,820,000 m^3 would be added for the dredging of the Tonlé Sap River between Chhnoc Trou and Phnom Penh.

The estimated cost per m^3 of dredging in the lake could be as high as 3.5 US$/m^3 if distances between the disposal sites are far away from the navigation channel. For the Tonlé Sap River between Chhnok Trou and the Chaktomuk Area of Phnom Penh, 3.0 US$/m^3 should be a reasonable cost estimate.

Great Lake estimate:between 23,450,000 US$ and50,640,000 US$
Chhnok Trou – Phnom Penh:8,460,000 US$

Total estimate:between **31,910,000 US$**(minimum) **and 59,100,000 US$**(maximum)
(for the investment programme of this Master plan an average estimate of **45,505,000 US$** is used).

HUMAN RESOURCES

River engineers and quantity surveyors, environmental specialists, hydraulic engineers, construction site managers and dredging experts, skippers and helmsmen and required manpower for the various dredging sites.

PROPOSED EXECUTING/IMPLEMENTING AGENCY

Cambodian Ministry of Public Works and Transport's Waterway Department (for the eventual revision of the design of the channel, for the preparation of the tender documents and the follow-up and supervision of the physical implementation of the channel improvement).

The Cambodian Ministry of Industry, Mines and Energy and the Cambodian Ministry of Environment (for the approval of the channel design and the method of dredging and the suggested disposal sites of the dredged materials).

MRC-CNMC.

TIME AND WORK SCHEDULE

The total duration of the study, tendering and contract award, dredging and implementation is estimated at 40 months.

SOCIAL ISSUES

The social impacts of people living in the project area and in the Tonle Sap lake would be assessed under the EIA. The impacts of reduced fisheries, sediment and water quality may impact on local livelihoods.

ENVIRONMENTAL ISSUES

This action could have significant environmental impacts on the Tonle Sap Lake which is a UNESCO biosphere reserve and critical for fisheries and livelihoods. This project should not be completed until the results of the test dredging (SWD5) have been fully analyzed. The project would trigger an EIA under the Cambodian Environmental Protection Law 1996, and under the Draft EIA Law 2015 the following may be required:

- Initial Environmental Impact Assessment (IEIA);
- Full EIA report;
- The approved Environmental Protection Contract (EPC); and
- EMP and monitoring.

An environmental management and monitoring program for fisheries, sediment and water quality would be critical to determine the environmental impacts for future dredging strategies. Implementing a dredging environmental management plan (DEMP) will be critical to manage the impacts. The dredging and waterway improvement works may also trigger a PNPCA or consultation with Viet Nam on the potential downstream impacts.

Continued environmental screening should be carried out during and after the dredging, including a survey of the existing fish population and identification of eventual harmful impacts from dredging and dumping of dredged material on the fish population.

ECONOMIC ASSESSMENT

The proposed project to dredge a navigation channel for 500 DWT vessels in the Tonle Sap can only be justified by demand for barge transport of cargo between Phnom Penh and Chong Kneas, but forecasts prepared for this Master Plan indicate only demand for tour vessels between these two ports. The potential for cargo transport by barge is very limited owing to:

- The much shorter travel times of trucks as compared with barges between Phnom Penh and Siem Reap (approximately 7 hours by truck vs. at least 17 hours by barge);

- The need to transfer cargo between barges and trucks at Chong Kneas to complete the journey between Phnom Penh and Siem Reap, causing additional costs for cargo owners, when trucks can deliver cargo to where it is consumed;
- The need to invest in additional cargo storage facilities at Chong Kneas, which may add to distribution facilities in Siem Reap.

PRIORITY OF ACTION (H/M/L)

Medium (2028-2032).

FINANCING PLAN (PUBLIC/PRIVATE)

Possible investors are:

- Ministry of Public Works and Transport.
- International multinational donor community such as ADB, World Bank, etc.
- International donor agencies: JICA, KOICA, DANIDA, etc.
- The Port of Phnom Penh (PPAP), responsible for the Tonlé Sap and the Great Lake;
- The shipping lines and tourism businesses in Cambodia and Viet Nam.

PRIOR ACTIONS REQUIRED

A reliable knowledge of the real water depths in the Great Lake is essential. It has been calculated that every 10 cm of error in the real water depths of the Great Lake corresponds to 372,000 m^3 of dredging.

The water depths shown on the UHA Hydrographic Atlas from the MRC are shown towards a chart datum that seems to be uniform over the entire lake (which is not the case along the Mekong River). Indeed there is little or no water level gradient in this lake which receives the bulk of its waters from the Tonlé Sap while also draining (returning) all its water through the Tonlé Sap. The entrance to the Great Lake is the crucial point where most of the actual navigation problems are encountered. It is comparable to a reversed delta in a tidal water estuary.

Having more water level data today, compared to the available reliable data in 2006 at the time of the establishment of the Master Plan for Waterborne Transport on the Mekong River System in Cambodia, it appears that the chart datum level (based on which the water depths in the Great Lake have been measured) is too low (by 1.19 m as was estimated in 2006 during the Cambodian Navigation Master Plan). Recent data obtained between 2002 and 2014 confirms this. It is important to know the exact level of dredging the channel for vessels of 500 DWT while a minimum keel clearance will be adapted to limit the dredging volumes.

As a prior action, it is therefore important that a realistic knowledge of the real water depths during the low water season is obtained in order to define and calculate the dredging volumes for a 500 DWT navigation channel to Chong Kneas.

As a second prior action to this project, there should be a study of the 500t design vessel that will be used for defining the channel characteristics, in particular the Under Keel Clearance (UKC), taking into account the wave climate, the wind climate and the heave and pitch movements of the design vessel. This will allow the river engineers to accurately calculate the minimum volume to be dredged for obtaining the maximum result.

A third action prior to this project should be the experimental dredging described in action 5 under the short term waterway design actions.

FOLLOW-UP ACTIONS REQUIRED

During a certain period of time (at least two full seasons) hydrographic surveys should be carried out in the Great Lake to check the water depths in the dredged channel and at the dumping sites in the

lake. Hydrographic reports should follow every seasonal survey with recommendations for eventual future actions.

Continued environmental screening should be carried out during and after the dredging, including a survey of the existing fish population and identification of eventual harmful impacts from dredging and dumping of dredged material on the fish population.

3.14 LONG TERM WATERWAY DESIGN ACTION 9 (LWD9)

TITLE

Navigation channel between the Phnom Penh New Container Terminal and Ho Chi Minh City/Cai Mep ports for self-propelled barges of 2,000 DWT via the Cho Gao canal

BACKGROUND AND RATIONALE

This stretch is one of the lifelines of the Phnom Penh new Container Terminal and vital for its economic survival. In the past, many efforts have been done in preparation for the channel improvementsuch as dredging, channel marking, night and day buoys to indicate the channel, and frequent hydrographic surveys.

A number of dredging proposals have been discussed and apparently approved although it is not clear whether these dredging proposals are for channel improvement or for sand mining -- an activity, which after recent waterway regulations from the Ministry of Public Works and Transport and the Ministry of Mining, has become very lucrative, not only for the ministry granting the concessions but also for the dredging authority being granted those monopolies for dredging (read sand mining) in a specific area.

It is therefore not clear whether the dredging proposals which have been prepared by the Autonomous Port of Phnom Penh can be categorized under “channel improvement”.

The Master Plan for the Waterborne Transport on the Mekong River System in Cambodia (2006) has calculated dredging volumes for various depths between 3.50m and 8.00m and for various channel widths from 60m, 80m to 100m.

However, the actual project links the Phnom Penh New Container Terminal to the Ho Chi Minh City/Cai Mep ports via de short-cut Cho Gao canal between My Tho and Saigon/Cai Mep. This canal, consistingof three sections, has a total length of 28.6 km. The sections are Rach La Section (10.2 km), Cho Gao section (11.6 km) and Rach Ky Hon section (6.8 km). Traffic on this canal during peak days can reach 1,800 vessels per day. The canal is actually being upgraded as a class II waterway in the Vietnamese waterway classification (barges and vessels up to 2,500 DWT) with water depth of >3.50m, channel width of > 50 m, and air clearance of 9.50m. This canal is not suitable for sea going vessels.

The characteristics of all Mekong mainstream navigation stretches upstream of the Cho Gao canalwell exceed the class II criteria and do not represent any technical physical obstruction for this kind of vessels of class II. The project only focuses on vessels and [container] barges (self-propelled or pushed) on this route between the new Container Port of Phnom Penh and the ports of Ho Chi Minh City/Cai Mep.

Once the channel improvement works will be completed at all three sections of the Cho Gao canal, the channel width will be 55 meters, water depth 3.10m and bend radius of minimum 300m. Air clearance under the new Cho Gao bridge will be 9.50m.

The works will be completed well before the long term deadline of this Master Plan (2040).

LOCATION

The Phnom Penh New Container Terminal is at Km 325 of the UHA maps or Km 30 of the NR1 between Phnom Penh and Neak Lueng.

The entrance to the Cho Gao canal downstream the city of My Tho on the Mekong mainstream is at km 66 on the left bank.

The end of the Cho Gao canal at the Ho Chi Minh/Cai Mep ports is at Soai Rap, Nha Be city, Song Long and finally Thi Vai. It is a conglomeration of several seaports, berths and terminals.

OBJECTIVES

The objective is to create a comfortable waterway suitable for river barges (self-propelled or pushed) of max. 2,500 DWT between the Phnom Penh New Container Terminal and the ports of Ho Chi Minh City/Cai Mep. This waterway corresponds to class II of the Vietnamese Waterway Classification, perhaps with exception of the water depth, which will be only 3.10m instead of 3.50m.

OUTPUTS AND DELIVERABLES

A fully implemented waterway for barges (self-propelled or pushed, river or seagoing) between the Phnom Penh New Container Terminal and the ports of Ho Chi Minh City/Cai Mep corresponding to class II of the Vietnamese waterway classification (with the exception of a water depth of 3.10m in the Cho Gao canal instead of 3.50m).

ACTIVITIES

- Dredging and widening the Cho Gao canal (in two phases: first one side of the channel [already completed] and then the other side [actually under implementation at the time of writing this report]);
- Reconstruction of the Cho Gao bridge (at higher air clearance);
- Construction of new bank protections in the widened canal (also in two phases).

BUDGET

Substantial parts of the budget have been secured through the World Bank (2 x 3,297,000 US$) while the remaining phases will be financed with ODA resources.There is no additional funding needed.

HUMAN RESOURCES

River engineers and quantity surveyors, environmental specialists, hydraulic engineers, construction site managers and dredging experts, skippers and helmsmen and required manpower for the various dredging sites.

PROPOSED EXECUTING/IMPLEMENTING AGENCY

VIWA (Vietnam Inland Waterway Administration).

TIME AND WORK SCHEDULE

The works are scheduled to be completed in the coming years.

SOCIAL ISSUES

The social impacts (positive and negative) will be assessed under the EIA/EPC required for the project.

ENVIRONMENTAL ISSUES

This project may have significant environmental impacts. Sand mining or dredging a channel that extracts more than 50,000m^3 of material or dredging canals, rivers and lakes with a dredging area of more than 10,000m^{2}triggers an EIA under the Viet Nam Environmental Protection Law 2014. Smaller projects require an Environmental Protection Commitment (EPC). The legal framework requires:

- **EIA:** to assess environmental and social impacts of projects;
- **EPC:** minor environmental impacts based on type and activity; and
- **EMP** and monitoring.

The EIA would need to consider the impacts of dredging on water quality, sediment, fisheries and riverbank and coastal erosion.

ECONOMIC ASSESSMENT

Improvement of the navigation channel will allow the gradual replacement of current 1500 DWT (100 TEU) barges with 3,000 DWT (200 TEU) barges. The economic benefits associated with this project are:

- A saving in barge operating costs of US$ 44.84 (20%) per TEU;
- A saving in greenhouse gas emissions of 0-058 tons (20%) per TEU.

Detailed calculations of these benefits are given in the table below

Long term waterway design action 9: Improvement of navigation channel to allow operation of 3,000 DWT barges from Phnom Penh to Cai Mep via the Cho Gao Canal

Option	Item	Route	Annual operating cost per TEU (US$)	Fuel cons. litres/ TEU	GHG emissions per TEU (tonnes)*
1	Existing river barges (100 TEU)	Mekong - CG canal (371 km)	221.89	106	0.2882
2	Future river barges 3,000 DWT (200 TEU)	Mekong -CG canal (371 km)	177.05	85	0.2302
	Economic savings: - Option 2 vs. Option 1 % saving		44.84 20.2%	21 20.1%	0.0580 20.1%

** Emission rate = 2.72 kg per litre of diesel fuel consumed*

PRIORITY OF ACTION (H/M/L)

High due to the ongoing congestion in the Cho Gaocanal and the multiple accidents and collisions. Barges of 2,000DWT or higher have to reduce their speed according to Vietnamese regulations.

FINANCING PLAN (PUBLIC/PRIVATE)

There is no additional financing needed.

World Bank and IDA are the financing authorities.

PRIOR ACTIONS REQUIRED

As the project is nearing its completion this issue is not relevant.

FOLLOW-UP ACTIONS REQUIRED

Keep statistics of the number of vessels, volume and commodity of transported cargoes, passengers, and accidents in the canal.

3.15 LONG TERM WATERWAY DESIGN ACTION 10 (LWD10)

TITLE

Navigation Channel for sea going vessels 7,000 DWT between the Phnom Penh New Container Terminal and Can Tho, and 10,000 DWT fully laden between Can Tho and the Quan Chanh Bo canal

BACKGROUND AND RATIONALE

This stretch is the main current and future lifeline of the Phnom Penh New Container Terminal and vital for its economic survival. Once seagoing vessels of that size (7,000 DWT) are able to reach the port of Phnom Penh, there will no longer be a need to transload from barges to seagoing vessels in the ports of Ho Chi Minh City/Cai Mep.However these vessels will still have direct links with ports such as Singapore, Hong Kong, Klang, Pelapas, Da Nang, Haiphong, Shanghai, Laem Chabang and many more “mother-ship ports”.

Many efforts have been done in the past to improve the waterway access to the sea via the Bassac and to make it accessible for that size of vessels.There has been dredging, channel marking, night and day buoys to indicate the channel, and frequent hydrographic surveys to monitor the navigation channel, among others.

The Phnom Penh Autonomous Port has even suggested a number of dredging proposals, some of which have already been approved. Again it is not clear whether these dredging proposals are for channel improvement or whether they are for sand mining -- an activity which, after recent waterway regulations from the Ministry of Public Works and Transport, has become very lucrative, not only for the ministry itself selling sand-mine concessions but also for the dredging authority being granted those monopoly-concessions for dredging (read *sand* dredging) in the authorized areas and commercializing the sand.

It is therefore not clear whether the dredging proposals that have been prepared by the Phnom Penh Autonomous Port can be categorized under “channel improvement”.

The Master Plan for Waterborne Transport on the Mekong System in Cambodia (2006) established another navigation channel and calculated various dredging volumes for a number of water depths between 3.50m and 8.00m and for a number of channel widths from 60m, 80m to 100m, serving solely navigation improvement.

The actual project links the Phnom Penh New Container Terminal to the deep waters of the sea, offering direct links with mother-vessel seaports, such as Singapore, Hong Kong, Pelapas and Nanjing. The channel makes benefit of a new feature, which at the time of the Cambodian Navigation Master plan only existed as blueprint,the Quan Chanh Bo canal. This canal, which evades the sedimentation dome at the entry of the estuary, directs the sea going vessels via a 28 km canal straight to deep waters some 18 km east of the Dinh An Estuary and way outside of the influence zone of the sedimentation area. At the time of writing this report, the project was nearing its completion and inauguration is expected shortly. Total investment is estimated at 9,781 billion VN Dong (467,000,000 US$). It comprises a part of the Hau River (12.1 km), the Quan Chanh Bo canal itself (19.2 km), the Tat channel (8.2 Km) and some 7 Km sea channel section. Fully laden ships of 10,000DWT and ships of 20,000DWT with reduced load will accommodate some 21-22*10^6 tons/year and 450,000-500,000 TEU/year starting from 2020. These vessels will be able to reach Can Tho port.

In order to bring fully laden 7,000 DWT vessels to the New Container Port of Phnom Penh, a few more shallow places along the Bassac, Vam Nao pass and Mekong mainstream will have to be dredged to depths of -8.00 m. These volumes have been accurately calculated during the Navigation Master Plan for Cambodia and the total for a navigation channel of 80 meters wide is as follows:

Phnom Penh NCT to Cambodian border:	3,227,000 m^3
Cambodian Border to Vam Nao Pass until QCB-canal entrance (but at a depth of 9.00m between Can Tho and the entrance to the QCB canal):	1,816,000 m^3
Total:	**5,043,000 m^3**

LOCATION

The New Container Terminal of the Port of Phnom Penh is at Km 325 along the Mekong River or at Km 30 of the NR1 between Phnom Penh and Neak Lueng.

The Mekong mainstream at the border with Vietnam is at Km 251.

Can Tho is at Km 106 of the Bassac (city centre, at the Can Tho River mouth).

The entrance of the Quan Chanh Bo canal in the Bassac River (Hau) is at Km 33 of the Bassac.

The Quan Chanh Bo canal runs through the Province of Tra Vinh and enters the Sea at:

Lat. = 09º 34'09.01"N and Long. = 106º 31'07.08"E.

OBJECTIVES

The overall objective is to create an all-year round suitable navigation channel for seagoing vessels of fully laden 10,000 DWT between the sea and the port of Can Tho and fully laden 7,000 DWT vessels between the sea and the Phnom Penh New Container Terminal.

The immediate objective is (i) to develop the Mekong mainstream, Vam Nao pass, and the Bassac as the indicated shipping route for seagoing vessels of 7,000 DWT up to Can Tho, (ii) and to further develop the Hau River and the Quan Chanh Bo canal as the indicated shipping routes for seagoing vessels of 10,000DWT (fully laden) between Can Tho and the sea. Moreover, this channel will equally accommodate vessels of 20,000 DWT with reduced loads, as long asthey have no greater draught than the earlier mentioned 10,000 DWT vessels (Sea-Can Tho) or 7,000 DWT (Can Tho-NCT Phnom Penh Port).

OUTPUTS AND DELIVERABLES

A well beaconed, deep and comfortable shipping route for vessels of 10,000 DWT fully laden and 20,000 DWT with reduced load, between the sea and Can Tho via the Quan Chanh Bo canal and the Hau River, and for vessels of 7,000 DWT fully laden between the New Container Terminal of the Phnom Penh Port and the Port of Can Tho via de Mekong mainstream, the Vam Nao pass and the Bassac and the sea via the Quan Chanh Bo canal.

ACTIVITIES

The project contains the following activities:

- Hydrographic survey of the entire channel between the Phnom Penh NCT and the sea.
- Identify and quantify the dredging volumes and define appropriate dumping places, after environmental screening by the respective Ministries of Public Works and Transport.
- Either prepare the call for tenders (tender documents) or assign a national dredging company the dredging works after approval of all authorizations and granting the necessary concessions.
- Dredge the channel and dump the dredged materials at the indicated locations.
- Reinstall or relocate the aids to navigation buoys and the beacons according to the designed navigation channel.

BUDGET

For a total volume of 5,043,000 m^3 dredging and including study work, obtaining the necessary concessions and authorizations, etc.:

For **Cambodia:**3,227,000 m^3 x 3.3 US$/$m^3$	10,649,100 US$
For **Viet Nam:** 1,816,000 m^3 x 3.3 US$/$m^3$	5,992,800 US$
Total:5,043,000 m^3 x 3.3 US$/$m^3$	**16,641,900 US$**

HUMAN RESOURCES

River engineers and quantity surveyors, environmental specialists, hydraulic engineers, construction site managers and dredging experts, skippers and helmsmen and required manpower for the various dredging sites.

PROPOSED EXECUTING/IMPLEMENTING AGENCY

The Ministry of Public Works and Transport Waterway Department in Cambodia.

VIWA, Vinamarine and Vietnam National Mekong Committee in Viet Nam.

TIME AND WORK SCHEDULE

The works can be finished in 24 months, after all authorizations and concessions have been obtained and financing is secured.

SOCIAL ISSUES

The social impacts (positive and negative) will be assessed under the EIA/EPC required for the project.

ENVIRONMENTAL ISSUES

This project may have significant environmental impacts. Sand mining or dredging a channel that extracts more than 50,000m^3 of material, or dredging canals, rivers and lakes with a dredging area of more than 10,000m^2triggers an EIA under the Viet Nam Environmental Protection Law 2014. Smaller projects require an Environmental Protection Commitment (EPC). The legal framework requires:

- **EIA:** to assess environmental and social impacts of projects;
- **EPC:** minor environmental impacts based on type and activity; and
- **EMP** and monitoring.

The EIA would need to consider the impacts of dredging on water quality, sediment, fisheries and riverbank and coastal erosion.

ECONOMIC ASSESSMENT

This project will permit operation of:

- Reinforced sea/river barges with capacity of 10,000 DWT (650 TEU) between the Phnom Penh New Container Port and Cai Mep, via the Bassac River and the Quan Chanh Bo canal;
- Seagoing vessels with capacity of 10,000 DWT (650 TEU) between the Phnom Penh New Container Port and Singapore, Hong Kong or Kaoshiung, via the Bassac River and the Quan Chanh Bo canal.

New services based on the operation of high capacity container carrying vessels would gradually replace existing services via the Mekong River and the Cho Gaocanal utilizing barges with a typical capacity of only 100 TEU. The economic benefits arising from these new services would translate into savings in vessel operating costs and in emissions of greenhouse gases. These benefits were calculated by comparing the operating costs and greenhouse gas emissions of:

1) reinforced sea/river barges with those of existing low capacity river barges;

2) seagoing vessels (operating directly between Phnom Penh and Singapore) with those of existing low capacity river barges; and

3) seagoing vessels, operating directly between Phnom Penh and Singapore, with those of combined feeder shipping plus road services between Phnom Penh and Singapore, via Sihanoukville Port.

Of these new services, those involving the operation of reinforced seariver barges can be expected to deliver the highest economic benefits, with a 70% saving in vessel operating costs per TEU and a 97% saving in greenhouse gas emissions per TEU. Detailed benefit calculations are provided in the table below.

Long term waterway design action 10: Improvement of navigation channel PNH new container port - Quan Chanh Bo Canal for operation of vessels of up to 10,000 DWT

Option	Item	Route	Operating cost per TEU (US$)	Fuel cons. litres/ TEU	GHG emissions perTEU (tonnes)*
1	Existing river barges (100 DWT)	PNH-CAI via Mekong and CG canal (371 km)	221.89	105.96	0.2882
2	Sea-river barges (10,000 DWT=650 TEU)	PNH-CAI via Bassac and Qang Chanh Bo Canal (520 km)	68.13	27.15	0.0738
3	Sea-going vessel (10,000 DWT = 650 TEU)	PNH-SIN via Bassac and Qang Chanh Bo Canal (1,443 km)	129.12	13.12	0.0357
4	Sea-going vessel (12,000 DWT = 800 TEU)+ feeder truck PNH-SHV	PNH-SHV-SIN (sea voyage = 1,028 km; road haul = 226 km; total = 1,254 km)	286.72	76.41	0.2078
	Economic savings: - Option 2 vs. Option 1		153.76	78.81	0.2144
	- Option 2 vs. Option 1 (% saving)		69.3%	74.4%	74.4%
	Economic savings: - Option 3 vs. Option 1		92.77	-14.03	-0.0382
	- Option 3 vs. Option 1 (% saving)		41.8%	-106.9%	-106.9%
	Economic savings: - Option 3 vs. Option 4 (US$)		157.59	63.28	0.1721
	- Option 3 vs. Option 4 (% saving)		55.0%	82.8%	82.8%

** Emission rate = 2.72 kg per litre of diesel fuel consumed.*

PRIORITY OF ACTION (H/M/L)

High (2021-2022).

Increased road transport between Phnom Penh and Ho Chi Minh City/Cai Mep is a threat for the Phnom Penh New Container Terminal, particularly since the opening of the new Mekong bridge at Neak Lueng which makes transportation faster and more reliable. However, direct shipping to other ports by sea going vessels of 7,000 DWT (Phnom Penh NCT) and 10,000 DWT and higher (partly laden from Can Tho) will not suffer from road competition.

FINANCING PLAN (PUBLIC/PRIVATE)

The financing of the Quan Chanh Bo canal is completed (by own Vietnamese funds). The maintenance dredging in Viet Nam as well as in Cambodia is to be financed from Viet Nam's own national budget from the Ministry of Public Works and Transport, VIWA and VINAMARINE.

PRIOR ACTIONS REQUIRED

Hydrographic surveys of the shallow areas in both countries have to be carried out at regular intervals. They will be the basis of determining the final dredging volumes (and budget involved). Environmental screening of the dredging operation is a prerequisite, particularly the dumping sites of the dredged materials or the [temporary] storage areas.

FOLLOW-UP ACTIONS REQUIRED

At regular intervals, hydrographic surveys have to be conducted in the channel to detect and observe eventual rapid siltation of the navigation channel.

3.16 LONG TERM WATERWAY DESIGN ACTION 11 (LWD11)

TITLE

Morphology study producing feasible proposals for river training works in the areas between Phnom Penh and the sea, in order to reduce yearly maintenance dredging to keep the required water depths for sea going vessels

BACKGROUND AND RATIONALE

The maintenance of the various Mekong navigation channels (Mekong mainstream, Vam Nao Pass, Bassac or Hau River) is a yearly burden. It is not possible to keep transport cost low without jeopardizing the safety of navigation.

Yearly dredging seems necessary in order to maintain the required water depths although the volumes to be dredged since the move of the Phnom Penh New Container terminal downstream the Chaktomuk area and downstream the Km 345-Km 325 shallow. A substantial maintenance dredging reduction follows the completion of the Quan Chanh Bo canal that will be operational shortly. Some 75 to 80% of the 2008 calculated dredging volumes have become obsolete and no longer needed.

Nevertheless there are still some “hot spots” along the channel that need special attention and that could be reducedin dredging volumes if appropriate river training works were successful in restoring the scouring effect of the available water flow, sustaining the water depths needed for safe navigation.

River training works are sheer morphology studies. The riverbed and its morphology have to be well known and the changing flow patterns well understood. River training works by groynes and overflow dikes are expensive undertakings and are permanent structures. There is no room for mistakes or tentative attempts. The result should be known with certainty before construction starts.

The actual project aims at studying these river training works in the best possible way and with thehighest probability of success. Some of these studies will be conducted by a computer simulator program, others will need a scale model study as there is no room for experiments.

LOCATION

- The entire Mekong mainstream river and navigable delta between the Phnom Penh NCT and the sea.
- The Vam Nao pass.
- The Bassac river between the Vam Nao junction and the entrance to the Quan Chanh Bo canal.

OBJECTIVES

The overall objective is to create a sustainable navigation channel for the fully laden 7,000 DWT vessels that will reach the Phnom Penh New Container Terminal either from the Bassac and Vam Nao pass or, for lesser DWT’s, from the Mekong mainstream and the Cua Tieu estuary.

The specific objective is to conduct morphology studies on specific areas in the Mekong mainstream, the Bassac and the Vam Nao pass, with an aim to reduce yearly dredging costs by designing efficient river training works.

OUTPUTS AND DELIVERABLES

- A very detailed hydrographic survey of the study area.
- ADCP survey report of the currents in both seasons (dry and wet).
- Former surveys and dredging history (with hydrographic maps).
- Baseline report and analysis of the past morphology changes.
- Design of river training works and testing the anticipated results by either mathematical model (2D or 3D) or physical scale model.

- Prepare a final report with recommendations for river training works and for follow up actions.

ACTIVITIES

1) Prepare detailed hydrographic survey maps:
   a) Identify the problematic stretches where substantial maintenance dredging is needed to maintain the water depth.
   b) Define the area to be surveyed.
   c) Draw up the hydrographic survey plan (inter-distance, precision, etc.).
   d) Conduct the survey (use the most modern equipment available).
   e) Draw the hydrographic survey maps with contour lines and lines of equal depth.
2) ADCP survey:
   a) In preparation of the morphology study, define the areas and the cross sections in which ADCP measurements have to be carried out, during dry season and during flood season.
   b) Assign the survey campaign by open call for tenders or carry out the ADCP survey by own means and by own surveyors.
   c) Provide interpretation of the ADCP work in preparation of the morphology study.
3) History of dredging at the survey site:
   a) Collect quantified data on previous dredging work at the specific site.
4) Analysis of morphology changes:
   a) Compare the new surveys with the history of surveys and quantify the differences.
   b) Interpretation-report of the morphology changes.
5) Design a river training construction that will aim to reduce the maintenance dredging at a specific area:
   a) Prepare Engineering drawings of the river training construction.
   b) Prepare the BOQ and the cost estimate.
   c) Test the proposal either in a mathematical 2D or 3D model, or a physical scale model.
   d) Evaluate the result and eventually prepare alternative design[s] to improve the results.
6) Prepare final report with all the findings and evaluate the project proposal: cost versus savings.

BUDGET

Each potential site, worth this investment, will require a budget as follows:

Survey team: 6 men x 1month x 10,000 US$	60,000 US$
Logistics:	15,000 US$
ADCP work:	25,000 US$
Consultancy service of international expert: 1 manmonth	18,000 US$
Reporting and various:	2,000 US$
Total per site:	120,000 US$
Total for the estimated 4 sites: 4 x 120,000 US$	**480,000 US$**

HUMAN RESOURCES

- Hydrographic surveyors.
- ADCP experts.
- International consultants in morphology.

PROPOSED EXECUTING/IMPLEMENTING AGENCY

In Cambodia:

- The Ministry of Public Works and Transport – Waterway Department
- PPAP
- In Vietnam:
- Ministry of Water Resources
- VIWA
- VINAMARINE
- Port of Can Tho

TIME AND WORK SCHEDULE

Several hot spots can be studies simultaneously as each study should be extended over a whole season.

Activities start with continuity in observation of the navigation channel and information from pilots (eventual complaints).

A yearly report of the status of the known hot spots has to be established and the waterway manager or managing office has to decide whether such a study should be conducted or not.

The identified spots will then be surveyed (hydrographic and ADCP) over a full season (dry season and flood season) and the survey submitted for further morphology study.

The whole process should take not more than one year.

SOCIAL ISSUES

This project is not expected to have any adverse social impacts.

ENVIRONMENTAL ISSUES

This project is not expected to have any adverse environmental impacts. Reducing yearly maintenance dredging may have positive environmental benefits and should be included in the analysis of the river training works.

ECONOMIC ASSESSMENT

Qualitative assessments of navigation channel improvements between Phnom Penh and the sea show that these projects are likely to be justified in economic terms, meaning that they are likely to achieve economic internal rates of return of 12% or more. If the morphology study results in lower annual maintenance dredging to maintain desired depths for seagoing vessels, it is likely that this will simply reinforce the positive results of the proposed channel improvement projects.

PRIORITY OF ACTION (H/M/L)

Medium (2028).

FINANCING PLAN (PUBLIC/PRIVATE)

Basically, the expenses should be borne by the national waterway administrations (public expense) in both of the countries, Cambodia and Viet Nam.

International donors can eventually co-sponsor the activity as a matter of training in morphology studies and design of river training works.

PRIOR ACTIONS REQUIRED

None, except for the continuity of the hydrographic observation of the known hot spots and from the cooperation of the river pilots.

FOLLOW-UP ACTIONS REQUIRED

After the implementation of the river training works, the river morphology has to be studied and closely observed. Scouring will occur in the locations that have been designed for this. Water depth measurements and current velocity measurements have to be carried out at regular intervals.

A substantial report with findings and cost-benefit evaluation of the river training worksneeds to be carried out.

4 NAVIGATION SAFETY ACTIONS

4.1 SHORT TERM NAVIGATION SAFETY ACTION 1 (SNS1)

TITLE

Introduce a vessel inspection system for the waterway authority

BACKGROUND AND RATIONALE

In December 2010, the Mekong River Commission (MRC) Navigation Programme (NAP) commenced the *'Phase 1: Risk Analysis of the Carriage, Handling and Storage of Dangerous Goods'*. The project forms part of the MRC Navigation Strategy and Programme Component 3: Traffic Safety and Environmental Sustainability, of which the development objectives are to improve safety and enhance environmental protection and pollution control. From this risk analysis it is clear that the majority of inland waterway vessels do not meet the minimum requirements needed for safe transport and operations on the Mekong River. Furthermore, awareness and understanding of Dangerous Goods for port management, workers and all waterway users needs to be enhanced. The recommendations called for inland waterway vessels to implement minimum requirements for safety, handling of DG, environmental protection, emergency and oil spill response and to develop training for crewmembers.

The inland waterway vessel should be fit for purpose, conform to all legislative requirements, and should be operated in a safe manner to ensure protection of the environment and safety of both the crew and the general public. The safety requirements are important for all vessels sailing on the Mekong River, but especially for tanker vessels which pose one of the biggest threats to humans and the environment when an accident occurs or when operations go wrong. In oil, petrochemical and chemical industries, tank vessels are used for the transport of products along the Mekong River. In general, these vessels are not owned by the companies but by independent owners/operators which range in size from a few who own large fleets, to individuals who own (and frequently master) a single vessel.

In order to carry out inspections of inland waterway vessels, a checklist needs to be made to provide a consistent basis for vessel inspections. The checklist will depend on the national standards and international guidelines. If the national standards do not existor are not adequate, new standards need to be made. The next step is to harmonize the standards, especially between Lao PDR and Thailand, and between Cambodia and Viet Nam.

At the 10th Navigation Advisory Body (NAB) Meeting on 16 January 2012, Thailand requested MRC assistance to implement the '*Sustainable Management of Dangerous Goods at Chiang Saen Commercial Port (Pilot Project*)'. The other Member Countries accepted the proposal and the DG management plan developed for Chiang Saen Commercial Port can be applied to other inland ports in the Mekong Basin. Chiang Saen is an official port in Thailand under the Lancang-Mekong Agreement on Commercial Navigation, and will be among the largest ports ever built along the Mekong River System. The Port Authority of Thailand (PAT) and the Marine Department (MD) raised concerns regarding the arrival of foreign flagged vessels that do not meet appropriate standards. As a result, a vessel component was included in the project and minimum safety requirements and an inspection process have been developed for vessels calling at Chiang Saen Commercial Port. The pilot project at Chiang Saen Commercial Port included a component, namely establishing a Vessel Inspection Scheme (VIS).

The Chiang Saen Commercial Port Project was considered a successful pilot project. The original set-up and context of the Chiang Saen Commercial Port Project was that the results could be used as pilot projects for the other countries, and the manuals, when adjusted to the local conditions, applied to other inland waterway vessels, Mekong ports and terminals. In this way, initial steps on

harmonising standards for the sustainable transportation of dangerous goods in the Lower Mekong Basin are being taken.

Therefore a Vessel Inspection Checklist and Guidelines were prepared for Cambodia and Viet Nam outlining the relevant and minimum requirements for inland waterway vessels and their crew carrying dangerous cargo.

This Action "SNS2 Introduce a vessel inspection system" will deal with all kinds of vessels including cargo and passenger boats.

Therefore, for the authorities and the owners to have a correct idea of the vessel, inspections involving both a physical inspection and an audit of the vessel and its written procedures need to be carried out. These inspections may be conducted by authorities, company personnel, authorised inspectors or other stakeholders. The inspection report should be considered as part of a "Safety and Quality Assessment of Inland Waterway Vessel Operations and Management". There should also be a questionnaire designed to assist inspectors to determine whether a vessel complies with the relevant international, national and/orlocal regulations regarding responsible operation of the vessel, safe operational practices and environmental protection.

The content of the checklist is based on national and international legislation, guidelines and best practice. The Vessel Inspection Guidebook (VIG) needs to provide an explanation on the items mentioned in the Vessel Inspection Checklist (VIC) and guidance and justification for the implementation. In the Guidebook, checklist items are referenced to the relevant regulation and industry recommendations, where appropriate.The Vessel Inspection System consists of:

1) **Vessel Inspection Checklist – VIC:** The VIC is a checklist used to inspect vessels and their crew that are intended for the transport of cargo and passengers.
2) **Vessel Inspection Guidebook – VIG:** The VIG is a comprehensive guidebook that provides a practical and technical explanation for each point under the Vessel Inspection Checklist. The guidebook ensures that the user of the checklist gains sufficient knowledge and technical background to complete the checklist in an appropriate and comprehensive manner. The contents of the guidebook are based on national and international best practices and guidelines and, where applicable, they are based on the national regulations.
3) **Vessel Inspection Procedures – VIP:** This details how the inspections will take place and how the authorities will ensure that the vessel's conditions will fit the requirements.

The next step is for the authorities to enforce the law and make the necessary rectifications so that in the end all ships are fit for their purpose.

LOCATION

All four Mekong Countries.

OBJECTIVES

The **development objective** isto ensure efficient, safe and secure carriage, handling and storage of passengers and goods on the Mekong River in a sustainable manner.

With regards to fleet, the **specific objectives**for Cambodia, Lao PDR, Thailand and Viet Nam are to:

- Increase safety on board vessels;
- Minimize the environmental impact of navigation on the Mekong River by improved waste management;
- Secure safe and clean navigation on the Mekong River; and
- Increase human capacity of inland waterway and environmental authorities and the private sector.

The **immediate objectives** are:

- To provide a detailed overview of the current condition of the vessels and compare this with the existing regulations and to evaluate the level of education, experience and competence of the crew.
- To ensure the standards, rules and regulations regarding vessel construction and vessel safety equipment, among others, exist, are improved and are appropriate. Reference should be made to international benchmarks. Harmonisation of these standards, rules and regulations between Lao PDR and Thailand, and between Cambodia and Viet Nam needs to be taken into account.
- To assist the responsible persons, authorities and stakeholders to check if a vessel complies with best practice until national rules, regulations and standards are established, concerning the operation of the vessel, environmental protection and emergency response (VIC)
- To give a practical and technical explanation for each point under the checklist so as to conduct onboard inspections in an appropriate and comprehensive manner (VIG).
- To detect the deficiencies onboard to be rectified (VIP).
- To use as a basis for training of the vessel's crew to improve safety management on board.
- To be employed as a practical tool for authorities and stakeholders to check.

OUTPUTS AND DELIVERABLES

Output 1: A detailed overview of the current condition of the vessels, and a comparison with existing regulations.

Output 2: The standards, rules and regulations regarding vessel construction, vessel safety equipment, International Safety Management (ISM) etc., are improved and appropriate to the local conditions.

Output 3: The Vessel Inspection Checklist (VIC) is prepared for all kinds of vessels.

Output 4: The Vessel Inspection Guidebook (VIG) is prepared withpractical and technical explanations for each point under the VIC.

Output 5: The Vessel Inspection Procedures (VIP) detect the deficiencies on board, and how to rectify these.

Output 6: Training is provided for the vessel's crew to improve safety management on board, and the authorities to make the Vessel Inspection System operational and effective

Output 7: The authorities have actually started the vessel inspections and law enforcement.

ACTIVITIES

Under Output 1 (detailed overview of the vessels, compared with the existing regulations)

Activity 1.1 Investigate in detail the needs and requirements for safety management of all kinds of vessels on the Mekong River taking into consideration the kind of cargo and quantities being shipped today and planned for the future and compare the needs with the provisions of the ISM Code but at the level of IWT. Also compare with the standards, rules and regulations regarding ship safety construction and ship safety equipment.

Activity 1.2 Prepare an overview and conduct national consultations on how to adapt the existing regulations and standards.

Under Output 2 (the standards, rules and regulations are improved and appropriate)

Activity 2.1 In line with other actions under the Master Plan, adapt and endorse the required standards, rules and regulations that are required as a platform for the preparation of the Vessel Inspection Checklists.

Activity 2.2 Prepare a full database of the improved standards, rules and regulations.

Under Output 3 (The Vessel Inspection Checklist (VIC) is prepared for all kinds of vessels)

Activity 3.1 Prepare first draft of the VICs, and discuss with the relevant line agencies. The Vessel Inspection Checklist should include:

- Summary: applicable for all vessels. Includes general information (vessel identification, owner, operator, charterer, etc.) and technical information (vessel's particulars and built for what cargo).
- Vessel Inspection Checklist: Part A – Part B – Part C

- Part A – Part of the Checklist applicable for all vessels including general cargo, container and tanker vessels. Includes the following twelvechapters:
  1) Vessel certificates and documents
  2) Crew certificates
  3) Lifesaving equipment
  4) Fire fighting equipment
  5) General safety
  6) Condition of hull and superstructure
  7) Engine room and machinery
  8) Mooring/anchoring
  9) Wheelhouse and navigation
  10) Radio equipment
  11) Emergency preparedness
  12) Environmental protection and pollution prevention
- **Part B** – Part of the Checklist with additional required inspections for vessels carrying packaged dangerous goods. Therefore it can be applicable for container and general cargo vessels. Includes the following chapter:
  1) Requirements for vessels carrying packaged dangerous goods
- **Part C** – Part of the Checklist with additional required inspections for vessels carrying dangerous goods in liquid bulk, applicable for tanker vessels. Includes the following three chapters:
  1) Tanker vessel cargo transfer operation
  2) Tanker vessel cargo measurement
  3) Tanker vessel safety procedures and equipment requirements

Activity 3.2 Adjust according to comments, inputs and recommendations, and finalise the VICs.

Activity 3.3 Publish the VICs and present to the stakeholders in workshops.

Under Output 4 (The Vessel Inspection Guidebook (VIG) is prepared to support/guide the Checklist)

Activity 4.1 Prepare first draft of the VIGs, and discuss with the relevant line agencies.

Activity 4.2 Adjust according to comments, inputs and recommendations, and finalise the VIGs.

Activity 4.3 Publish the VIGs and present to the stakeholders in workshops.

Under Output 5 (The Vessel Inspection Procedures (VIP) are worked out)

Activity 5.1 Prepare first draft of the system, and discuss with the relevant line agencies.

Proposal for procedures on how to use the VIS:

1) By the vessel's crew:
   - Every six months the Master is requested to complete the full VIC, using the Vessel Inspection Guidebook.
   - Rectify deficiencies and take appropriate measures.
2) By the vessel's operator:
   - Every year the vessel owner or charterer conducts a full onboard investigation using the VIC.
   - Rectify deficiencies of the vessel in question, and use the list of deficiencies to apply to other vessels of the fleet.
   - Adjust the Vessel Safety Management System to reflect deficiencies noted, if necessary.
3) By the Marine Authorities:
   - As an instrument of control and law enforcement by the Inland Waterway Transport Department or Inland Waterway Administration (VIWA), or future Port State Control.
   - To use the VIS results to develop or update the national safety rules, regulations and standards.

Note: The inspection checklist is made to assist the responsible person(s) or representative to determine the present condition of the vessel and determine whether a vessel complies with the relevant international, national and local regulations and guidelines concerning the operation of the vessel, safe operational practices, environmental protection and emergency response.

The electronic checklist is a working toolthat can be adjusted and limited to those items of the vessel that a particular authority, agency or other stakeholder wants to check or verify. The columns added give the user the possibility of marking the items that have to be checked under his or her responsibility, and limit the list by making a tailor-made inspection list for each user.

The representative should wear the appropriate Personal Protective Equipment (PPE), including safety helmet, safety shoes, life jacket and eventually safety gloves and glasses while on board the vessel and in port areas.

The demonstration of a particular piece of equipment, such as the firefighting pump, the emergency alarm, the fire hoses and bilge alarm, should be encouraged so as to get a good idea of the functionality of the equipment on board and the knowledge of the crew by demonstrating how equipment works. Refusal to demonstrate the functionality of equipment should be mentioned in the report, together with the reason.

Activity 5.2 Adjust according to comments, inputs and recommendations, and finalise the VIPs.

Activity 5.3 Present the procedures to stakeholders in workshops.

Under Output 6 (Training is provided for the vessel's crew and authorities)

Activity 6.1 Prepare the training programme and packages (including training of trainers) and select the target groups. Evaluate the possibility to include it into existing national training requirements.

Activity 6.2 Conduct training by selected training consultants.

Activity 6.3 Trained trainers conduct further capacity building of new trainees in the country to have a larger outreach including vessel operators, vessel's crew, and marine authorities.

Under Output 7 (the vessel inspections and law enforcements have started)

Activity 7.1 The trained inspection experts start work according to the Vessel Inspection Procedures.

Activity 7.2 Deficiencies are recorded and monitored.

Activity 7.3 Penalties are being applied for non-conformity.

BUDGET

Estimated budget for the part in the Lao PDR and Thailand (common budget):

Output 1: US$ 20,000 including consultancies, data collection and survey.

Output 2: Will be done through the other actions, therefore excludes formulation of the standards, rules and regulations. However, US$ 20,000 may be needed for adjustments.

Output 3: US$ 80,000 including consultations and consultancy.

Output 4: US$ 90,000 including consultations and consultancy.

Output 5: US$ 90,000 including consultations and consultancy.

Output 6: US$ 70,000.

Output 7: Operational budget of US$80,000 for 2 years.

Total for the Lao PDR and Thailand: 450,000 US$ (common budget)

Estimated budget for the part in Cambodia:

Output 1: US$ 20,000 including consultancies, data collection and survey.

Output 2: Will be done through the other actions, therefore excludes formulation of the standards, rules and regulations. However, US$ 20,000 may be needed for adjustments.

Output 3: US$ 50,000 including consultations and consultancy.

Output 4: US$ 60,000 including consultations and consultancy.

Output 5: US$ 60,000 including consultations and consultancy.

Output 6: US$ 50,000.

Output 7: Operational budget of US$80,000 for 2 years.

Total for Cambodia: 340,000 US$

Estimated budget for the part in Viet Nam:

Output 1: US$ 30,000 including consultancies, data collection and survey

Output 2: Will be done through the other actions, therefore excludes formulation of the standards, rules and regulations. However, US$ 30,000 may be needed for adjustments.

Output 3:	US$ 70,000 including consultations and consultancy.	
Output 4:	US$ 80,000 including consultations and consultancy.	
Output 5:	US$ 80,000 including consultations and consultancy.	
Output 6:	US$ 80,000.	
Output 7:	Operational budget of US$120,000 for 2 years.	
	Total for Cambodia:	**490,000 US$**
	General Total:	**1,280,000 US$**

HUMAN RESOURCES

Main agencies:

Lao PDR: Department of Waterways, MPWT.

Thailand: Marine Department, MoT.

Cambodia: Inland Waterway Transport Department, MPWT.

Viet Nam: VIWA-MoT.

Mekong River Commission (NAP hosting a Regional Navigation Coordination Unit RNCU) + vessel owners and operators, port and terminal operators, training center, National Mekong Committees.

Other implementing agencies:

Waterway police, port state control (if available).

Waterway users and crew.

Shipping companies and operators, charterers.

PROPOSED EXECUTING/IMPLEMENTING AGENCY

Main executing agencies**:**

Lao PDR: Department of Waterways, MPWT.

Thailand: Marine Department, MoT.

Cambodia: Inland Waterway Transport Department, MPWT.

Viet Nam: VIWA-MoT.

Coordinators:

- Mekong River Commission (NAP hosting a Regional Navigation Coordination Unit RNCU) + vessel owners and operators, port and terminal operators, training venter, National Mekong Committees.

Other implementing agencies:

- Waterway police, port state control (if available).
- Waterway users and crew.
- Shipping companies and operators, charterers.

TIME AND WORK SCHEDULE

The idealwould be to wait until all standards, rules and regulations are in place but that may be too far off.Could actually start in 2017.

Output 1 would take 2 months.Output 2 would take 3 months but can be longer if standards are not in place. Output 3, 4 and 5 would take together 8 months, Output 6 would take 6 months and Output 7 is operational and is counted for 2 years under the project.

Total: preparations, formulations and training: minimum 19 months, operational schedule for output 7 is 24 months in addition to the above.

SOCIAL ISSUES

This policy action is not expected to have any adverse social impacts. The introduction of vessel inspections creates opportunities for employment and capacity building of line agencies and authorities.

ENVIRONMENTAL ISSUES

This policy action is not expected to have any adverse environmental impacts. The inspection system should include onboard waste management, contingency planning and safety management systems to reduce pollution and improve energy efficiency.

ECONOMIC ASSESSMENT

This action is likely to have safety improvement benefits, which are practically difficult to measure in economic terms.

PRIORITY OF ACTION (H/M/L)

High.

FINANCING PLAN (PUBLIC/PRIVATE)

National (in-country): National budget.

Regional: MRCS NAP, ADB - GMS (Greater Mekong Sub region).

International: World Bank, European Union, Flanders / Belgium, Australia aid, KOICA (Korea), JICA (Japan), ASEAN IAI (receiving funds from Australia, Japan, etc.)

PRIOR ACTIONS REQUIRED

None.

FOLLOW-UP ACTIONS REQUIRED

None.

4.2 SHORT TERM NAVIGATION SAFETY ACTION 2 (SNS2)

TITLE

Establish a framework for reporting shipping and port accidents in MRC member countries

BACKGROUND AND RATIONALE

Accident statistics and accident files are hardly available, and certainly not reliable for the Mekong. Given the lack of safety awareness and absence of a regulated safety regime, most accidents that occur are not reported. A framework is needed for a national, standardized port and shipping accident reporting and investigation system by which a government can determine causes, responsibilities, costs and trends and make decisions regarding educational, regulatory and enforcement actions.

Accidents involving ships or accidents in ports occur every day. Most accidents are minor and are not investigated. Some accidents are bigger and should be investigated by trained persons. The results of such investigations and subsequent reports would contribute to better safety. Unfortunately, when extremely serious incidents occur such as large oil spills or a ferry sinking with a large death toll, there is a danger that the subsequent investigation becomes entangled with vested interests and the cause of the incident may be attributed to a different cause. Human error is still a major factor contributing to shipping accidents due to, among others, the insufficiency of safety awareness.

In the maritime sector, investigations involving seagoing ships have always been high on the agenda. Under the International Convention for the Safety of Live at Sea (SOLAS)2, each country undertakes to conduct an investigation into any casualty occurring to ships under its flag subject to those conventions, and to supply MRC with pertinent information concerning the findings of such investigations. Article 23 of the Load Lines Convention also requires the investigation of casualties. Under the United Nations Convention on the Law of the Sea (UNCLOS)3, "*Each State shall cause an inquiry to be held by or before a suitably qualified person or persons into every marine casualty or incident of navigation on the high seas involving a ship flying its flag and causing loss of life or serious injury to nationals of another State or serious damage to ships or installations of another State or to the marine environment. The flag State and the other State shall co-operate in the conduct of any inquiry held by that other State into any such marine casualty or incident of navigation.*" In 2008 IMO adopted a new Code of International Standards and Recommended Practices for a Safety Investigation into a Marine Casualty or Marine Incident (Casualty Investigation Code).

Most countries with navigable inland waterways have adopted similar systems for their inland navigation but there are no international standards available for investigating shipping accidents. This action should also look at setting a uniform standard for the Mekong River System.

Port or shipping investigation processes can be divided into three main steps:

- **Step 1:** Data collection & occurrence sequence determination.
- **Step 2:** Factors identification and classification.
- **Step 3:** Safety actions development.

Types of shipping accidents or events, or a sequence of events, are directly connected with the operations of a ship:

1) The death of, or serious injury to, a person;

[2]Regulation I/21 and MARPOL articles 8 and 12.

[3]Article 94 on Duties of the Flag State, paragraph 7.

2) The loss of a person from a ship;
3) The loss, presumed loss or abandonment of a ship;
4) Material damage to a ship;
5) The stranding or disabling of a ship;
6) The involvement of a ship in a collision;
7) Material damage to marine infrastructure external to a ship, that could seriously endanger the safety of the ship, another ship or an individual,and
8) Severe damage to the environment, or the potential for severe damage to the environment, brought about by the damage of a ship or ships.

Theinvestigation report or accident reporting should provide necessary information in order to avoid mentioned threats and errors in the future, and should contain:

1) A summary outlining the basic facts of the marine casualty or marine incident and stating whether any deaths, injuries or pollution occurred as a result;
2) The identity of the flag state, owners, operators, the company as identified in the safety management certificate, and the Classification Society;
3) Where relevant, the details of the dimensions and engines of any ship involved, together with a description of the crew, work routine and other matters, such as time served on the ship;
4) A narrative detailing the circumstances of the incident;
5) Analysis and comments on the causal factors including any mechanical, human and organizational factors;
6) A discussion of the marine safety investigation's findings, including the identification of safety issues, and the marine safety investigation's conclusions; and
7) Where appropriate, recommendations with a view to preventing future accidents.

Investigations should always consider three basic questions:

1) What happened? The unfolding of the accident is given as a factual, chronological narrative.
2) How did the accident occur? The technical circumstances of the accident are identified.
3) Why did the accident occur? Based on a thorough examination and analysis of the event, it is explained why the accident happened.

A Shipping Accident Investigation Branch (SAIB) should be established in each country. The investigators have a strong nautical and technical background combined with knowledge of safety science. The investigations by the SAIB procure information about the actual circumstances of accidents and clarify the sequence of events and reasons leading to these accidents. With this information in hand, others can take measures to prevent similar accidents in the future.

The reports and lessons learned are published. The Branch should also prepare and publish Safety Bulletins. These bulletins will draw the attention of the inland shipping community to some of the lessons arising from investigations into recent accidents and incidents. This information is published to inform the shipping and transport industries, and the public of the general circumstances of port and shipping accidents and to draw out the lessons learned. The sole purpose of the Safety Bulletin is to prevent similar accidents happening again.

Under the River Information Services (RIS) that will be developed through LNS2, planning and management of traffic and transport operations will be supported. The system of data exchange will be invaluable for waterway authorities in supporting traffic management tasks and dangerous goods monitoring. Transport statistics is an input commonly used to analyze national and regional

development characteristics and to formulate socio-economic forecasts. Statistics on accidents serve the same purpose. Operational information is critical for safety onboard and in-land. Prevention of accidents is a high priority for the simple reason that many riparian countries largelydepend on the resources of the Mekong for their daily living. A pollution accident could be a serious threat to the livelihoods of people who often do not have alternatives for income generation. In addition to this, a comprehensive River Information System would also reduce travel time for the ships, thereby ensuring waterborne transport's comparative advantages to other transport modes. Whatever can be learned from the accidents may lead to prevention of similar accidents in the future. The standardization process of RIS will be applicable to the operational data, including accidents, and the economic data (traffic, fleet, port and cargo data). River Information Services should prepare a framework for Mekong Cooperation on navigation data standards and harmonization for more effective use and easy interchange.

But, in view of the urgency, this Action should not wait until the RIS is in place but should start earlier. Once the reporting system is well in place it can easily be integrated into the RIS.

LOCATION

In the four Mekong Countries.

OBJECTIVES

The **overall objective** is to seriously reduce shipping and port accidents to save human life, prevent spills and reduce the pressure on the environment.

The **immediate objective** of the project is to prevent accidents from happening again by carefully registering shipping and port accidents, identifying the causes, analyzing what mitigation measures could be adopted and relaying the lessons learned to all stakeholders, and enhancing the 'safety culture' among the main players in the shipping industry.

OUTPUTS AND DELIVERABLES

Output 1: Assessment of existing practices on Accident Reporting and Investigations.

Output 2: Framework is prepared to start up Accident Reporting and Investigations, including setting up a uniform system for the Mekong.

Output 3: Shipping Accident Investigation Branches are set up in all four countries.

Output 4: The investigators and accident rapporteurs are trained.

Output 5: Evaluation after a one year test-period.

Output 6: River Information Services (RIS) integrate the Accident Reporting and Investigations process under the Operational Services and Fairway Information.

ACTIVITIES

Under Output 1 (Assessment of existing practices on Accident Reporting and Investigations)

Activity 1.1 Preliminary investigations.

The development of Accident Reporting and Investigations should be initiated reviewing the existing information, reporting and investigating systems in each of the Mekong countries.

Under Output 2 (Framework is prepared to start upAccident Reporting and Investigations, including setting up a uniform standard system for the Mekong)

Activity 2.1 Detailed implementation planning.

Based on the outcome of the above activities, formulate a concrete framework (and plan) for the establishment of an Accident Reporting and Investigation System for Mekong Navigation that includesport or shipping investigation process with three main steps:

Step 1: Data collection & occurrence sequence determination.

Step 2: Factors identification and classification.

Step 3: Safety actions development.

Activity 2.2 Identify data needs for the system.

Activity 2.3 Identify specific data and operational needs in the MRC Member Countries and identify data sources/providers. Make an overall assessment of operational needs and develop this into a concept paper to guide future operations.

Activity 2.4 Analyze the existing systems and provide recommendations on what should be improved, and how to make use of a harmonized or uniform system.

Activity 2.5 Propose the uniform standards for the Accident Reporting and Investigating System for the Mekong River, which include full reporting, investigating, analyzing and publishing the methodology.

Activity 2.6 Discuss and approve the Uniform System during a regional workshop.

Under Output 3 (Shipping Accident Investigation Branches are set up in all four countries)

Activity 3.1 The uniform standards for the Accident Reporting and Investigation System are applied in each country; existing systems are adapted.

Activity 3.2 The Shipping Accident Investigation Branches (SAIB) are established (or existing ones adapted) in each country.

Under Output 4 (The investigators and accident rapporteurs are trained)

Activity 4.1 Regional Training is conducted to the trainers representing the Shipping Accident Investigation Branches (SAIB).

Activity 4.2 Trainers continue training on a national level.

Under Output 5 (Evaluation after a one year test-period)

Activity 5.1 Implement the system for one year.

Activity 5.2 After one year, conduct an evaluation in the four countries.

Activity 5.3 A regional workshop is held between the four countries to discuss the evaluation and how to improve.

Under Output 6 (River Information Services (RIS) integrate the Accident Reporting and Investigations process under the Operational Services and Fairway Information)

Activity 6.1 As soon as the RIS Action starts, full integration is conducted.

BUDGET

Because this project is transboundary, the budget is partly regional, partly national:

Output 1 Assessment of existing practices on Accident Reporting and Investigations.

Regional budget: US$30,000

Output 2 Framework is prepared to start up Accident Reporting and Investigations, including setting up a uniform system for the Mekong.

Regional budge: **US$40,000**

Output 3 Shipping Accident Investigation Branches are set up in all four countries.

National budgets:

Lao PDR: US$30,000

Thailand: US$ 20,000

Cambodia: US$25,000

Viet Nam: US$40,000

Total:**US$ 115,000**

Output 4 The investigators and accident rapporteurs are trained.

Regional training budgetUS$ 40,000

National training budgets:

Lao PDR:US$30,000

Thailand:US$10,000

Cambodia:US$20,000

Viet Nam:US$40,000

Total:**US$140,000**

Output 5 Evaluation after a one year test-period.

Regional budget: **US$30,000**

Output 6 River Information Services (RIS) integrate the Accident Reporting and Investigations process under the Operational Services and Fairway Information.

TOTAL BUDGET: US$ 355,000

HUMAN RESOURCES

The work can be implemented by the relevant staff of the Waterways, Marine Department and VIWA and by the new Shipping Accident Investigation Branches but consultants will need to be hired, especially with expertise in accident reporting, investigation and analysis, in order to formulate the standardsand training.

Once operational, the Mekong Navigation Facilitation Committee under the Bilateral Navigation Agreement between Cambodia and Viet Nam should be involved.

PROPOSED EXECUTING/IMPLEMENTING AGENCY

Since this is a regional project with cross-border aspects, the Waterways and Marine Department, and VIWA, and the new Shipping Accident Investigation Branches in the Lao PDR, Thailand, Cambodia and Viet Nam should be implementing agencies together with the MRC Secretariat (MRCS). MRCS and NMCs could, on behalf of the MRC, serve as Executing Agency of the project.

TIME AND WORK SCHEDULE

Output 1 (Assessment of existing practices on Accident Reporting and Investigations): 2 months

Output 2 (Framework is prepared to start up): 4 months

Output 3 (Shipping Accident Investigation Branches are set up in all four countries): 3 months

Output 4 (The investigators and accident rapporteurs are trained): 1 month

Output 5 (Evaluation after a one year test-period): 13 months

Output 6 (River Information Services (RIS) integrate the Accident Reporting and Investigations process under the Operational Services and Fairway Information)

The outputs are overlapping so total duration is 9 months, then 12 months implementation, then 1 month evaluation.

Total is 22 months

SOCIAL ISSUES

This policy action is not expected to have any adverse social impacts.

ENVIRONMENTAL ISSUES

This policy action is not expected to have any adverse environmental impacts. The framework should include oil spills **(Tier 1-3)** and other water pollution incidents. The proper reporting and investigation of incidents can prevent the reoccurrence of shipping accidents and water pollution incidents.

ECONOMIC ASSESSMENT

This action is likely to have safety improvement benefits, which are difficult to measure in economic terms.

PRIORITY OF ACTION (H/M/L)

Medium (2018-2019).

FINANCING PLAN (PUBLIC/PRIVATE)

National

Regional: MRCS NAP, ADB - GMS (Greater Mekong Sub region).

PRIOR ACTIONS REQUIRED

None.

FOLLOW-UP ACTIONS REQUIRED

Improve based on the evaluation report after 12 months. Link it with Search and Rescue.

4.3 SHORT TERM NAVIGATION SAFETY ACTION 3 (SNS3)

TITLE

Formulate a contingency plan for efficient accident response

BACKGROUND AND RATIONALE

Large quantities of petroleum products are transported in tankers from Viet Nam to Cambodia on the Mekong River. There are also significant quantities of oil being shipped from Thailand to PR China over the Mekong River. Spills occurring on the Mekong or its tributaries may, depending on the scale, have a cross-border impact. Arrangements should exist between Cambodia and Viet Nam on mutual assistance to abate and minimize the impacts of spills which affect both countries. Oil companies and other private and public organizations handling hazardous substances, including port authorities, have a responsibility to deal with the high risk of water contamination through spillage of products in their care. This should include an obligation to contribute to a coordinated response to a navigation spill.

Besides oil spills, other accidents such as collisions, groundings on rocks, fires and sinking, among others, also need to be considered.

This Action will address the existing legal framework and will provide a Contingency Plan which needs to include guidelines for improvement of emergency and/or oil spill response, training facility personnel, preparing reporting procedures for incidents, addressing evidence of financial responsibility,and standardizing safety requirements and minimum emergency and oil spill equipment. The Plan will also look at how cross-border emergency and oil spill response cooperation with the neighboring countries can be strengthened. Being prepared for emergency situations and taking mitigation measures and preventative measures greatly reduces the risk of injury, illness, and fatalities, and may limit the damage done to infrastructure, and to the surrounding environment and communities. Once the Navigation Contingency Plan has been adopted, the authorities will be able to impose contingency plans and responsibilities.

Time is short in an emergency situation, and it is therefore important to develop models of likely spill scenarios in advance in order to provide information to guide the preparation of contingency response plans. These models should take into account the expected frequency and size of priority pollutants, particularly oil, probable movement and fate of slicks, and prevailing meteorological and hydraulic conditions.

In order to minimize the damage caused by spills to the environment, to people's lives and to economic sectors, a rapid response is necessary. This requires:

- A functioning system to alert involved parties in the event of an accident, including awareness raisingfor communities that may be affected.
- Pre-positioning of response equipment. Priority should be given to equipment for combating oil spills, since this is the most likely emergency event.
- Well trained and skilled personnel.

Formulating a contingency plan involves making decisions in advance about the management of human and financial resources, coordination and communications procedures, and being aware of a range of technical and logistical responses and restrictions. This also involves procedures for accident reporting, the establishment of a response team and defining the roles and responsibilities in the response system. Moreover, it also involves providing guidance to regional or local response teams, coordinating a national program of preparedness planning and response, and facilitating research to improve response activities.

Tier class definitions

In order to plan a response to oil spills -- ranging from small, local incidents to larger and more persistent spills -- and identifying when regional and international assistance is required, the internationally used concept of **Tier** Response is adopted. Oil spills responses are classified according to the size of the spill.

Tier 1is normally associated with small local events for which response resources should exist locally. Examples of **Tier 1** spills include transfer of fuel or bunkers at a terminal or smaller spill at port. There will normally be no need to call for external assistance for a **Tier 1** spill.

An individual company or a ship's in-house capacity is usually responsible if the amount of oil spill in the location of the operation does not exceed the limitation of its own equipment capacity. The response will be undertaken by response organization if the spill occursin a distant location.

Tier 2is a larger spill that may occur in the vicinity of a response center or smaller spills at distant locations for which resources from several sources may be required from a private oil company, industry and/or government resources.

Tier 2 is undertaken much like the**Tier 1** response, plus other private companies, industries and/or government resources may be needed to combat a large spill exceeding the limits of a **Tier 1** response.

Tier 3is for the largest spills, such as large cargo vessel accidents resulting in loss of its fuel bunkers or large oil tanker accidents. **Tier 3** incidents will usually call for the entire oil spill response resources in a countryand may also need international assistance.

Tier 3 is undertaken much like **Tier 2** response (total national resources) with the addition of external recourses in case the spill cannot be controlled by the national resources and thus may need external assistance.

International conventions

For accidents relating to maritime accidents, there are international standards and obligations under the following conventions:

1) MARPOL 73/78;
2) Civil Liability Convention 1992; and

International Oil Pollution Compensation Fund Convention 1992.

What needs to be considered when formulating Plans for Oil Spill Response?

Priorities for protection of the river and lake resources should be based on the sensitivity of resources in question and the response shall place the protection of personnel as its first priority. Based on this, the following strategies are established to achieve the desired objective.

a) General Planning rules:

- Oil should be contained and recovered mechanically wherever possible.
- Oil should generally be collected as close to the source as possible.
- Chemical dispersant should be considered, if mechanical recovery is not effective or possible.
- Priority for protection of coastal resources should be based on the requirements of the Ministry of Environment.
- The natural breakdown process should be utilized to the greatest extent possible.

b) Strategy for cleanup:

- Mechanical containment and recovery.
- Chemical dispersant.
- No response.
- Others such as in situ burning.

c) Strategy for cleanup on the river and lake:

- Due to the high water velocities on the river and in the lake, quick response is very important to avoid large dispersion of the spill. The strategy to achieve this will include:
  - Mechanical containment.
  - Chemical dispersant.
  - No response. A strategy of no response can be a valid approach allowing the oil to disperse and weather naturally. This option is usually chosen when the oil is of a low density and viscosity (high evaporation and natural dispersion).

d) Personnel Safety:

- An objective that must be established at the initial phases of a response and be maintained throughout the entire process is the protection of the health and safety of response personnel.

e) Oiled Fauna Response:

- Birds and marine animals affected by oil slicks have an increased chance of survival if an effective rescue, cleanup and rehabilitation strategy is already established.

f) Strategy for Oil and Waste Storage and Disposal:

- Oil and oil-contaminated waste must be disposed of in a manner that meets therequirements of the Ministry of Environment.

g) Equipment for Oil Spill Response:

- Equipment for Oil Spill Response should be made available.

h) Response Organization- Organization Structure:

- An effective response to an oil spill requires an organizational structure that can manage all aspects of the incident and the appropriate response.

1) A Committee for Oil Spill Response (COSR). The COSR, consisting of various ministries, shall be responsible for providing all necessary support to enable the oil spill response operation. The COSR shall facilitate interministry coordination of government resources commensurate to the scale of the incident. The COSR reports to the head of government and shall be accountable for the response to the incident.
2) A Coordinator for Oil Spill Response comes under the General Department of Transport of the Ministry of Public Works and Transport, and shall assume the role of the Coordinator for Oil Spill Response. Coordinates and ensures the oil spill response operation is conducted in compliance with the national contingency plan.
3) An Incident Commander with a River/Lake Deputy.
4) A Planning Section evaluating the appropriateness of strategy and tactics, ensuring immediate plans for response are prepared, and recording, collating, reproducing, disseminating and securing all relevant documents pertaining to the spill incident.
5) A River/Lake Operation Section.
6) A Lake Logistics Section.

7) 7. A Finance Section managing the financial resources necessary for the response, instituting appropriate financial controls, tracking all expenditure of the operation and preparing financial records.

i) Response Operation:

- The aims of the oil spill response are both to minimize the immediate damage to environmental and socio-economic resources and to reduce the time for recovery of affected resources. Therefore, the oil spill response actions shall be wisely selected based on the circumstances presented.

j) Response procedures:

- Alert system
- Upon receivingan oil spill report
- Action to be taken upon the incident report
- Action to be taken by the Coordinator for Oil Spill Response
- Action to be taken by the Incident Commander for Oil Spill Response
- Action to be taken by the Operation Section
- Action to be taken by the Planning, Logistics and Finance Section
- Management of Oiled Fauna
- Disposal of Oily Debris
- Termination of Oil Spill Clean-up
- Documentation
- Evaluation

Important note: the 2009 Bilateral Navigation Agreement between Cambodia and Viet Nam includes an agreement on mutual assistance in dealing with navigation spills and practical arrangements for notification, communication, and mitigation of impacts.

LOCATION

In the four countries.

OBJECTIVES

Overall Objective: to protect the Mekong River environment from the damaging effects of oil spills by providing a coordinated response mechanism for combating oil spills using the combined resources of the private sector and the government.

Specific Objective: to protect human lives, protect the water environment of the Mekong River system, and limit damage to property by formulating effective emergency and oil spill response plans at local, national and cross-border levels.

OUTPUTS AND DELIVERABLES

Output 1: Assessment of existing practices on Contingency Plans.

Output 2: A harmonized Contingency (Action) Plan is prepared based on a Uniform Standard for the Mekong).

Output 3: The National Contingency (Action) Plans are adjusted according to the Standards for the Uniform Contingency Plan for the Mekong.

ACTIVITIES

Under Output 1 (Assessment of existing practices on Contingency Plans)

Activity 1.1 Preliminary investigations.

The formulation of Contingency (Action) Plans should be initiated by reviewing the existing plan in each of the Mekong countries.

Under Output 2 (A harmonized Contingency (Action) Plan is prepared based on a Uniform Standard for the Mekong)

Activity 2.1 Identify data needs for the system.

Activity 2.2 Identify operational needs in the MRC Member Countries. Make an overall assessment of operational needs and develop this into a concept paper for the Plan.

Activity 2.3 Make an analysis of the existing systems and provide recommendations on what should be improved, and how to make use of a harmonized or uniform system.

Activity 2.4 Propose the uniform standards for the Contingency Plan for the Mekong River, including proposals for institutional set-up, procurement of equipment and training.

Activity 2.5 Propose how the operations under the Contingency Plan can be shared or best coordinated between the Lao PDR and Thailand, and between Cambodia and Viet Nam.

Activity 2.6 Discuss and approve the Uniform System during a regional workshop.

Under Output 3 (The National Contingency (Action) Plans are adjusted according to the standards for the Uniform Contingency Plan for the Mekong

Activity 3.1 The uniform standards for the Contingency Plan for the Mekong are applied in each country: existing systems are adapted and detailed implementation plans are made including proposals for institutional set-up, procurement of equipment and training.

BUDGET

Because this project is transboundary, the budget is partly regional, partly national:

Output 1 Assessment of existing practices on Contingency Plans.

Regional budget **US$40,000**

Output 2 A harmonized Contingency (Action) Plan is prepared based on a Uniform Standard for the Mekong.

Regional budget **US$ 70,000**

Output 3 The National Contingency (Action) Plans are adjusted according to the Standards for the Uniform Contingency Plan for the Mekong.

National budgets	
Lao PDR	US$20,000
Thailand	US$ 10,000
Cambodia	US$15,000
Viet Nam	US$ 30,000
Total	**US$ 75,000**
TOTAL BUDGET	**US$ 185,000**

PROPOSED EXECUTING/IMPLEMENTING AGENCY

A number of stakeholders will be involved in emergency and oil spill response at ports and terminals. The most important are listed below:

- Ministry of Public Works and Transport
- Ministry of Environment (MoE)
- Ministry of Industry, Mines and Energy
- Ministry of Water Resources and Meteorology
- National Committee for Disaster Management
- Port and Terminal Operators

Once operational, the Mekong Navigation Facilitation Committee under the Bilateral Navigation Agreement between Cambodia and Viet Nam should be involved as well.

Since this is a regional project with cross-border aspects, the Waterways and Marine Department, and VIWAare implementing agencies alongwith the MRC Secretariat (MRCS). MRCS and the NMCs could, on behalf of the MRC, serve as the Executing Agency of the project.

TIME AND WORK SCHEDULE

Output 1 Assessment of existing practices on Contingency Plans:2 months

Output 2 A harmonized Contingency (Action) Plan:2 months

Output 3 The National Contingency (Action) Plans are adjusted:4 months

Total duration is **8 months**.

SOCIAL ISSUES

This action is not expected to have any adverse social impacts.

ENVIRONMENTAL ISSUES

This action will have a positive impact on the environment. Improving contingency planning and waste management can prevent and mitigate the impacts of shipping accidents, including oil spill pollution.

ECONOMIC ASSESSMENT

This action is likely to have safety improvement benefits, which are difficult to measure in economic terms.

PRIORITY OF ACTION (H/M/L)

Medium (2018).

FINANCING PLAN (PUBLIC/PRIVATE)

National

Regional: MRCS NAP, ADB - GMS (Greater Mekong Sub region).

PRIOR ACTIONS REQUIRED

None.

FOLLOW-UP ACTIONS REQUIRED

Make the Plan operational:

- Establish the institutional structure in each country (National Committee for Navigation Spill Response, Coordinator for navigation spill response appointed, Incident Commander for navigation spill response appointed).

- Negotiations between Cambodia and Viet Nam on the principles of mutual assistance in the event of cross-border impacts of navigation spills.
- Drafting and adoption of new rules, regulations or legislation requiring concerned private and public organizations to prepare navigation spill contingency plans and take part in common response activities.
- Prepare a series of spill scenarios predicting the likely spread of spilled materials in different circumstances.
- Incorporate these predictions into emergency response planning.
- Develop nationwide alerting procedures, and carry out awareness-raising and training programs in all provinces that may be affected by a spill.
- Procure and pre-position response equipment.
- Conduct training for all persons and organizations involved in the alerting procedure and emergency response.
- Hold exercises to confirm that the response plan is effective and to familiarize personnel with their tasks and responsibilities.

4.4 SHORT TERM NAVIGATION SAFETY ACTION 4 (SNS4)

TITLE

Implement search and rescue units on the Mekong River prepared for vessel emergencies such as collision, grounding, sinking, fire and explosion, and oil and chemical spills

BACKGROUND AND RATIONALE

The inland water transportation mode is the most efficient and safe mode for moving large quantities of bulk materials. Highway freight traffic is intermixed with cars and, in urban areas, with pedestrians. Rail cars are susceptible to accidents, often resulting in loss of cargo, because rail shipments typically involve a large number of massive units travelling at high speeds on a single line. River barges however, share their right-of-way mostly with smaller craft and at a much slower speed.

However, accidents to the crew and other waterway users occur, and damage to the environment will increase if no action is taken. It would be preferable if actions were taken on a supranational level because of transboundary transportation.

Safety of ship: OnlyViet Nam has enforced regulations for the technical condition, registration and maintenance of watercraft. Enforcement of the rules tends to be lax. It should be compulsory to have all vessels (minimum dimensions) classified, registered and regularly inspected. Ships carrying dangerous goods have to be subject to more stringent rules and inspections. Of course, when a ship crosses borders, some countries may require a higher standard of boat inspection than another country. Harmonization of these standards is needed and will contribute to a reduction in ship casualties.

Related shortcomings: Most of the present certification procedures and registration of the fleet are not adequate. The design of the ships is, especially for the Lao PDR and Cambodia, not according to standards. The shape of the fleet is not adapted to the conditions of the waterway and volume of cargo in relation to the available river depth.

Some causes of accidents:

- No common navigation rules and regulations.
- The existing regulations cannot be enforced due to a lack of institutional capacity.
- No co-ordination on salvage. No plans in case of accidents or emergencies.
- Navigation aids in place only on a limited scale on some parts of the waterway (some still date from to the Indochina period).
- Low budget for maintenance of waterway signal, buoys, beacons etc.
- Inspection and certification of the fleet is not carried out properly.
- Low or no maintenance of fleet and waterways.
- In Viet Nam alone there are some 400,000 boats with low safety standards, many transporting passengers.
- Most accidents are due to overloading of vessels.
- Low safety situation for passengers (life jackets, rescue systems etc.).
- Poor safety regulations in ports.

Safety of crew: Appropriate Inland Navigation Laws will specify the requirements for aptitude and qualifications of boat masters and crew members. Only in Viet Nam are such laws being drafted. The vessels submitted to registration, except floating installations, can be led only by a qualified person. The qualifications must be proved before a navigation office and is confirmed by a license issued by that office. Among other requirements, when boat owners or masters cross borders into another

country, the same competency or standards as the waterway users in that country needs to be in place.

- There are no rules for fire protection equipment, lifesaving appliances or communication equipment on board of inland waterway vessels on the Mekong River, exceptfor maritime ships. Many major rivers have their own specific regulations (Rhine, Mississippi, Danube, etc.) so identifying and adjusting common rules for the Mekong should not be that complicated.
- Although accidents abound, there is no proper reporting mechanism for accidents occurring on and along the Mekong River.

Regional agreements and national regulations in MRC member countries require an emergency response, search and rescue committee (such as the NCDM in Cambodia). However, the practical implementation of these units is lacking and a strengthening program needs to be in placein order to establish units with trained and qualified staff and provided with necessary equipment.

In Cambodia, for example, the Inland Waterway Police (IWP) are responsible for search and rescue. Although the IWO has the staff, and to some degree the infrastructure, the lack of proper operational equipment and training is a hindrance to an effective Search and Rescue Program.

Under this proposed intervention, the development process can commence quickly with existing staff and infrastructure. Each of the proposed outputs will require significant human resources and financial inputs, but will produce short-term results.

Although in recent yearsno major accidents have been reported, a number of casualties have occurred. While reports may be filed with the local river police, there is no specific reporting or investigatory process of marine accidents.

At present, there are hardly any Police River Patrols (PRP) that need to be created and attached to the inland waterway management organizations. At the same time, River Rescue Units (RRU) in the LMB should be established. Combining the efforts of emergency medical services with those of the PRP can be the most effective way of creating this type of unit. This activity will formulate the primary mission of the Rescue Units for responding to waterborne emergencies in the inland waterway in each country. Particularly during the floods, these services will be lifesaving and direly needed. This activity should also include:

- The mainstream as well as various inland locations. In addition to responding to river rescues, the Unit could also provide the same high levels of pre-hospital emergency medical care and law enforcement in the Mekong River during floods.
- These Units should be an integral part of the waterways organizations providing assistance to the largest number of registered users of the waterway and assisting the commercial and tourist sectors in the inland waterways of the LMB.
- All members of the Units should undergo various levels of water rescue and boat operation training, including handling of equipment. MRC could provide excellent assistance in the creation of these units and specification of equipment (single or multipurpose boats) and scuba equipment.

LOCATION

In the four countries.

OBJECTIVES

Overall Objective: to save the lives of the ship's crew and to protect the Mekong River environment from the damaging effects of accidents by providing coordinated Search and Rescue (SAR).

Specific Objective: to protect human lives, protect the water environment of the Mekong River system, and limit damage to property by formulating Search and Rescue Plans, and making the system operational atlocal, national and cross-border levels.

OUTPUTS AND DELIVERABLES

Output 1: Assessment of existing practices on SAR.

Output 2: A harmonized SAR Plan is prepared based on a Uniform Standard for the Mekong,

Output 3: The National SAR Plans are adjusted according to the Standards for the Uniform Contingency Plan for the Mekong.

Output 4: Prepare a number of rescue scenarios predicting the likely impacts of the shipping accidents. Incorporate these predictions into SAR planning.

Output 5: SAR institutional structures are set up in all four countries, and equipment is rehabilitated or procured.

Output 6: Negotiations between the Lao PDR and Thailand, and between Cambodia and Viet Nam about the principles of mutual assistance.

Output 7: Training of the SAR personnel in each country; hold exercises.

ACTIVITIES

Under Output 1 (Assessment of existing practices on SAR)

Activity 1.1 Preliminary investigations.

The formulation of SAR Plans should be initiated reviewing the existing plan in each of the Mekong countries.

Under Output 2 (A harmonized SAR Plan is prepared based on a Uniform Standard for the Mekong)

Activity 2.1 Identify data needs for the system.

Activity 2.2 Identify operational needs in the MRC Member Countries. Make an overall assessment of operational needs and develop this into a concept paper for the Plan.

Activity 2.3 Make an analysis of the existing systems and provide recommendations on what should be improved, and how to make use of a harmonized or uniform system.

Activity 2.4 Propose the uniform standards for the SAR Plan for the Mekong River, including proposals for institutional set-up, procurement of equipment and training.

Activity 2.5 Discuss and approve the Uniform SAR System during a regional workshop.

Under Output 3 (The National SAR Plans are adjusted according to the Standards for the UniformContingency Plan for the Mekong)

Activity 3.1 The uniform standards for the SAR Plan for the Mekong are applied in each country: existing systems are adapted and detailed implementation plans are made including proposals for institutional set-up, procurement of equipment and training.

Under Output 4 (Rescue scenarios predicting the likely impacts of the shipping accidents. Incorporate these predictions into SAR planning)

Activity 4.1 Prepare the scenarios and integrate them into the planning.

Under Output 5 (SAR institutional structures are set up in all four countries, and equipment. Is rehabilitated or procured)

Activity 5.1 The uniform standards for the Uniform SAR system are applied in each country. Existing systems are adapted.

Activity 5.2 The SAR equipment is improved or procured in each country.

Under Output 6 (Negotiations between the Lao PDR and Thailand, and between Cambodia and Viet Nam about the principles of mutual assistance)

Activity 6.1 The relevant authorities discuss potential for mutual assistance with MRC as facilitator.

Under Output 7 (Training of the SAR personnel in each country; hold exercises)

Activity 7.1 Regional Training is conducted for the SAR Trainers.

Activity 7.2 Trainers continue training at national level.

BUDGET

Because this project is transboundary, the budget is partly regional, partly national:

Output 1	Assessment of existing practices on SAR	
	Regional budget	**US$30,000**
Output 2	A harmonized SAR Plan	
	Regional budget	**US$30,000**
Output 3	The National SAR Plans are adjusted	
	National budgets	
	Lao PDR	US$ 20,000
	Thailand	US$10,000
	Cambodia	US$ 15,000
	Viet Nam	US$20,000
	Total	**US$ 65,000**
Output 5	SAR institutional structures are set up and equipment	
	National budgets	
	Lao PDR	US$ 120,000
	Thailand	US$ 30,000
	Cambodia	US$ 90,000
	Viet Nam	US$ 140,000
	Total	**US$ 380,000**
Output 6	Regional negotiations for mutual assistance	
	Regional budget	**US$ 50,000**
Output 7	The investigators and accident rapporteurs are trained	
	Regional training budget	US$ 40,000
	National training budgets	
	Lao PDR	US$30,000
	Thailand	US$10,000
	Cambodia	US$20,000
	Viet Nam	US$40,000
	Total	**US$ 140,000**
	TOTAL BUDGET	**US$ 695,000**

PROPOSED EXECUTING/IMPLEMENTING AGENCY

A number of stakeholders will be involved in SAR. The most important are listed below:

- Ministry of Public Works and Transport
- Ministry of Environment (MoE)
- National Committee for Disaster Management
- Port and Terminal Operators

Once operational, the Mekong Navigation Facilitation Committee under the Bilateral Navigation Agreement between Cambodia and Viet Nam should be involved as well.

Since this is a regional project with cross-border aspects, the Waterways and Marine Department, and VIWA are the implementing agencies together with the MRC Secretariat (MRCS). MRCS could, on behalf of the MRC, serve as the Executing Agency of the project.

TIME AND WORK SCHEDULE

Output 1 Assessment of existing practices on SAR 2 months

Output 2 A harmonized SAR Plan 2 months

Output 3 The National SAR Plans are adjusted 3 months

Output 4 Prepare a number of rescue scenarios 1 month

Output 5 SAR institutional structures and equipment are set up5 months

Output 6 Regional Negotiations 3 months

Output 7 Training of the SAR personnel in each country, hold exercises3 months

Total duration, with overlaps between outputs 4, 5 and 6, is **15 months**.

SOCIAL ISSUES

This action is not expected to have any adverse social impacts. Preventing oil spill and water pollution will benefit local communities that depend on natural resources and fisheries for their livelihoods.

ENVIRONMENTAL ISSUES

This action will have a positive impact on the environment. Improving waterway safety, contingency planning and waste management can reduce the risks of oil spills and water pollution from vessels. The action will also provide clear guidelines on preventing and responding to oil spills and waste management for all vessel operators and waterway users.

ECONOMIC ASSESSMENT

This action is likely to have safety improvement benefits, which are difficult to measure in economic terms.

PRIORITY OF ACTION (H/M/L)

Medium (2018).

FINANCING PLAN (PUBLIC/PRIVATE)

National

Regional: MRCS NAP, ADB - GMS (Greater Mekong Sub region).

PRIOR ACTIONS REQUIRED

- Obtain agreement from appropriate levels of the relevant officials: Inland Waterway Police, Transport Department, Port Authorities, Provinces and Municipalities.

- Confirm that the Inland Waterway Police will be the lead agency.
- Seek funding from donor agencies. Note: this initiative has sufficient human and capital infrastructure to begin immediate implementation.
- Recruit the experts.

FOLLOW-UP ACTIONS REQUIRED

This Action should be closely linked with the Contingency Plan. Statistical analysis of the performance of the Search and Rescue system will come partly from record-keeping procedures established under the RIS.

4.5 SHORT TERM NAVIGATION SAFETY ACTION 5 (SNS5)

TITLE

Introduce general safety booklets that providea comprehensive explanation of safety issues and safe working practices, and special safety booklets onboard inland waterway vessels that carry dangerous goods in order to enhance the crew's awareness of the risks of carriage and handling dangerous goods and to introduce safe working practices

BACKGROUND AND RATIONALE

The Mekong River and its main tributaries are an important transport corridor for the trade of cargo, particularly the Upper Mekong between China and Thailand, and the Lower Mekong between Cambodia and Viet Nam. Cargo and fuel throughput and trips by vessels have increased significantly in the Mekong Delta with the development of a deep-sea port at Cai Mep, which allows exports from Cambodia and Viet Nam to be shipped directly to major world markets. At the same time, the construction of a new Mekong port in Chiang Saen in northern Thailand, was completedin 2012, is paving the way for a sharp increase in exports of fuel to China.

In 2009, the Navigation Programme consulted with port authorities, vessel associations, petroleum companies, transport operators and relevant ministries in Cambodia, Lao PDR, Thailand and Viet Nam to assess growing transport of dangerous goods along the Mekong.Conducted over a 12-month period with four National Working Groups and international experts, the Risk Analysis was an extensive assessment of selected ports, terminals, vessels and waterways as well as an analysis of the environment and legal framework that governs the safe transport of dangerous goods in the Lower Mekong Basin. The potential impacts of oil spills and operational impacts of the transport of dangerous goods, and the possible risks for the crew, the port workers, and people within the vicinity of the river were carefully considered on both a regional and national basis.

National working groups were selected in the Member Countries to undertake risks assessment activities at selected ports, terminals, ferry crossings and onboard vessels. The risks identified were compared against regional and international standards. Causes of major incidents in the petroleum, maritime and the inland waterborne transport sector were analyzed to identify priority areas for improving the transport of dangerous goods.

In the **Lao PDR**, the transport of dangerous goods is relatively limited and there are no large inland ports or petroleum terminals operating along the Mekong River. The most prominent navigation activity is the passenger transport between Huay Xay and Luang Prabang in the Upper Mekong. Vessels are used to transport general cargo mostly in the high-water season. One of the main reasons that navigation is limited is due to the dangerous conditions of the waterway.

Most dangerous goods are transported by ferry crossings and include gasoline, diesel, asphalt, fertilizers and construction materials. Tanker trucks containing dangerous goods load onto ferries and transport goods from Thailand to Lao PDR. Km 4 State Port Authority has fuel-storage capacity for refueling trucks, cranes and equipment onsite.

The main navigation activity in **Thailand** is the import and export of general cargo to the People's Republic of China through Chiang Saen Port in the Upper Mekong. Cargo throughput and ship calls are increasing through Chiang Saen and the new Chiang Saen Port II has commenced operations in 2012, with imports and exports set to increase even further. The transport of dangerous goods is also increasing in Thailand through the export of petroleum products through Keawalee Terminal in Chiang Saen, a privately-owned terminal used to transfer diesel and gasoline from tanker trucks to inland barges from the People's Republic of China and Myanmar.

Ferry crossings continue to transport tanker trucks containing gasoline, diesel and asphalt across the Mekong River to Lao PDR. General cargo, construction materials and consumables are also carried across the Mekong River at the ferry crossings.

In **Cambodia** the carriage, handling and storage of dangerous goods is significant. Gasoline, diesel, jet fuel and other petroleum products are imported from Viet Nam and primarily stored at 12 large petroleum terminals on the Mekong and Tonle Sap Rivers. The petroleum products are transported on inland barges from petroleum terminals in Viet Nam. Other dangerous goods including ammonium nitrate, fertilizers and toluene are imported through Phnom Penh Port by cross-border transport with Vietnamese and other foreign-flagged vessels. Domestic tankers are still used in the high-water season to transport petroleum products from terminals on the Tonle Sap River to floating fuel stations on the Tonle Sap Lake. Domestic tankers are also used as feeders for fuel supply to industries along the Mekong River for power generation and other uses. The transport and storage of petroleum products on the Tonle Sap Lake was identified as an area of concern in relation to the waterway, water-quality threats, importance of wetlands and proximity to riparian populations. Domestic transport may increase in the future with a focus on the development of the agricultural sector, with rice exports expected to rise steadily.

Inland waterborne transport is well advanced in **Viet Nam** where there are a number of inland and maritime ports helping to boost economic growth. The transport and storage of dangerous goods is extensive in Viet Nam. There are a number of petroleum terminals which use domestic tankers to supply refueling stations and industry for power generation. Tankers are used to export petroleum products to Cambodia from terminals in Ho Chi Minh City and large tankers are also used for domestic trade from Can Tho and My Tho to the west of the Mekong Delta. Due to the magnitude of the transport of dangerous goods in the Mekong Delta, the potential risks to wetlands, agricultural land, mangrove forests and riparian populations is high.

The Risk Analysis conducted in 2010-2011 was done very thoroughly and will serve the implementation of this Action. The methodology followed will also prove useful:

The risk register:A standard risk assessment template developed for ports, terminals and ferry crossings to be used in all the MRC Member Countries. The risk register was based on international standards and leading industry practices. It was developed to document risk mitigation strategies being pursued in response to the identified risks and their grading in terms of likelihood and consequence, and ensuring the communication of risk management issues to key stakeholders. The risk register in this study was used to identify hazards, evaluate risks and determine the existing prevention and mitigation measures. The risk register included a description of specific activities and operations and the associated hazards. For example, in the case of FLEET the following activities were analyzed:

1) Mechanical
2) Structural
3) Electrical
4) Physical environment
5) Dangerous goods
6) Fire hazards
7) Human factors
8) Management
9) Lifesaving/fire fighting equipment

The human factors (#7) isparticularly important for the Safety Booklets.Certain human factors can affect the performance of crewmembers onboard vessels, leading to operational errors and incidents, endangering their own lives and those of other crewmembers, the environment and members of the public. Human factors include things such as fatigue, level of education and training, skills and experience, information provided to crewmembers, communication and signage, and exposure to physical hazards and weather conditions.

Identification of hazards and risks: There are hazardsthat present potential risks to people, property and the environment and thatneed to be effectively managed. Controlling the risks of explosion and limiting the risks for environmental pollution by improving safety, security and efficiency of vessel operations depends on a number of factors: responsible owners and operators, well-trained crewmembers, compliance with national regulations and international standards, development of new technologies and management approaches.

***P*ossible Consequences:**The possible consequences of accidents were evaluated in relation to the severity and the likelihood of an incident occurring. The possible consequences of an accident involving dangerous goods include oil spills, release of toxic gas, fire, explosion, injuries or fatalities and can pose risks to local communities. For dangerous goods, the possible consequences can range from minor to catastrophic. The severity depends on:

- type and quantity of dangerous goods stored;
- operating conditions of the ports, terminals and vessels; and
- external factors increasing the risks of possible incidents.

Risk Rating and Risk Level: Once the risk rating was determined, a risk matrix was used to indicate the risk level and determine whether the risk is acceptable based on the risk ratings.

Determine Prevention and Mitigation Measures: Once the risk levels were estimated, the existing risk control measures were documented, additional risk control options considered, and list measures required at the ports, terminals and vessels. They also idenified the additional measures that need to be implemented to reduce the risk levels to as low as reasonably practicable (ALARP).

Prevention measures are intended to remove the causes of incidents or reduce the likelihood of an incident occurring. The hazard remains but the frequency of incidents involving the hazard is lowered. Control measures are taken before an accident/incident, emergency, loss or problem occurs.

One of the prevention measures recommended was to provide easy-to-understand information and instructions to crewmembers and port stevedores on priority safety matters, who are the most exposed to dangers.

Not all crewmembers on board the ship and not all workers in the ports have a high degree of education, and a considerable time would be needed beforea complete education programme is in place. Therefore, information on safety matters is urgent.

Pocket books or pamphelts using easy, “light” and local language with explicit drawings and pictures can save lives and prevent injury. Based on the current work in the Risk Analysis, and from the Guide Books and Manual, MRC could prepare such pocket books. Some examples of safety booklets and its contents include ‘a pocket safety guide on oil tankers’ and a ‘personal safety booklet’. The booklets should increase risk awareness by showing examples of serious accidents, such as ‘Instructions and cautions regarding the handling of Dangerous Goods’. The booklets should also make the crewmembers and port workers aware of the impacts of dangerous goods and the effects they can have on humans. Furthermore, the safety booklets should provide instructions on using protective gear and following emergency procedures.

LOCATION

The booklets shouldbe prepared on a regional basis because the issues and topics strike common points, regardless of the country. The materials should then betranslated to each of the four riparian languages as they need to reach the widest possible audience. Training sessions should be carried out on a national basis.

OBJECTIVES

The **overall objective is** to ensure efficient, safe and secure carriage, handling and storage of dangerous goods on the Mekong River in a sustainable manner in order to reduce accidents and to protect the life of the ship's crew and port workers.

The **specific objectives is** to increase safety on board vessels, with a special focus on tankers, by informing the ship's crew of dangers and risks, and instruct them how to avoid accidents and protect themselves and the environment.

OUTPUTS AND DELIVERABLES

Output 1: '*The Risk Analysis of Carriage, Handling and Storage of Dangerous Goods Along the Mekong River'*conducted by the MRC in 2010 is used to determine the most important safety hazards for the ship's crew and port workers.

Output 2: The target group of the Safety Booklets is selected, and a distribution process is designed.

Output 3: Based on the results of Outputs 1 and 2, special instructions and cautions regarding the safety on board and in port are derived and described, and the Specific Safety Booklets are prepared.

Output 4: The booklets are translated into the four MRC riparian languages.

Output 5: Training of trainers is conducted on the use of the Safety Booklets.

Output 6: Promotional events are organized and the booklets, in local language, are widely distributed.

ACTIVITIES

Under Output 1 (Identification of the most important safety risks and hazards for the ship's crew and port workers)

Activity 1.1 Carefully review 'The Risk Analysis of Carriage, Handling and Storage of Dangerous Goods Along the Mekong River' conducted by MRC in 2010.

Activity 1.2 Based on the sections on'vessels' and 'ports/terminals', determine the most important safety hazards for the ship's crew and port workers.

Activity 1.3 Share the findings with the line agencies of the four MRC Member States, and jointly decide which type of booklet would be most effective (is cartoon-type visualization? Other?)

Under Output 2 (Target groups are assigned and a distribution process is designed)

Activity 2.1 Together with the line agencies, prepare a detailed list/categories of target groups (including vessel crew and port workers).

Activity 2.2 Design the distribution process of the Safety Booklets.

Under Output 3 (Specific Safety Booklets are prepared)

Activity 3.1 Based on the results of Outputs 1 and 2, derive the special instructions and cautions regarding the safety on board and in port.

Activity 3.2 Prepare and design the Specific Safety Booklets.

Under Output 4 (Safety Booklets are translated in the 4 languages, and printed)

Activity 4.1 Translate the Safety Booklets in the four languages. Print the booklets.

Under Output 5 (Trainers are trained)

Activity 5.1 Conduct training of the selected trainers.

Under Output 6 (Promotional events and distribution)

Activity 6.1 Promotional events are organized at a local level.

Activity 6.2 Ensure the target groups receive the Safety Booklets and understand them well.

BUDGET

Because this project can be done at a centralized level, the budget is prepared for the whole basin and not per country. The budget is as follows:

For **Output 1**–Identification of the safety risks and hazards:	US$15.000
For **Output 2** – Target groups and distribution process identified:	US$8,000
For **Output 3** – Safety Booklets prepared:	US$25,000
For **Output 4**–Translation and printing of the booklets:	US$80,000
For **Output 5**–Training of Trainers:	US$60,000
For **Output 6**–Events and distribution:	US$40,000
Total:	**US$228,000**

HUMAN RESOURCES

The work can be implemented by the relevant staff of the Waterways and Marine Department but consultants will need to be hired, especially with expertise in Ship Safety.

PROPOSED EXECUTING/IMPLEMENTING AGENCY

Since this is a regional project with cross-border aspects, the Waterways and Marine Department in the Lao PDR, Thailand, Cambodia and Viet Nam are the implementing agencies together with the MRC Secretariat (MRCS). MRCS and the NMCs could, on behalf of the MRC, serve as the Executing Agency of the project.

TIME AND WORK SCHEDULE

Duration Outputs 1 and 2	2 months
Duration Output 3	3 months
Duration Output 4 and 5	5 months
Duration Output 6	2 months
Total duration	**12 months**

SOCIAL ISSUES

This action is not expected to have any adverse social impacts. This action may prevent or mitigate the impacts of accidents involving the transport and handling of dangerous goods.

ENVIRONMENTAL ISSUES

This action is not expected to have any adverse environmental impacts. The action will improve environmental awareness of vessel operators to reduce water pollution. This action should be implemented in conjunction with short term environmental action 5 (SEN5).

ECONOMIC ASSESSMENT

This action is likely to have safety improvement benefits, which are difficult to measure in economic terms.

PRIORITY OF ACTION (H/M/L)

Medium (2018).

FINANCING PLAN (PUBLIC/PRIVATE)

Regional: MRCS NAP, ADB - GMS (Greater Mekong Sub region).

International: World Bank, European Union, Flanders / Belgium, Australia aid, KOICA (Korea), JICA (Japan), ASEAN IAI (receiving funds from Australia, Japan, etc.).

PRIOR ACTIONS REQUIRED

None.

FOLLOW-UP ACTIONS REQUIRED

Evaluate how effective the Safety Booklets are.

4.6 SHORT TERM NAVIGATION SAFETY ACTION 6 (SNS6)

TITLE

Develop AIS and VHF all along the Mekong River System, and make it compulsory for selected ship sizes and types

BACKGROUND AND RATIONALE

Improving safety and increasing navigation efficiency go hand in hand. All measures that reduce accidents and collisions enhance safety. Correct ship inspection, installation of buoys and beacons, other aids to navigation facilities, communication, appropriate charts, proper training, river policing and dredging works to clear hot spots, among others, would all have positive consequences for the efficiency of water transportation. These would allow rapid increases in trade once real-time information and inland water vessels traffic systems and regulations are in place. Allocation of resources to maintain modern standardized and accurate navigation aids should be given high priority. Safe navigation is one of the fundamental underpinnings of the strategy implementation.
During the formulation of the MRC Navigation Programme 2011-2015, three specific aids to navigation systems were considered for Upper Mekong Navigation. They include:

1) Automatic Identification System (AIS);
2) Critical Low Water Level Alerts; and
3) Radio Communication Systems.

As these three systems are inter-linked and fall under the same category, it was decided to prepare the feasibility study on the three together and to prepare implementation plans for all.

On 7 August 2014 a meeting was held between the MRC Secretariat and the Thai Marine Department to discuss development of new aids to navigation along the Upper Mekong River. The meeting agreed that the Marine Department would conduct a feasibility study covering the three topics. Indeed, AIS, Communication Systems and Water Level Alert Systems could essentially help improve vessel safety and make voyage planning more efficient. Therefore, the first step should be to conduct a feasibility and detailed study of these components. Discussions were also held with the Waterway Department in the Lao PDR, which agreed with the institutional set-up of the project.

Thailand has called for an implementation of AIS coverage along the Mekong River between the Golden Triangle and Chiang Khong, and later to upstream and downstream areas. These stretches of river have been identified as extremely dangerous areas of navigation given the complexity of the waterways, the large seasonal variability in water levels, the substantial amount of flood debris in the wet season, high shipping trafficand the difficulty in navigating due to numerous rocks and rocky outcrops and submerged obstacles. These stretches are also environmentally sensitive, home to local villages anda source of food for communities. Consequently, Thailand intends to improve its awareness of the presence and movement of shipping traffic (real-time and historic) in the Mekong River region.

Automatic Identification System

The AIS is an automatic tracking system used on ships and by Vessel Traffic Services for identifying and locating vessels by electronically exchanging data with other nearby ships, AIS base stations, and satellites. When satellites are used to detect AIS signatures, then the term Satellite-AIS (S-AIS) is used.

Information provided by AIS equipment, such as unique identification, position, course, and speed, can be displayed on a screen. AIS is intended to allow maritime or river-controlling authorities to track and monitor vessel movements. Vessels fitted with AIS transceivers and transponders can be tracked by AIS base stations located along coast lines or, when out of range of terrestrial networks,

through a growing number of satellites that are fitted with special AIS receivers which are capable of deconflicting a large number of signatures.

The 2002 IMO SOLAS Convention included a mandate that required most vessels over 300GT on international voyages to fit a Class A type AIS transceiver. This was the first mandate for the use of AIS equipment. In 2006, the AIS standards published the Class B type AIS transceiver specifications, designed to enable a simpler and lower cost AIS device. In 2006, the world's first Class B transceiver was developed.

However, IMO isnot mandated on the rivers and therefore there are no international guidelines or regulations applicable. However, on many navigable international rivers AIS has become a well-known reference. The introduction of low cost Class B transceivers has triggered multiple additional national mandates, making large-scale rollout of AIS devices onto vessels of all sizes commercially viable. Since then a wide range of applications, from the largest vessel to small fishing vessels and lifeboats, are using AIS.

Application and use

- Although the benefits of increased trade are obvious, caution has to be paid in terms of controlling the import and export of contraband (customs and police need to monitor the movements of all foreign ships along their route on the Mekong River). This is also vital for detecting the trafficking of people.
- In case of oil spills, the ships in questionneed to be easily tracked so that contingency plans can be started and the cause can be mitigated.
- Able to monitor the movement of incoming vessels to prepare the port of call for discharging operations.
- Presence and movement of shipping traffic (real-time and historic) must be recorded. Voyage data recorders are needed to provide improved “black box” tracking.
- Finally, but critically, the Mekong River system is very environmentally sensitive. The vessels have to remain clear of dangerous obstacles, and should be able to be contacted if they are seen to be on a dangerous course.

According to Safety of Life at Sea - SOLAS - convention, AIS shall:

- Provide automatically to appropriately equipped shore stations, other ships and aircraft, information including the ship's identity, type, position, course, speed, navigational and maneuvering status and other safety-related information.
- Be able to very closely track the position of ships carrying dangerous cargo in real time and within meter accuracy.
- Automatically receive information from similarly equipped ships.
- Monitor and track ships and exchange data with shore-based facilities.
- Improve the safety of navigation by enabling the efficient navigation of ships, protection of the environment, and operation of Vessel Traffic Services (VTS).

AIS is an extremely useful tool to monitor the movement of ships along the river and to plan river voyages. However, the system is not always reliable when the radio waves are interrupted by hills or mountains. Before installing the system it is necessary to conduct a survey/investigation to assess its technical and financial viability. During the Feasibility Study it should be investigated whether the GPS vessel Guidance System can be combined or integrated with the AIS System.

Radio Communication Systems

Currently, there is limited communication available between the boats and the shore. In some stretches with sharp bends, vessels cannot be seen and collisions sometimes occur during approach. A system with Single Side Band (SSB), Very High Frequency (VHF) or alternative system needs to be installed on all boats and in one or two central stations to allow for open lines between boats and between the shores. Improved communication methods will also be useful to exchange information regarding water depths and possible obstructions.

Ships' radios are used for the safe navigation of vessels and for making distress calls in emergency situations. It enables communication with harbour authorities and with other vessels.

Radiotelephone is one of the 'traditional' River Information System (RIS)[4]. The radiotelephone service on inland waterways enables the establishment of radio communication for specific purposes by using agreed channels and an agreed operational procedure (service categories). The radiotelephone service comprises four service categories:

1) Ship-to-ship;
2) Nautical information;
3) Ship-to-shore authorities; and
4) Public correspondence (service on a non-mandatory basis).

Of these fourcategories, only the first three are important for RIS. Radiotelephone service enables direct and fast communication between skippers, waterway authorities and port authorities. It is best suited for urgently needed information on a real time basis.

In the service categories, ship-to-ship, nautical information and ship-to-shore-authorities, the transmission of messages should deal exclusively with the safety of human life, and with the movement and the safety of vessels.

Fairway information by voice in the nautical information (shore/ship) service category could be communicated by radiotelephone:

1) For urgent information needing to be updated frequently and having to be communicated on a real time basis, and
2) For dynamic information having to be communicated on a daily basis.

The **urgent and dynamic information** to be communicated by voice radio could concern, for example:

1) Temporary obstructions in the fairway, malfunctions of aids to navigation;
2) Restrictions in navigation caused by floods; and
3) Present and future water levels at gauges.

In the **nautical information** service category, notices to skippers are transmitted "to all users", such as:

1) Scheduled reports on the state of the waterways, including water level reports at the gauges at fixed times of the day, and
2) Urgent reports on special events (e.g. traffic regulations after accidents).

[4] The Central Commission for Navigation on the Rhine (CCNR) made radiotelephone mandatory in Rhine navigation for vessel with machine propulsion as of 1 January 1995.

A distress button automatically sends a digital distress signal identifying the calling vessel and the nature of the emergency. A connection to a GPS receiver can allow the digital distress message to contain the distressed vessel's position.

Even though the Feasibility Study is currently (2015-early 2016) being undertaken by Thailand, the results will also be useful for Cambodia and Viet Nam.

LOCATION

Although the Feasibility Study only covers the area between the Golden Triangle and Phadai (border point, 30 km downstream Chiang Khong), the project area for implementation will be the whole Mekong River from the Green Triangle to the sea: Thailand, Lao PDR, Cambodia and Viet Nam.

OBJECTIVES

Overall objective of the project is to improve safety/security and vessel/port efficiency through the development of selected navigational aids.

Specific objectives:

1) Review the results of the technical feasibility and economic viability of developing the AIS and Radio Communication Systems conducted by Thailand, and expand the area of investigation and implementation to the Lao PDR, Cambodia and Viet Nam.
2) Prepare a draft detailed procurement and implementation plan.
3) Develop and install the AIS and Radio Communication Systems, where and when as determined in Objective 1.
4) Make the system compulsory (equipment must be on board, functional and operators should be trained to use it) for selected ship sizes and types, incorporated in the law, and consequentlyenforced.

OUTPUTS AND DELIVERABLES

Output1: Based on the results of the Feasibility Study conducted by the Thai Marine Department[5], an extended Economic and Technical Viability Report with Recommendations clearly showing where else along the Mekong River AIS and Radio Communication Systems are required, and how to install and use them.

Expected deliverables:

- Extended Feasibility Report on AIS and Radio Communication Systems for the whole Mekong River;
- Locations and systems are decided;
- Final design and equipment determined;
- Capital costs are defined.

Output 2:A Detailed Procurement and Implementation Plan based on the results of the F/S.

Expected deliverables:

- Detailed Procurement Plan per country[6];

[5]In cooperation with MRC Navigation Programme, 2015-early 2016.

[6] For the common stretches between the Lao PDR and Thailand, implementation may be shared.

- Detailed Implementation Plan per country[7].

Output 3: AIS and Radio Communication Systems are developed and installed in the four Member States, including provisions for training, use and maintenance.

Expected deliverables:

- AIS and Radio Communication Systems are installed and Automatic Low Water Alert Stations and systems are functioning;
- Training and awareness campaigns are conducted;
- Maintenance plans for the next 10 years are in place and budgets are reserved.

Output 4: The systems are made compulsory (equipment must be on board, functional and operators trained to use it) for selected ship sizes and types. Law is approved and enforced.

Expected deliverables:

- AIS and Radio Communication Systems are compulsory for selected ships;
- Law is approved and enforced.

ACTIVITIES

Under Output 1 (Expansion of the Feasibility Study)

1.1 Extended field visits in the four Mekong Countries to gather information on the topographical limitations of installing low water alert gauges and system.

1.2 Check the river condition and river characteristic of the project site. Discuss with the provincial and local agencies.

1.3 Decide where to develop AIS and communication systems. Make a harmonized system, especially between the Lao PDR and Thailand, and between Cambodia and Viet Nam.

1.5 Define the final design and equipment.

1.6 Detail what the capital costs are.

1.7 Detail what the maintenance of the system should be, and what would be the cost.

Under Output 2 (Detailed Procurement and Implementation Plan)

2.1 Based on the results of the F/S and the recommendations, decide which components will be implemented, where and when.

2.2 Prepare a draft detailed Procurement Plan.

2.3 Prepare a draft detailed Implementation Plan.

2.4 Prepare a draft document for requesting human and financial resources to implement the feasible components of the Project.

[7]For the common stretches between the Lao PDR and Thailand, implementation may be shared.

Under Output 3 (Development and Installation)

3.1 After tendering and contracting, receive and clear the goods.

3.2 Conduct the required surveys.

3.3 Ensure the systems are harmonized.

3.4 Install the AIS and VHF.

3.5 Prepare a Training Needs Assessment, and on-the-job training plan.

3.6 Select the relevant staff members to be trained.

3.7 Train the staff in all relevant fields identified in the Assessment.

Under Output 4 (System is made Compulsory; Law Enforcement)

4.1 Investigate which kinds of ships need to have the systems on board.

4.2 Approve the law and ensure the required ships carry the system and the crew is trained.

4.3 Enforce the law and penalize if and when required.

BUDGET

- The actual costs for Outputs 1 and 2 are about USD 80,000 for the stretches between the Green Triangle and the Khone Falls.
- The actual costs for Outputs 1 and 2 in Cambodia are about USD 25,000. The actual costs for Outputs 1 and 2 in Viet Nam are about USD 30,000.
- The actual costs for Output 3 will become available when the results of the feasibility study are known. Preliminary estimates are as follows: for the stretches between the Green Triangle and the Khone Falls, USD 480,000. For Cambodia USD 280,000, and for Viet Nam USD 320,000 (as some systems already exist in Viet Nam).
- Outputs 4 are in-kind and controlled by the relevant authorities and control agencies.

Total estimated budget:

For the Lao PDR and Thailand:	US$ 80,000 + 480,000	= 560,000 US$
For Cambodia:	US$ 25,000 + 280,000	= 305,000 US$
For Viet Nam: US$ 30,000 + 320,000		= 350,000 US$
Total:		**= 1,215,000 US$**

HUMAN RESOURCES

The work can be implemented by the relevant staff of the Waterways, Marine Department and VIWA but consultants will need to be hired, especially with expertise in surveys, and Automatic Identification and VHF Systems. The trainees will be the ship's captains and pilots, and relevant waterway department staff.

PROPOSED EXECUTING/IMPLEMENTING AGENCY

Since in the Lao PDR and Thailand this is a regional project with cross-border aspects, the Waterways and Marine Department in Myanmar, Lao PDR and Thailand are the implementing agencies together with the MRC Secretariat (MRCS). MRCS could, on behalf of the MRC, serve as the Executing Agency of the project. The National Mekong Committees could be the Coordinating Agencies and assist the MRCS in liaising with the government to obtain any other additional information necessary. Each NMC will be asked to make arrangements for importation procedures including custom clearances of all project equipment purchased and other government formalities.

In Cambodia and in Viet Nam implementation can be done on a national level but MRC could assist in ensuring the systems are compatible between both countries.

TIME AND WORK SCHEDULE

The activities under Output 1 and 2, including the tendering and contracting process, could take up to 6 months. The activities under Output 3, could take 12 months.

Total implementation is 18 months.

SOCIAL ISSUES

This action is not expected to have any adverse social impacts. However it will be important to consider how smaller passenger and cargo vessels interact with the AIS and VHF systems to ensure waterway safety.

ENVIRONMENTAL ISSUES

This action is not expected to have any adverse environmental impacts. The use of AIS and VHF will be important to manage vessels carrying dangerous goods and for improving contingency planning.

ECONOMIC ASSESSMENT

This action is likely to have safety improvement benefits, which are difficult to measure in economic terms.

PRIORITY OF ACTION (H/M/L)

High for priority stretches, Medium for the remaining stretches.

FINANCING PLAN (PUBLIC/PRIVATE)

National

Regional: MRCS NAP, ADB - GMS (Greater Mekong Sub region).

International: World Bank, European Union, Flanders / Belgium, Australia aid, KOICA (Korea), JICA (Japan), ASEAN IAI (receiving funds from Australia, Japan, etc.).

PRIOR ACTIONS REQUIRED

None.

FOLLOW-UP ACTIONS REQUIRED

Maintenance of the AIS and communication systems on board and on shore will be crucial.

4.7 SHORT TERM NAVIGATION SAFETY ACTION 7 (SNS7)

TITLE

Immediate improvement of safety of passenger boats between Huay Xay and Luang Prabang

BACKGROUND AND RATIONALE

This involves immediate action by the responsible authorities and the boat owners to drastically improve safety measures, emergency preparedness and emergency response on board passenger boats. One day a boat with more than 100 people on board could capsize in a strong rapid and trap the majority of its passengers and crew. **This scenario is not fiction and the probability that it could happen is highly worrying.**

The boat route between Huay Xay and Luang Prabang is the most important leg frequently used by tourists between Chiang Mai/Chiang Rai and Luang Prabang. It also happens to be the busiest passenger route of local people living along the smaller villages along that route. More than 1000 passengers use the boats every day. This stretch is a fascinating and extremely beautiful part of the Mekong Basin. This is also the reason why it is so attractive.

The reality is also that the river is **very difficult and dangerous to navigate**:

- The Mekong in that part is full of rapids and large whirlpools;
- Most of the riverbed consists of rocks and there are numerous rocky outcrops;
- There are water level differences of more than 20 meters between the dry and wet seasons;
- In the dry season the river depths often get lower than 1.5m;
- The waters are so murkybecause of the sediments that it is almost impossible to 'read' the water, meaning that underwater obstacles remain invisible;
- During the flood season, floating debris like trees and large branches come down at high speed;
- There are no visual aids to navigation (buoys and beacons) because of the river conditions;
- There are some concrete markers that, when submerged, are an obstacle themselves;
- Navigation during night time is, under the present conditions, not possible but sometimes done anyway;
- Navigation in reduced visibility due to fog or heavy rain poses a high risk for accidents;
- MRC has made the surveys and produced hydrographic maps and charts but the scale is 1/20,000 and the distance between the echo sounding lines was 400m. This means that in between there can be unidentified obstacles or rocky outcrops;
- The flow of the river is very high so the downstream speed of the river can exceed 12 kms/hr.

Because of these restrictions in navigability, the boats are designed to be fast and powerful enough when challenging the countercurrents sailing upstream. This means the boats are constructed **narrow and long which drastically decreases the stability**.

Due to the nautical hazards accidents occur frequently: ships hit the rocky bed, take water and sink or capsize when the currents hit sideways, the channels often get narrow and ships hit the rocks on the side of the channel, ships hit large debris, etc.

On top of this, the boats themselves lack all safety standards:

- The ship design and construction are poor;
- Maintenance of the ship's hull, steering gear, hull, and engine is poor;
- Steering gear is not up to standard;

- No vessel checklist is available;
- Communication and radio is not available;
- The safety equipment is missing;
- Life jackets and buoys are missing, not enough or of bad quality;
- Fire extinguishers are missing or faulty;
- There are no safety procedures or emergency plans;
- There is no insurance.

Although the skippers or pilots have been trained from 'father to son' and they know the river quite well, the underwater obstacles like rocky outcrops are not all marked or known. Besides their pilot skills, the crewmembers are not trained to carry so many passengers. Some boats carry over 120 passengers and, contrary to the general belief, many of the villagers do not know how to swim.

On an institutional level it must be stated that the safety construction, safety equipment, maintenance and training standards are practically non-existing. Vessel inspection and law enforcement is also lagging behind.

This Master Plan would put much in place in terms of standards, rules, regulations, safety and emergency procedures, training and safety awareness, including harmonization of the standards between the Lao PDR and Thailand. However,it will take years before everything is in place. MRC has installed a well-functioning GPS Vessel Guidance System in Huay Xay and Luang Prabang but not all the boats have the equipment on board, and the system also needs fine-tuning. All the hydrographic maps prepared by MRC need updating and to be modernized to multibeam echo sounding so the whole river bed is charted.

Therefore, before the whole operational and institutional framework is in place, urgent and immediate improvements need to be done because a major accident with many casualties is likely to occur.

LOCATION

Stretch between Huay Xay and Luang Prabang.

OBJECTIVES

The **Development Objective** isto prevent loss of life from possible accidents on the Mekong River in Huay Xay and Luang Prabang.

The Specific Objectives are to:

- Increase safety of the passenger vessels;
- Increase the safety on board of the passenger vessels;
- Increase human capacity at inland waterways of both the waterway operators and the authorities, and
- Better safety awareness of the public and private waterway operators and authorities.

The **Immediate Objectives** are:

- To provide a detailed overview and assessment of the current condition of the passenger vessels and compare this with the existing regulations, and to evaluate the level of education, experience and competence of the crew, and authorities.
- To provide a detailed overview of the current situation of vessel inspections and law enforcement.
- To formulate at least the most basic and urgent standards, rules and regulations regarding vessel construction, vessel safety equipment, etc.Reference should be made to international

benchmarks. Simultaneously, the more long term standards, rules and regulations should be prepared according to other Actions in the Master Plan.

- To ensure that the boats, crew and authorities apply thesebasic and urgent standards, rules and regulations regarding vessel construction, vessel safety equipment, training, etc.
- To prepare a basic Vessel Inspection Checklist (BVIC) so that the boats can be inspected.
- To assist the responsible persons, authorities and stakeholders to inspect the boats, and prepare a Basic Vessel Inspection Timeframe (BVIT).
- To give a practical and technical explanation for each point under the checklist so as to conduct onboard inspections in an appropriate and comprehensive manner (BVIG).
- To detect the deficiencies on board to be rectified (BVIP).
- To train the vessel's crew to improve safety management on board.
- To be employed as a practical tool for authorities and stakeholders to check.

OUTPUTS AND DELIVERABLES

Output 1: A detailed overview and assessment of the current condition of the passenger vessels, of the situation and the institutional set-up, including inspections.

Output 2: The most basic and urgent standards, rules and regulations regarding vessel construction, vessel safety equipment, training, etc., are formulated.

Output 3: The formulated basic and urgent standards, rules and regulations regarding vessel construction, vessel safety equipment, training, etc., are applied.

Output 4: The basic Vessel Inspection Checklist (BVIC) is prepared only for the passenger vessel.

Output 5: The basic Vessel Inspection Guidebook (BVIG) is prepared withpractical and technical explanation for each point under the BVIC.

Output 6: The basic Vessel Inspection Procedures (BVIP) includea Timeframe of Inspection, and how to rectify.

Output 7: Training is provided for the vessel's crew and authorities to improve safety management on board, and to make the Vessel Inspection System operational and effective.

Output 8: The authorities start the Vessel Inspections and law enforcements.

ACTIVITIES

Under Output 1 (A detailed overview and assessment of the current condition of the passenger vessels, of the situation and the institutional set-up, including inspections)

Activity 1.1 Investigate in detail the needs and requirements for safety management only of the passenger vessels between Huay Xay and Luang Prabang, and compare with the actual conditions of the boats, crew and law enforcement. Prepare a detailed assessment with recommendations.

Activity 1.2 Prepare an overview and conduct national consultations on the results.

Under Output 2 (The most basic and urgent standards, rules and regulations regarding vessel construction, vessel safety equipment, training, etc. are formulated)

Activity 2.1 Formulate at least the most basic and urgent standards, rules and regulations regarding vessel construction, vessel safety equipment etc.Reference should be made to international benchmarks. Simultaneously, the more long term standards, rules and regulations should be prepared according to other Actions in the Master Plan, but that is outside of the scope of this Action.

Activity 2.2 Discuss with local stakeholders and relevant authorities

Under Output 3 (The formulated basic and urgent standards, rules and regulations regarding vessel construction, vessel safety equipment, training, etc. are applied)

Activity 3.1 Carefully explain to boat owners what needs to be adjusted on board, what needs to be added for safety equipment and emergency material, which training is required, etc.

Activity 3.2 Apply the standards and assist the boat owners to applythem.

Under Output 4 (The Basic Vessel Inspection Checklist (VIC) is prepared for the passenger vessels)

Activity 4.1 Prepare first draft BVICs, and discuss with the relevant line agencies. The Vessel Inspection Checklist should include the following chapters:

1) Vessel certificates and documents;
2) Crew certificates;
3) Life-Saving equipment;
4) Fire fighting equipment;
5) General safety;
6) Stability of the vessel;
7) Condition of hull and superstructure;
8) Engine room and machinery;
9) Mooring/anchoring;
10) Wheelhouse and navigation;
11) Radio equipment;
12) Safety preparedness;
13) Emergency preparedness;
14) Passenger safety;
15) Passenger awareness and preparedness.

Activity 4.2 Adjust according to comments, inputs and recommendations, and finalise the BVICs.

Under Output 5 (The Basic Vessel Inspection Guidebook (VIG) is prepared to support/guide the Checklist)

Activity 5.1 Prepare first draft BVIGs.

Activity 5.2 Translate the BVI s and BVIGs.

Activity 4.3 Publish the VIGs and BVIGs and present to the stakeholders in workshops.

Under Output 6 (The Basic Vessel Inspection Procedures (VIP) are worked out including a Timeframe of Inspection and how to rectify)

Activity 6.1 Prepare a first draft and discuss with the relevant line agencies.

Proposal for procedures on how to use the BVIS.

Activity 6.2 Adjust according to comments, inputs and recommendations, and finalise the VIPs.

Activity 6.3 Present procedures to the stakeholders in workshops.

Under Output 7 (Training is provided for the vessel's crew and authorities)

Activity 7.1 Prepare the Training Programme and packages (including training of trainers) and select the target groups. Evaluate the possibility to include it into existing national training requirements.

*Activity 7.2*Conduct training by selected Training Consultants.

Activity 7.3 Trained trainers conduct further capacity building of new trainees in the country to have a larger outreach including vessel operators, vessel's crew, and marine authorities.

Under Output 8 (The Vessel Inspections and law enforcements have started)

Activity 8.1 The trained inspection experts start according to the Basic Vessel Inspection Procedures.

Activity 8.2 Deficiencies are recorded and monitored.

Activity 8.3 Penalties are being applied for non-conformity.

BUDGET

Estimated budget

Safety equipment: 2,000 US$/boat x 50 boats =	100,000 US$
Consultancies, training and implementing emergency procedures	140,000 US$
Total	**240,000 US$**

HUMAN RESOURCES

International, regional and local experts.

PROPOSED EXECUTING/IMPLEMENTING AGENCY

Main executing agencies:

Lao PDR: Department of Waterways, MPWT.

Coordinators:

Mekong River Commission (NAP hosting a Regional Navigation Coordination Unit RNCU) + vessel owners and operators, port and terminal operators, Training Center, National Mekong Committees.

Other implementing agencies:

Waterway police, port state control (if available).

Waterway users and crew.

Shipping companies and operators, charterers.

TIME AND WORK SCHEDULE

Total: Preparations, formulations and training: minimum 8 months.

Operational schedule between 4 to 6 months.

Total 12 to 14 months.

SOCIAL ISSUES

This action is not expected to have any adverse social impacts. This will improve safety for local passengers and waterway users and in the long-term may create more employment opportunities if safety is improved.

ENVIRONMENTAL ISSUES

This action is not expected to have any adverse environmental impacts. The action should also include improving the facilities for solid and liquid wastes generated onboard or by increased tourism activities.

ECONOMIC ASSESSMENT

This action is likely to have safety improvement benefits, which are difficult to measure in economic terms.

PRIORITY OF ACTION (H/M/L)

Very high.

FINANCING PLAN (PUBLIC/PRIVATE)

Safety equipment: boat owners and associations.

Consultancy, training and procedures: national budget and regional grant.

PRIOR ACTIONS REQUIRED

None.

FOLLOW-UP ACTIONS REQUIRED

This Action will take care of the basic standards, rules, regulations and inspections. Other Actions are preparing and harmonizing the more long term standardization.

4.8 LONG TERM NAVIGATION SAFETY ACTION 1 (LNS1)

TITLE

Develop Electronic Navigation Charts (ENC) for the whole Mekong River

BACKGROUND AND RATIONALE

Description Electronic Navigation Charts (ENCs)

There are two classes of navigational electronic chart systems:

- **The first is an Electronic Chart Display and Information System (ECDIS):**a navigation information system which, with adequate back up arrangements, can be accepted as complying with the up-to-date chart required by the 1974 SOLAS Convention.
- **The second is an Electronic Chart System (ECS):**a navigation information system, used to assist navigation, that electronically displays vessel position and relevant nautical chart data and information from an ECS Database, but does not meet all the IMO requirements for ECDIS.

Electronic chart systems encompass any electronic system that uses digital chart data. There are two kinds of official digital charts commonly available:

- **Electronic Navigational Charts (ENC):**A vector chart (ENC) is a series of points and lines that make up the features on a chart. Vector charts look computer generated. Details on the chart can be turned on and off. Objects on the chart can be clicked on to learn more details. Depths can be monitored to warn before grounding. When zooming in and out of a vector chart only the geographical features grow larger or smaller where text keeps its same size and orientation. Vector charts lack most topographical features. ENC means the database of chart features, standardized as to content, structure and format, issued for use with ECDIS on the authority of government-authorized Hydrographic Offices. The ENC contains all the chart information useful for safe navigation, and may contain supplementary information in addition to that contained in the paper, which may be considered necessary for safe navigation. The ENC is intended for use in electronic charting systems (ECS) as well as Electronic Chart Display and Information Systems (ECDIS). ENCs can also be used in geographic information systems (GIS) as base map data. ENCs can also be used for non-navigational purposes in Geographic Information Systems (GIS). In order for ENCs to be used in GIS, the data must be translated from S-57 to a GIS-rap format. The resulting data can be used for a variety of non-navigational purposes that involve geospatial analyses. The sources used in compiling ENCs include: official surveys, drawings and permits, notices to mariners and national imagery.
- **Raster Navigational Charts (RNC):**A raster chart (RNC) is a direct copy or scan of an existing paper chart. Raster charts look identical to paper charts. All information contained within the chart is printed directly on it. What you see is what you get. When zooming in and out of a raster chart everything on the chart grows larger or smaller. When rotating a raster chart everything on the chart rotates.

LOCATION

In the four Lower Mekong Countries.

OBJECTIVES

Overall objective of the Project is to improve safety and vessel/port efficiency through the introduction of Electronic Navigation Charts.

Specific objectives:

1) Make a full database of existing hydrographic and topographic charts and data of the Mekong River System, including tributaries and canals. Includewhere ENCs have been already prepared.
2) Prepare a plan and prioritize which stretches need to have ENCs.
3) Prepare a detailed ToR and bidding documents for preparation of the ENCs, and select the national agency or company.
4) Develop the ENCs according to the prioritized list.
5) Make the system compulsory (equipment must be on board and functional, operators need to be trained to use it) for selected ship sizes and types, incorporated into the law, and law-enforced.

OUTPUTS AND DELIVERABLES

Output 1: All hydrographic and topographic data from the navigable waterways in the Mekong River system are collected.

Expected Deliverables:

- Full database in physical and electronic format hydrographic and topographic data from the navigable waterways in the Mekong River system in the four countries.

Output 2: A prioritization of stretches to be transformed for ENC is prepared.

Expected Deliverables:

- A prioritised list of navigable canals, river stretches and lakes, which have been selected (in time) for ENC application.

Output 3: Detailed ToR and bidding documents for preparation of the ENCs are prepared, and national agency is assigned or company is contracted.

Expected Deliverables:

- The assigned national agency or contracted company is fully aware of the tasks to do.

Output 4: The ENCs of the selected stretches are prepared according to the detailed ToR.

Expected Deliverables:

- Electronic Navigation Charts that electronically display vessel position and relevant nautical chart data and information from an ECS Database are in place.

Output 5: The systems are made compulsory (equipment must be on board, functional and operators trained to use it) for selected ship sizes and types. Law is approved and enforced.

Expected deliverables:

- ENC Systemsare compulsory for selected ships.
- Law is approved and enforced.

ACTIVITIES

Under Output 1 (Full database of existing hydrographic and topographic charts and data of the Mekong River System)

1.1 Extended visits in the four Mekong Countries to gather information on existing hydrographic and topographic charts and data, and existing ENCs.

1.2 Check the condition and characteristics of the charts and data. Discuss with the provincial and local agencies.

Under Output 2 (A prioritisation of the stretches for ENC is done)

2.1 Decide where to develop the ENCs(a prioritized list of navigable canals, river stretches and lakes which have been selected – in time). Make a harmonized system especially between the Lao PDR and Thailand, and between Cambodia and Viet Nam.

2.2 Take into consideration the economic interests, and the Basin Development Scenarios under the Master Plan to select which stretches will have ENCs and when.

Under Output 3 (Detailed ToR, and bidding documents for preparation of the ENCs are prepared and national agency is assigned or company is contracted)

3.1 Based on the Outputs 1 and 2, each country decides whether they will have the relevant national agency to prepare the ENCs or whether it will be outsourced to a company.

3.2 Prepare detailed ToR for the agency, or detailed bidding documents for a company.

3.3 Prepare the assigned national line agency, or start the bidding procedures.

3.4 Start the work of the assigned line agency, or contract the company that won the bid.

3.5. Prepare a draft detailed Implementation Plan.

Under Output 4 (Development and installation)

4.1 Conduct the required surveys if required.

4.2 Ensure the systems are harmonised.Ensure a harmonized system especially between the Lao PDR and Thailand, and between Cambodia and Viet Nam.

4.3 Start preparing the ENCs taking into consideration the following:

The final Outputs of the maps and GIS database:

1) GIS database in ArcView shape file format, file structure and its attribute should follow up the Hydrographic Atlas GIS database description, MRC 2003. Every data layer should cover the whole survey area sheet-by-sheet based on the topohydrographic maps sheet (scale of 1/20,000).

2) The map output covered sheet-by-sheet based on the topohydrographic maps sheet (scale of 1/20,000) and the whole survey area. The maps are in ARCMAP format. All ARCMAP project files, applied scripts/tools, map symbols and styles including its description should be provided. Map symbols, colour, styles and fonts should be designed following the S 57 format, which is theInternational Hydrographic Organization (IHO) standard for Electronic Navigational Charts (ENC) as in the Hydrographic Atlas GIS database description, MRC 2003.

GIS database format and structure

The GIS database structure should be designed to support the S57 format, which is the IHO standard for Electronic Nautical Charts (ENC). This standard is specifically concerned with entities in the real world with relevance to hydrography. This hydrographic regime is considered to be geo-spatial. As a result, the model defines real world entities as a combination of descriptive and spatial characteristics. Within the model these sets of characteristics are defined in terms of feature and spatial objects. ArcView will be used for displaying final editing. The maps should be distinguished into the following different layers:

3) All river depths/soundings – points with elevation attributes.

4) All river depth contours – lines with elevation attributes.

5) All existing aids to navigation – points with attributes of aid types.
6) River bank including island one-line streams – lines with directions oriented with starting point as upstream and ending point as downstream. Lines should contain attributes, which indicate the left/right bank, island, and stream. In the final output, all sheets of rivers will be edge-matched.
7) Danger areas – polygons.
8) Elevation contour lines – lines with attribute of elevations.
9) Spot height – points with attribute of elevations.
10) Roads–lines with attribute of name and/or road type, if there is any.
11) Bench marks, including KM-Markers – points.
12) Villages – points with attribute of name.
13) Building – points.
14) Navigational aspects (such as anchorages, etc.).
15) Kilometre marks.
16) Chart datum of each map.

To ensure consistency and accuracy of primary data, use ARCINFO to produce the primary data format in ArcView shape files that are linked with the attribute of each feature as well as annotation. The metadata of the primary data follows the ISO ESRI format (ISO19115).

ENC Display

An ENC contains an abstract description of geographic entities but does not contain any presentation rules. All presentation rules to get the ENCs content displayed are contained in a separate ECDIS software module - the "Presentation Library".

Both the geo-referenced objects contained in the ENC and the appropriate symbolization contained in the Presentation Library are linked to each other in the ECDIS only when called up for display.

The definition of the Presentation Library for ENCs is contained in Annex A of the IHO Special Publication S-52, Appendix 2 "Colors & Symbols Specifications for ECDIS".

The strict separation between the hydrographic information contained in the ENC, operational information taken from navigation sensors and their situation related to the presentation by means of the Presentation Library, gives the flexibility to display the diversity of ECDIS information, e.g.:

- Physical chart information, (e.g. coastline, depth contours, buoys);
- Traffic routing; specified areas; cautions; etc.;
- Skipper's notes; additional local chart information; manufacturer's information;
- Own ship's position and course/speed vector; ship's heading and rate of turn; past track;
- Fix accuracy, or position check from secondary positioning system;
- Possibly ship handling options, based on ship's characteristics;
- Alphanumeric navigation information (ship's latitude, longitude, heading, course, etc.).

Under Output 5 (System is made compulsory and law enforcement)

5.1 Investigate which kinds of ships need to have the systems on board.

5.2 Approve the law and ensure the required ships carry the system and the crew is trained.

5.3 Enforce the law and penalize if and when required.

BUDGET

- The actual costs for Outputs 1, 2 and 3 are the same for each country, about USD 25,000.
- The actual costs for Output 4 will become available when the results of Outputs 1, 2 and 3 are known. Preliminary estimates are as follows: a budget is calculated per kilometer stretch and is based on the costs of the ENC project. The costs are calculated at a total price of US$ 250 per kilometer.
- The total distance for the Lao PDR and Thailand is about 1650 km between the Golden Triangle and the Khone Falls, which equals about 412,000 USD. For Cambodia, it would be about 220,000 but for Viet Nam it all depends on how much there is already available, and if it needs to be done for the canals as well – however this could be split so a start-up budget of at least 400,000 USD is needed.
- Output 5 is in-kind and controlled by the relevant authorities and control agencies.

Total estimated budget:

For the Lao PDR and Thailand:	US$ 50,000 + 412,000	= 462,000 US$
For Cambodia:	US$ 25,000 + 220,000	= 245,000 US$
For Viet Nam:	US$ 25,000 + 400,000	= 425,000 US$
Total:		**= 911,000 US$**

HUMAN RESOURCES

The work can be implemented by the relevant staff of the Waterways and Marine Department but consultants will need to be hired, especially with expertise in ENC map making. The trainees will be the Waterway Departments.

PROPOSED EXECUTING/IMPLEMENTING AGENCY

Since this is a regional project with cross-border aspects, the Waterways and Marine Department in the Lao PDR and Thailand are the implementing agencies together with the MRC Secretariat (MRCS). MRCS could, on behalf of the MRC, serve as the Executing Agency of the project. The National Mekong Committees could be the Coordinating Agencies and assist the MRCS in liaising with the government to obtain any other additional information necessary. Each NMC will be asked to make arrangements for importation procedures including custom clearances of all project equipment purchased and other government formalities.

TIME AND WORK SCHEDULE

The activities under Output 1, 2 and 3, including the tendering and contracting process, could take up to 9 months. The activities under Output 4, could take 14 months. Output 5 could take about 4 months.

Total implementation is 27 months.

SOCIAL ISSUES

This action is not expected to have any adverse social impacts. Capacity building will be important to ensure that boat operators can implement the ENC.

ENVIRONMENTAL ISSUES

There will be no negative direct impact from the project to the environment. On the contrary, the project will improve the safety of shipping on the Mekong River and is the most important aspect of navigation that will result in a reduction of risk for groundings and collisions, therefore reducing the indirect risk of pollution and environmental damage.

ECONOMIC ASSESSMENT

This action is likely to have safety improvement benefits, which are difficult to measure in economic terms.

PRIORITY OF ACTION (H/M/L)

Medium (2025-2027).

FINANCING PLAN (PUBLIC/PRIVATE)

Regional: MRCS NAP, ADB - GMS (Greater Mekong Sub region).

International: World Bank, European Union, Flanders / Belgium, Australia aid, KOICA (Korea), JICA (Japan), ASEAN IAI (receiving funds from Australia, Japan, etc.).

PRIOR ACTIONS REQUIRED

None.

FOLLOW-UP ACTIONS REQUIRED

None.

4.9 LONG TERM NAVIGATION SAFETY ACTION 2 (LNS2)

TITLE

Implement RIS (River Information Services) over the total length of the Mekong River

BACKGROUND AND RATIONALE

River Information Services (RIS) support the planning and management of traffic and transport operations. It can contribute significantly to a more efficient and safer use of waterways, locks, bridges and terminals by enhancing and optimizing electronic data interchange and logistics operations. It is invaluable for waterway authorities in supporting traffic management tasks and dangerous goods monitoring and will become of great use for commercial actors. RIS will lead to increased competitiveness of Mekong inland navigation and improved safety, and needs to be implemented and further developed in a coordinated way within the framework of the trans-Mekong networks.

The MRC member countries are working to develop their information systems in more basin-related activities. National ownership of data is getting more difficult to defend as more extensive and advanced information sharing systems are developed, and regional (and international) cooperation and integration is regarded as important to ensure economic growth and social welfare.

Transport statistics is an input commonly used to analyze national and regional development characteristics and to formulate socio-economic forecasts. All governments in the Lower Mekong Basin have committed themselves to ASEAN integration and are aligning their investments and policies to the visions and policy objectives defined within this cooperation framework.

Operational information is critical for safety onboard and in-land. Prevention of accidents is a high priority for the MRC for the simple reason that many people depend largely on the resources of the Mekong for their daily living. A pollution accident could be a serious threat to the livelihoods of these people who often do not have alternatives for income generation. In addition to this, a comprehensive River Information System will also reduce travel time for the ships, thereby ensuring the waterborne transport modes' comparative advantages to other transport modes.

Collection and distribution of accurate operational data for boat users, skippers and pilots plying the Mekong River is widely missing. Only isolated efforts have been made to introduce operational information provision or to classify the waterways, maintain river surveys and databases. In addition, the efforts have only been limited to specific national stretches of the river. Hence, they are not designed for cross-border navigational purposes.

On most international rivers a concept for harmonized information services to support traffic and transport management in inland navigation, including interfaces to other transport modes, has been developed under the name of River Information Services (RIS). RIS is defined as a concept for harmonized information services to support traffic and transport management in inland navigation including interfaces to other transport modes.

In transport, and definitely in inland shipping worldwide, the use of Information and Communication Technology (ICT) is dramatically increasing. ICT is potentially an important instrument for promoting transport over water. It can provide inland shipping with a competitive edge over road transport. An important aspect is that the RIS structure also allows information sharing with transport companies, thus enhancing the efficiency of transport management.

In view of the different levels of navigation development in the riparian countries, an advanced ICT system in the LMB would only be effective and feasible once the transport infrastructure network and services are in place. However, to avoid a situation where the countries install a different system, MRC could ensure that the basic functions of River Information Servicesare in place based on a standardized system. This means that at first there would be a focus on (1) data: standardizing, harmonizing, collecting, analyzing and processing, but also (2) disseminating the most needed information, including water level forecasts and initial steps for voyage planning.

Once the development of regional navigation is well underway, the basic functions of the RIS can be expanded to allow for more advanced technological modules such as electronic charting and traffic management and vessel monitoring systems.

Before any regional services can be carried out there should be a standardized and harmonized system. To fully benefit from RIS, it is necessary that different information systems are interchangeable and capable of mutual communication. Even if a country chooses to develop its own system with special functions, it is advisable to adhere to a minimum set of basic principles. These basic principles are laid down in the data and communications standards. Once all parties adhere to these standards all over the LMB, authorities and the industry will be able to exchange data. This will mean substantial cost savings by abandoning the costly development of interfaces for the authorities and the shippers. Without standards, the industry will probably not launch applications on the market when standards are changing. Standardization of data will allow better resource management, will deliver innovative products and services and will provide the tools, knowledge, and technological capabilities to take care of business and the environment.

There is an urgent need to use the same data throughout the entire transport chain.The need for more organized, authentic and uniformly collected data in each one of the member countries cannot be overemphasized.

The standardization process will be applicable to the **operational data** (water depths, ship's position, voyage planning, and movement of dangerous goods) and the **economic data** (traffic, fleet, port and cargo data).

MRC has already taken steps towards standardizing e.g. for the navigation charts. The International Maritime and Hydrographic organizations (IMO and IHO) have developed a hydrographic and geographic information system for maritime shipping under the name of *ECDIS - Electronic Chart Data and Information System*. The development of electronic charts for inland navigation is already making progress by making use of the S-57 data standard. Although the electronic charts are already an advanced application, MRC has applied this S-57 standard under the project '*Digitizing the Hydrographic Atlas in Viet Nam'* carried out in 2003.

In short:

- RIS will enhance the safety of inland navigation in ports and rivers in a preventive sense and contribute to any remedial measuresdeemed necessary by the competent authorities.
- RIS will protect the environment by, among others, providing dangerous goods information to the competent authorities assigned to combat pollution within a pre-defined response time.
- RIS will expedite inland navigation, optimize inland port resources and manage traffic flows.
- RIS will prepare a framework for Mekong Cooperation on navigation data standards and harmonization for more effective use and easy interchange.
- RIS will build on infrastructure to exchange information to vessels and ports concerning relevant resources and the state of these resources.

LOCATION

In the four Mekong Countries.

OBJECTIVES

The **ultimate objective** is to promote freedom of navigation and increase international trade opportunities for MRC member countries' mutual benefit, and to assist in coordination and cooperation in developing effective and safe waterborne transport in a sustainable and protective manner for the waterway environment.

The **immediate objective** of the project is to establish an integrated Mekong River Information Service necessary for navigation development that covers operational data, traffic monitoring and information on navigation development and management throughout the lower Mekong Basin.

OUTPUTS AND DELIVERABLES

Output 1: RIS Implementation Plans.

Output 2: Standardization and harmonization of data.

Output 3: Mekong traffic monitoring: Cargo and passengers statistics.

Output 4: Operational services and fairway information.

ACTIVITIES

Under Output 1 (RIS Implementation Plans)

Activity 1.1 **Preliminary investigations and planning**

The development of operational information services should be initiated by reviewing the existing information systems in each of the Mekong countries and assessing what would be the most efficient system to disseminate operational advise to pilots and boat users on the Mekong waterway, taking into account the general level of development in the Mekong region, recommendations in existing reports and studies8, and financial constraints. This undertaking shall include identification of resources required for the establishment and operation of the integrated Mekong River Information Services for Navigation in each of the four countries and formulation of a detailed implementation plan.

Activity 1.2 **Detailed implementation planning**

Based on the outcome of the above activities, formulate a concrete implementation plan for the establishment of an Integrated River Information System for Mekong Navigation that includes:

1) Standardization and harmonization of data;
2) Fairway Information;
3) Voyage Planning;
4) Mekong traffic monitoring: cargo and passenger statistics.

For exchange of river information, new communication tools should be used to the extent they are accessible and reliable for the Mekong waterway users. Navigation information will not only be disseminated to the masses via newspapers and radios, but will also be exchanged among different countries.

8 PIANC has recently published a report on "Vessel Traffic and Transport Management in the Inland Waterways and Modern Information Systems" (Working Group 24 - 2002) that could be useful as a reference.

The Final Report of the Inland Navigation Demonstrator for River Information Services – INDRIS , (July 2002), could also be useful. This project is a joint venture between national public authorities, the transport industry, the ICT-industry and research institutes from Austria, Germany, Belgium, France, Italy and the Netherlands, through assistance by the European Commission.

Under Output 2 (Standardization and harmonization of data)

The standardization process will be applicable to the **operational data** (water depths, ship's position, voyage planning, and movement of dangerous goods) and the **economic data** (traffic, fleet, port and cargo data).

Activity 2.1 Identify data needs for the RIS according to output 1.

Activity 2.2 Identify specific data needs in the MRC Member Countries and identify data sources/providers. Make an overall assessment of NAP management data needs and develop this into a concept paper to guide future data collection.

Activity 2.3 Compile an initial set of data and identify data gaps or inadequate data quality. Develop regional guidelines for data collection, source criteria, data and reporting formats.

Activity 2.4 Implement the data standardization process on a national and regional level in accordance with clear deadlines and requirements. The capacity building activity on '*Navigation information and promotion training'*is expected to enhance capacities to implement such a system of overall navigation data.

Under Output 3 (Mekong traffic monitoring)

One of the most important types of information needed to support waterborne trade and traffic scenarios as well as navigation investment plans concerns reliable data on the actual cargo and passenger traffic on the river. After investment plans have been formulated, monitoring of the river traffic develops into a two-fold purpose:

1) To generate data on traffic that is not presently available and, thereby, contribute to knowledge building on Mekong navigation and proves the importance of this transport mode for local people and for tourism and trade development.
2) To collect data that will reflect whether the NAP has actually achieved the overall aim of developing and increasing regional and international trade and transport when it has been implemented for 5-6 years.

Activity 3.1 Introducing a monitoring system

Together with the national focal points and relevant line agencies andinstitutions, a detailed guideline for data collecting staff should be developed. The data to be selected for this monitoring could consist of, but is not limited to:

Cargo

- good transport in tonkilometer
- goods by origin-destination, transit, loaded, unloaded
- distance
- river-sea transport
- ferry transport
- freight in costs and revenues for cargo and for passengers

Ports

- types of cranes
- cargo throughput
- facilities (sewage, bilges reception, fresh water)

- length of quay
- type and loading capacity of quay
- towage
- pilotage
- stevedoring
- wharfing
- dangerous cargo
- demurrage
- wharehouses
- firefighting
- resource deployment
- training personnel
- customer monitoring

Fleet

- fleet characteristics (types of barges, engines, etc.)
- total fleet according to type of barges, convoys
- carrying capacity (tons and passengers)
- safety conditions of the vessel
- safety conditions on board for the crew
- accidents

Crew

- personnel information
- manpower planning
- certificates
- training

Waterways

- classification
- length, bottom width, design depth
- river banks
- height, width bridges
- maintenance
- channel markers

Activity 3.2 Quality assurance

When the first batch of data has been collected, assess the data quality and gaps in collection. Refine the data collection system according to shortcomings and the

attached guidelines. Determine the formats for presenting the data and how to disseminate data to target groups.

Activity 3.3 Regular monitoring

Determine the intervals by which the Mekong traffic monitoring should take place and how often this information should be published.

Under Output 4 (Operational services and fairway Information)

In order to safely ply the Mekong waters and to bring passengers and cargo to their destinations in the most efficient manner, pilots and boat operators need a reliable information system. A system that provides operational data on water levels, maximum flow velocities during floods, physical impediments on the waterway and maps, is much needed and is a prerequisite if the Mekong waterway is to be used by more ships and barges in the future.

Activity 4.1 Water depths and forecasts at shallow parts:

Intelligent RiverInformation Systems are developed and studied in many places around the world. For the NAP, it is desirable to start with a smaller regional river information system that provides detailed information to waterway users in well-defined areas. This activity shall initially focus on collecting, processing and disseminating the most needed information. A regional center server unit at MRCS interconnected with the countries shall serve the entire waterway in the Basin. Of course there will be very close collaboration between the NAP RIS and the *AHNIP Appropriate Hydrological Network Improvement Project9.*

The MRC river monitoring and forecasting system is based on two mathematical models and provides river level forecasts for five days. This was initially set-up to disseminate flood forecasts and warnings. This system can of course also be used for river monitoring during the low water levels so that the shippers, boat operators and pilots can plan their voyages. Depending on the river depth at certain stretches, they will be able to plan whether they should take more or less cargo. This information should be disseminated to the waterway users and local communities along the Mekong River through the most advanced and yet still accessible communication tools (*Cfr. MRC Flood warning and dissemination project)*. Based on the Hydrographic Atlas (now in digital form), the hot spots can be located and the Least Available Depths at a particular time will be known from the forecasts. Data to be collected, processed and disseminated for this purpose consists of:

(a) Water levels, bed profiles10 at specific cross sections.

(b) Tidal levels, including spring and neap tides.

(c) Maximum flow velocities during the flood season and location of the stretches were they occur.

(d) Least Required water Depths along critical stretches.

(e) Updated River maps of the navigable channel.

The predicted water levels shall be updated at least once a day by 12 p.m. Predicted levels shall be provided five days ahead.

[9]Project Under Implementation: Mekong-HYCOS » WHYCOS ...*www.whycos.org/whycos/projects/.../mekong-hycos*

[10] Can be derived from the Hydrographic Atlas but may need updating

Activity 4.2 Other Dynamic Nautical Information

(a) Exact location of physical obstructions to navigation, including natural obstructions as well as accidents and wreckages.

(b) Exact data on spills.

(c) Location of areas where river training works or recurrent maintenance dredging is planned or carried out.

(d) Traffic regulations and changes.

(e) Instructions to fleet.

(f) Aids to navigation and changes.

(g) Description and indication of the ecologically sensitive areas (for example near the habitat of the rare Mekong Dolphin – alternative routes are to be taken and speed drastically reduced).

(h) Movement of dangerous cargo.

A standard vocabulary should be used for the **"Notices to skippers"** in order to enable easy or automatic translation into the riparian languages.

In close cooperation with the MRC Environment Programme, the NAP will collect information to monitor the impacts of navigation on the water environment.

The Integrated River Information System for Mekong Navigation will also include an early-warning system to prevent disasters. Such a system should be developed in close cooperation with provincial and local disaster-preventive authorities to obtainthe most updated, and comprehensive warning system.

BUDGET

Because this project is transboundary, the budget is prepared for the whole basin, and not per country. The budget is as follows:

For **Output 1**-RIS Implementation Plans	US$210.000
For **Output 2** - Standardization and harmonization of data	US$ 130,000
For **Output 3** - Mekong traffic monitoring: cargo and passengers statistics	US$ 380,000
For **Output 4** - Operational services and fairway information	US$ 680,000
Total	**US$ 1,400,000**

Crucial for the success of this project is maintenance. That is why a 3-year maintenance plan needs to be agreed upon. Estimated maintenance costs per year are:

For the Lao PDR	US$ 90,000
For Thailand	US$ 30,000
For Cambodia	US$ 70,000
For Viet Nam	US$100,000
Total per year	**US$ 290,000**
Total over 3 years	**US$ 870,000**
GENERAL TOTAL	**US$ 2,270,000**

HUMAN RESOURCES

The work can be implemented by the relevant staff of the Waterways and Marine Departments but consultants will need to be hired, especially with expertise in RIS planning and operations.

PROPOSED EXECUTING/IMPLEMENTING AGENCY

Since this is a regional project with cross-border aspects, the Waterways and Marine Department in the Lao PDR, Thailand, Cambodia and Viet Nam are the implementing agencies together with the MRC Secretariat (MRCS). MRCS and the NMCs could, on behalf of the MRC, serve as the Executing Agency of the project.

TIME AND WORK SCHEDULE

Duration Output 1 - RIS Implementation Plans	6 months
Duration Output 2 - Standardization and harmonization of data	8 months
Duration Output 3 - Mekong traffic monitoring: statistics	18 months
Duration Output 4 - Operational services and fairway information	22 months

The outputs are overlapping, so total duration is 24 months.

Maintenance over 3 years is 36 months.

Total implementation is therefore 60 months.

SOCIAL ISSUES

This action is not expected to have any adverse social impacts.

ENVIRONMENTAL ISSUES

This action is not expected to have any adverse environmental impacts. The action could consider incorporating water quality monitoring and real-time monitoring for oil spill pollution as identified in long term environmental action 1 (LEN1).

ECONOMIC ASSESSMENT

This action is likely to have safety improvement benefits, which are difficult to measure in economic terms.

PRIORITY OF ACTION (H/M/L)

Medium (2024-2028).

FINANCING PLAN (PUBLIC/PRIVATE)

Regional: MRCS NAP, ADB - GMS (Greater Mekong Sub region).

International: World Bank, European Union, Flanders / Belgium, Australia aid, KOICA (Korea), JICA (Japan), ASEAN IAI (receiving funds from Australia, Japan, etc.).

PRIOR ACTIONS REQUIRED

None.

FOLLOW-UP ACTIONS REQUIRED

3-year maintenance must be included in the action. A strong commitment by each participating country to continue maintenance after the 3 years must be secured through a MoU.

5 AIDS TO NAVIGATION ACTIONS

5.1 SHORT TERM AIDS TO NAVIGATION ACTION 1 (SAN1)

TITLE

Improve the existing old concrete French markers (priority from Huay Xay to Luang Prabang)

BACKGROUND AND RATIONALE

Physical marking of the navigation channel of the Mekong River in the Upper sections in the Lao PDR and between the Lao PDR and Thailand, or along the upper parts in Cambodia, has not been an easy or effective task. Installing aids to navigation in extremely dangerous sections has been considered, however the complexity of the waterways in these regions and the large number of dangerous stretches makes this option prohibitively expensive. The large seasonal variability in water levels and substantial amount of flood debris in the wet season mean that, unless the markers are removed and replaced during periods of peak flows, there is a high probability of equipment damage or loss. The Middle/Upper Mekong River is difficult to navigate because of the numerous rocks and rocky outcrops, and because of the changing river levels that submerge the obstacles. These factors all create a challenging environment for maintaining a safe and reliable channel marking system in the upper Mekong.

In the early days of commercial navigation, the French transport experts made the first attempt to beacon the river and mark the channel. They were confronted with challenges: the river was wide and the navigation channel far from the banks so shore markers were not an option. Moreover, in areas such as Luang Prabang, the river levels rise almost 20m during the wet season. Shore beacons are not an option. The French experts therefore opted to erect concrete markers on strategic locations to mark the channel. These markers, which consist of a 3-to-5-meter high concrete step-structure, needed a solid foundation. Installing them on the sandy bed was impossible. Rocky outcrops were the only possibility.

The **advantages** of the French markers are clear: they are very conspicuous, can be seen from afar, and they are strong. They also provide good location reference to the skippers about where exactly they are in the river. They can be painted in white (port – or right bank) and green (starboard – or left bank) plus they are located close to the navigation channel for Thailand and the Lao PDR. They can be painted in red (port – or right bank) and green (starboard – or left bank) for Cambodia.

Disadvantages: they are not high enough. That means that if the river levels rise, these markers become submerged and become hazardous obstacles themselves. They also 'trap' debris coming down the river such as bamboo and tree branches. In some cases they are hit by entire trees floating down and get damaged.

Because they exists and they have advantages the idea is to improve them:

1) Make them high enough (using flexible extensions?)
2) Make them strong enough (repair the concrete, and apply protection bars on the upstream side).
3) Paint them (red, white or green).
4) Mark them in case they are submerged.

In the past many systems have been tried to improve the French markers but not many have been successful: pivotal systems to allow debris to hit a pole were not strong enough and broke, the 'spring coil-markers' consisting of 4m high carbon poles sitting on spring-coils were also not strong enough because the coils broke. So careful product design is needed before improvements are done.

Perhaps a much stronger spring-coil with high flexible pole to be fitted to the top of the markers (or just behind it) could be further studied.

The most important and priority stretch is between Huay Xay and Luang Prabang as most of the passenger traffic and tourism is there.

LOCATION

Lao PDR, Myanmar, Thailand and Cambodia.The project area covers the Mekong River from the Green Triangle (Triangle between PR China, Myanmar and Lao PDR) downstream to Kratie where the existing French markers are located.

OBJECTIVES

The **ultimate objective** is to promote freedom of navigation and increase international trade opportunities for MRC member countries' mutual benefit, and to assist in coordination and cooperation in developing effective and safe waterborne transport in a sustainable and protective manner for the waterway environment. The current project will support the ultimate objective through finding solutions to navigate during all river level situations and focus on the safety of navigation, especially through the rapids and rocky areas.

The **immediate objectives** of the project are:

1) To investigate the best way to improve the design and structure of the French markers.
2) To have an inventoryand plan which French markers need to be improved and which ones to be removed.
3) To improve the French markers.

OUTPUTS AND DELIVERABLES

Output 1: The optimal design is found and tested

Expected Deliverables:

- Research Results of the best structure, protection and visibility.

Output 2: An inventory and plan ofwhich French markers need to be improved and which ones to be removed

Expected Deliverables:

- A database of all existing French markers, including their condition;
- An inventory of the French markers that will be improved
- Animplementation plan on how to improve the markers, including budget, terms of reference and bills of quantity.

Output 3: The most important French markers are improved and navigation is safer

Expected Deliverables:

- Bidding and contracting.
- The selected French markers are appropriately improved.

Output 4: A maintenance plan and budget is in place

Expected Deliverables:

- A maintenance plan, including budget and training.

ACTIVITIES

Under Output 1 (The optimal design is found and tested)

1.1 Start research on how to improve the markers taking into consideration that the markers are:

1) High enough, possible with flexible extensions so that they are also visible during the wet season.
2) Strong enough (repair the concrete, and apply protection bars on the upstream side).
3) Visible enough by painting (red, white or green).
4) Marked in case they are submerged.

Under Output 2(An inventory and plan of which French markers need to be improved and which ones to be removed)

2.1 Site visits of all the markers during the lowest low water levels.

2.2 Prepare a full database of all French markers including their condition.

2.3 Prepare an inventory of the French markers that will be improved.

2.4 Prepare an implementation plan on how to improve, including a budget.

2.5 Prepare terms of reference, bills of quantity and bidding documents.

Under Output 3 (The most important French markers are improved and navigation is safer)

3.1 Conduct bidding and contracting.

3.2 Start the construction and repair works with priority on the stretch Huay Xay – Luang Prabang.

Under Output 4 (A maintenance plan and budget are in place)

4.1 Ensure a maintenance plan is being kept and followed.

4.2 Ensure the budget for maintenance is guaranteed and the responsible agency is assigned.

BUDGET

- An initial budget for Research and Development (Output 1) should be reserved for about 50,000 US$. The results of this output can be used for adjusting all French markers in the Lao PDR, Thailand and Cambodia.
- The actual costs for Output 2 are about 20,000 US$ for the stretches between Huay Xay and the Khone Falls (Lao PR and Thailand). The actual costs for Output 2 in Cambodia are about 15,000 US$.
- The actual costs for Output 3 will become available when the results of Outputs 1 and 2 are known. Preliminary estimates are as follows: for the stretches between Huay Xay and the Khone Falls (Lao PR and Thailand)150,000 US$ and for Cambodia 80,000 US$.
- The actual costs for Output 4 will become available when the results of Outputs 1 and 2 are known. Preliminary estimates are as follows: for the stretches between Huay Xay and the Khone Falls (Lao PR and Thailand) 40,000 US$ for 5 years, and for Cambodia 25,000 US$ for 5 years.

Total estimated budget:

For Output 1 (for all countries)	= 50,000 US$
For Outputs 2, 3 and 4:	
For the Lao PDR and Thailand: 20,000 + 150,000 + 40,000	= 210,000 US$
For Cambodia: 15,000+ 80,000 + 25,000	= 120,000 US$
Total:	**= 380,000 US$**

As a Priority Project the stretch Huay Xay – Luang Prabang could be done first and would cost:

For Output 1	= 50,000 US$
For Outputs 2, 3 and 4:7,000 + 70,000 + 10,000	= 87,000 US$
Total:	**= 133,000 US$**

HUMAN RESOURCES

The work can be implemented by the relevant staff of the Waterways and Marine Departments but consultants will need to be hired, especially with expertise in Research and Development. The trainees will be the ship's captains and pilots, and relevant waterway department staff.

PROPOSED EXECUTING/IMPLEMENTING AGENCY

Since in the Lao PDR and Thailand this is a regional project with cross-border aspects, the Waterways and Marine Department in Lao PDR and Thailand are the implementing agencies together with the MRC Secretariat (MRCS). MRCScould, on behalf of the MRC, serve as the Executing Agency of the project. The National Mekong Committees could be the Coordinating Agencies and assist the MRCS in liaising with the government to obtain any other additional information necessary. Each NMC will be asked to make arrangements for importation procedures including custom clearances of all project equipment purchased and other government formalities.

In Cambodia and in Viet Nam implementation can be done on a national level but MRC could assist in ensuring the systems are compatible between both countries.

TIME AND WORK SCHEDULE

The activities under Output 1 could take up to 4 months.

The activities under Outputs 2 and 3 could take 5 months.

Total implementation is 9 months. Maintenance is set initially at 5 years.

SOCIAL ISSUES

This project is not expected to have any adverse social impacts.

ENVIRONMENTAL ISSUES

There will be no negative direct impacts from this project to the environment. The project may have positive impact on the environment: improving the safety of shipping on the Mekong River reduces the risk of groundings, collisions, accidents and water pollution.

ECONOMIC ASSESSMENT

This action is likely to have safety improvement benefits, which are difficult to measure in economic terms.

PRIORITY OF ACTION (H/M/L)

High for priority stretch (2016), Medium for the remaining (2017).

FINANCING PLAN (PUBLIC/PRIVATE)

National

Regional: MRCS NAP, ADB - GMS (Greater Mekong Sub region).

International: World Bank, European Union, Flanders / Belgium, Australia aid, KOICA (Korea), JICA (Japan), ASEAN IAI (receiving funds from Australia, Japan, etc.).

PRIOR ACTIONS REQUIRED

None.

FOLLOW-UP ACTIONS REQUIRED

Maintenance of the French markers will be crucial.

5.2 SHORT TERM AIDS TO NAVIGATION ACTION 2 (SAN2)

TITLE

Constructand install clearly visible low water alert gauges in all remaining important places for navigation along the Mekong to indicate the water levels above the local chart datum

BACKGROUND AND RATIONALE

All MRC Member Countries have acknowledged that safe navigation should be one of the fundamental underpinnings for regional transportation development. It is clear that safety issues have not been high on the agenda when discussing water transportation. Yet improving safety and increasing navigation efficiency go hand in hand. All measures that reduce accidents and collisions enhance safety. Examples, such as correct ship inspection, installation of buoys and beacons, other aids to navigation facilities, communication, appropriate charts, proper training, river policing and dredging works to clear hot spots, would all have positive consequences for the efficiency of water transportation. These would allow rapid increases in trade once these navigation, real-time information and inland water vessels traffic systems and regulations are in place. Allocation of resources to maintain modern standardized and accurate navigation aids should be given high priority. Safe navigation is one of the fundamental underpinnings of the strategy implementation.

During the formulation of the MRC Navigation Programme 2011-2015, three specific aids to navigation systems were considered for Upper Mekong Navigation. They include:

1) Automatic Identification System (AIS);
2) Critical Low Water Level Alerts; and
3) Radio Communication Systems.

As these three systems are inter-linked and fall under the same category, it was decided to prepare the feasibility study on the three together and to prepare implementation plans for all.

On 7 August 2014 a meeting was held between MRC Secretariat and the Thai Marine Department to discuss development of new aids to navigation along the Upper Mekong River. The meeting agreed that the Marine Department would conduct a Feasibility Study covering the three topics. Indeed, AIS, Communication Systems and Water Level Alert Systems could essentially help improve vessel safety and make voyage planning more efficient. Therefore, the first step should be the feasibility and detailed study of these components. Discussions were also held with the Waterway Department in the Lao PDR who agreed with the institutional set-up of the project.

Critical Low Water Level Alerts

The water levels of the Upper Mekong were exceptionally low over the last years. The lack of access to water has not only made livelihoods from farming and fishing difficult for affected communities but the very low water levels have disrupted river transportation. Moreover, navigation has become particularly dangerous: submerged rocks that were not previously known to the waterway users suddenly became additional obstacles to navigation. In one instance a cruise boat with more than thirty tourists on board hit rock bottom, which pierced the hull sinking the boat within ten minutes. The location of this obstacle was not known before. Even on the Lancang River numerous boats have run aground and had to stay in the middle of the river for weeks before the water levels started to rise again.

At one stage, mainly as a result of the surge in boating accidents, navigation was stopped at several stretches along the river. Suitable low water level warning systems made available by the authorities could prevent many of the accidents and groundings and enable skippers to take more cargo depending on the available water depths.

It is clear that the Lao PDR and Thailand should have Low Water Navigation Alert Systems. As this may be quite complex, it needs to be done in phases, starting with a more simple approach leading

to a comprehensive and full functioning system. The idea is to alert the waterway users at different locations of water levels where,once reached, navigation becomes dangerous. As a next step, forecasts can be integrated.

Warnings for low water levels for navigation are different than flood warnings. There is actually not one level per station that can be called the critical level. This is because there are different classes of boats with draughts ranging from 0.5m to 3.5m. A critical level for the highest class of vessel is of course not so dangerous for small boats.

In addition to this, it is necessary to find a reliable way of indicating what the water level is at a specific dangerous area (shallow) at the moment a ship is passing and particularly what the most dangerous level is. This can be done by erecting Low Water Level Gauges. This 'guiding' mark is very efficient but careful planning is needed as well as full knowledge of the riverbed along the stretch. The Critical Low Water Level Alertsystem can be a useful tool for other users (importer, exporter) to determine whether they are ready for their voyage.

Even though the Feasibility Study is currently (2015-early 2016) being undertaken by Thailand, the results will also be useful for Cambodia and Viet Nam.

LOCATION

Although the Feasibility Study only covers the area between the Golden Triangle and Phadai (border point, 30 km downstream Chiang Khong), the project area for implementation will be the whole Mekong River from the Green Triangle to the sea: Thailand, Lao PDR, Cambodia and Viet Nam.

OBJECTIVES

The **overall objective** of the Project is to improve safety/security and vessel/port efficiency through the development of selected navigational aids.

Specific objectives:

1) Review the results of the technical feasibility and economic viability, conducted by Thailand, of developing the Critical Low Water Level Alerts, and expand the area of investigation and implementation to the four Member States.
2) Prepare a draft detailed procurement and implementation plan.
3) Develop and install the Critical Low Water Level Alerts, including visual gauges, where and when as determined in Objective 1.

OUTPUTS AND DELIVERABLES

Output1: Based on the results of the Feasibility Study conducted by the Thai Marine Department[11], an extended Economic and Technical Viability Report with recommendations clearly showing where else along the Mekong River (in the four Member States) the Critical Low Water Alerts are required.

Expected deliverables:

- Extended Feasibility Report on Critical Low Water Alerts for the whole Mekong River, in particular for Visual Low Water Level Gauges and Alert, and AutomaticLow Water Alert Stations;
- Locations are decided;
- Navigation conditions (LADs for the specific areas) are determined;

[11]In cooperation with MRC Navigation Programme, 2015-early 2016.

- Final design and construction materials determined;
- Capital costs are defined.

Output 2: A Detailed Procurement and Implementation Plan based on the results of the Feasibility Study

Expected deliverables:

- Detailed Procurement Plan per country[12];
- Detailed Implementation Plan per country[13].

Output 3: Critical Low Water Alert systems are developed and Installed in the four Member States, including provisions for training, use and maintenance

Expected deliverables:

- Visual Low Water Level Gauges and Alerts are installed and Automatic Low Water Alert Stations and systems are functioning;
- Training and awareness campaigns are conducted;
- Maintenance plans for the next 10 years are in place and budgets are reserved.

ACTIVITIES

Under Output 1 (Expansion of the Feasibility Study)

1.1 Extended field visits in the four Mekong Countries to gather information on the topographical limitations of installing low water alert gauges and systems.

1.2 Check the river condition and river characteristic of the project site. Discuss with the provincial and local agencies.

1.3 Decide where to locate the low water gauges.

1.4 Assign the maximum draught required for traversing.

1.5 Define the final design and construction materials for the visual gauges.

1.6 Define the final design and equipment for the automatic system.

1.7 Detail what the capital costs are.

1.8 Detail what the maintenance of the system holds, and what would be the cost.

Under Output 2 (Detailed Procurement and Implementation Plan)

2.1 Based on the results of the F/S and the recommendations, decide which components will be implemented, where and when.

2.2 Prepare a draft detailed Procurement Plan.

2.3 Prepare a draft detailed Implementation Plan.

2.4 Prepare a draft document for requesting human and financial resources to implement the feasible components of the Project.

[12] For the common stretches between the Lao PDR and Thailand, implementation may be shared.

[13] For the common stretches between the Lao PDR and Thailand, implementation may be shared.

Under Output 3 (Development and Installation)

3.1 After tendering and contracting, receive and clear the goods.

3.2 Conduct the required surveys – hydrographic and topographic.

3.3 Ascertain the maximum draught required with local vessel operators and waterway authorities.

3.4 Ensure the gauges must still be numerically calibrated to the chart datum.

3.5 Install the visual gauges.

3.5 Install the Automatic System.

3.6 Prepare a Training Needs Assessment, and on-the-job training plan.

3.7 Select the relevant staff members to be trained.

3.8 Train the staff in all relevant fields identified in the Assessment.

BUDGET

- The actual costs for Outputs 1 and 2 are about 90,000 US$ for the stretches between the Green Triangle and the Khone Falls. The actual costs for Outputs 1 and 2 in Cambodia are about 40,000 US$. The actual costs for Outputs 1 and 2 in Viet Nam are about 50,000 US$.
- The actual costs for Output 3 will become available when the results of the feasibility study are known. Preliminary estimates are as follows: for the stretches between the Green Triangle and the Khone Falls 450,000 US$, for Cambodia 220,000 US$ and for Viet Nam 320,000 US$.

Total estimated budget:

For the Lao PDR + Thailand: 90,000 + 450,000	=	530,000 US$
For Cambodia: 40,000 + 220,000	=	260,000 US$
For Viet Nam: 50,000 + 320,000	=	370,000 US$
Total:		**= 1,160,000 US$**

HUMAN RESOURCES

The work can be implemented by the relevant staff of the Waterways, Marine Department and VIWA but consultants will need to be hired, especially with expertise in topographic leveling, and Automatic Alert Systems. The trainees will be the ship's captains and pilots, and relevant waterway department staff.

PROPOSED EXECUTING/IMPLEMENTING AGENCY

Since in the Lao PDR and Thailand this is a regional project with cross-border aspects, the Waterways and Marine Department in Myanmar, Lao PDR and Thailand are the implementing agencies together with the MRC Secretariat (MRCS). MRCScould, on behalf of the MRC, serve as the Executing Agency of the project. The National Mekong Committees could be the Coordinating Agencies and assist the MRCS in liaising with the government to obtain any other additional information necessary. Each NMC will be asked to make arrangements for importation procedures including custom clearances of all project equipment purchased and other government formalities.

In Cambodia and in Viet Nam implementation can be done on a national level but MRC could assist in ensuring the systems are compatible between both countries.

TIME AND WORK SCHEDULE

The activities under Output 1 and 2, including the tendering and contracting process, could take up to 6 months.

The activities under Output 3, could take 16 months.

Total implementation is 22 months.

SOCIAL ISSUES

This project is not expected to have any adverse social impacts. A communication plan to all waterway users on using the low water alert gauges would improve the effectiveness of the system.

ENVIRONMENTAL ISSUES

There will be no negative direct impacts from this project to the environment. The project may have positive impacts on the environment. Improving the safety of shipping on the Mekong River reduces the risk of groundings, accidents and water pollution.

ECONOMIC ASSESSMENT

This action is likely to have safety improvement benefits, which are difficult to measure in economic terms.

PRIORITY OF ACTION (H/M/L)

High for priority stretchesin Lao PDR and Thailand (2016-2017). Medium for the remainingstretches in Cambodia and Viet Nam (2018-2019).

FINANCING PLAN (PUBLIC/PRIVATE)

National

Regional: MRCS NAP, ADB - GMS (Greater Mekong Sub region).

International: World Bank, European Union, Flanders / Belgium, Australia aid, KOICA (Korea), JICA (Japan), ASEAN IAI (receiving funds from Australia, Japan, etc.).

PRIOR ACTIONS REQUIRED

None.

FOLLOW-UP ACTIONS REQUIRED

Maintenance of the visual gauges and automatic alert system will be crucial.

5.3 SHORT TERM AIDS TO NAVIGATION ACTION 3 (SAN3)

TITLE

Develop and install a GPS Navigation Guidance System, compulsory for all boats carrying cargo and passengers along the Mekong River between the Green Triangle and Huay Xay

BACKGROUND AND RATIONALE

Low water levels in the Mekong River are a problem for navigation. Ships have no other option but to use the deepest channel in the river or risk grounding or striking a rocky bed. Means have to be found to guide the skippers through these channels. Without guidance these channels cannot be observed unless the vessels are piloted by extremely knowledgeable experts who have done this throughout their life and know the channel's location. Even then accidents happen or boats get stuck. Needless to say, climate change is impacting the water levels and, thus, navigation. Tracing the deepest channels will therefore become even more challenging and vessels need to adapt.

Physical marking of the navigation channel of the Mekong River in the Upper sections in the Lao PDR and between the Lao PDR and Thailand has not been an easy or effective task. Installing aids to navigation in extremely dangerous sections has been considered. However the complexity of the waterways in these regions and the large number of dangerous stretches makes this option prohibitively expensive. The large seasonal variability in water levels and substantial amount of flood debris in the wet season mean that unless the markers are removed and replaced during periods of peak flows, there is a high probability of equipment damage or loss. The Middle/Upper Mekong River is difficult to navigate because of the numerous rocks and rocky outcrops, and because of the changing river levels that submerge the obstacles. These factors all create a challenging environment for maintaining a safe and reliable channel marking system in the Upper Mekong.

An alternative approach to vessel guidance is therefore necessary on these stretches. Rather than relying on the physical markers and their associated maintenance and cost challenges, navigators should utilize new low-cost technologies in the form of GPS course guidance and identification of submerged hazards. Working with the already skilled navigators of river-navigating vessels, the optimal course for wet and dry seasons could be recorded and displayed on a digital chart, providing a visual tool that would allow navigators to ensure they are on course, and alert them of any hazards that might be approaching. By recording an ideal course with outer limits for safety and overtaking, it is possible to provide an accurate level of route guidance, while allowing for potential GPS accuracy issues. This system would allow the navigator to keep the vessel on a predetermined track and as such avoid underwater obstacles and rocky outcrops. During heavy rains, which seriously reduce visibility, the navigator could still reach the safety of port by steering with assistance from the digital chart.

The proposed system would incorporate a number of other advantages including:

1) 1The ETA (Estimated Time of Arrival) of vessels could be determined with great accuracy as the pilots could determine the distance remaining to reach the next destination.
2) Vessels could sail cautiously in conditions with bad visibility caused by dense rain or fog and from sailing during twilight hours.
3) In emergency situations, vessels could continue to sail in extreme weather such as heavy rain and winds.
4) The Government could have control and registration of accidents by checking the GPS readings and track logs of vessels.

In addition to the aforementioned benefits, vessels could continue to sail into the late evening and night just to reach a safe port (although due diligence would be required as it is strongly advised only to sail during daylight hours).

The Project will also include the purchase of twenty (20) fixed GPS units that will be installed on selected boats in the project area for trial purposes and five (5) mobile GPS units that will be used by the local waterway authorities for accident investigation and incident recording.

In addition to the aforementioned tasks, data collected from the early stages of the project must be combined with other spatial datasets including the updated digital hydrographic atlas and uploaded to the GPS units to provide a resource of handheld devices containing a universal navigation dataset of the basin for use in future projects and research.

In 2014 a GPS pilot project was done from Huay Xay downstream to Luang Prabang Cargo Port. This project was highly successful and is being used constantly by the river pilots in this stretch.

LOCATION

Lao PDR, Myanmar and Thailand.The project area covers the Mekong River from the Green Triangle (between PR China, Myanmar and Lao PDR) downstream to Huay Xay for a total length of 293 km.

OBJECTIVES

The **ultimate objective**is to promote freedom of navigation and increase international trade opportunities for MRC member countries' mutual benefit, and to assist in coordination and cooperation in developing effective and safe waterborne transport in a sustainable and protective manner for the waterway environment. The current project will support the ultimate objective through finding solutions to navigate during low water situations and encouraging effective and safe cross-border waterborne transport on a critical cross-border navigation route.

The **immediate objectives** of the project are:

1) To identify and record the deepest navigation route along the river thereby improving navigation safety through the establishment of an officially recommended course.
2) To promote waterway use, improved safety and better environmental outcomes through the use of electronic mapping resources.
3) To test the feasibility of GPS navigation devices as an aid to navigation on the Upper Mekong and build capacity in the use of this technology among waterway users.

OUTPUTS AND DELIVERABLES

Output 1: Completed 60m-wide, high resolution bathymetric survey of the traditional navigation route

Expected Deliverables:

- The traditional navigation route used by vessels is recorded.
- Bathymetric survey results (multibeam echo sounding) with imagery 'sweep' of the 60m channel to identify any potential hazards to navigation.
- A classification at lowest low water levels (0m – 1m below surface, 1m – 2m below surface, 2m – 3m below surface, >3m below surface).

Output 2: GIS format mapping outputs suitable for use in GPS devices

Expected Deliverables:

- The results of Output 1 are digitally attributed on advanced GIS map sets with different layers (optimal route, course centreline, buoys/beacons, submerged danger marks, ports, etc.)

Output 3: GPS equipment is installed on 20 vessels, vesselcaptains are trained on the use of new GPS maps and vessel tracking systems

Expected Deliverables:

- Vessel owners and pilots are identified for participation in the project.

- GPS devices are supplied to the participants in the program.
- The advanced map dataset is pre-loaded onto each of these devices to cover the stretches of river within the project area.
- This information is correct and suitable for use in navigating the river.
- Training is provided to the users of this equipment.

ACTIVITIES

Under Output 1 (Completed 60m wide bathymetric survey of the traditional navigation route)

1.2 Before the deepest (or optimal) route is found, recordthe traditional route (routes taken by the best pilots on the river) using high accuracy (differential, where possible) GPS receivers with external antennas. Nominate three separate vessels of at least 200 DWT (as large as possible) to be used for plotting the courses. GPS antenna should be placed at the centre point of the bridge of the vessel and the track of the vessel recorded at one second intervals. The traditional route should be recorded on three separate occasions for each of the two scenarios outlined below. The traditional vessel route should be recorded in both upstream and downstream directions to ensure consistency.

1.3 Analyze the results from recording the traditional navigation route and merge to create a definitive line representing the traditional navigation route for the project area.

1.4 Conduct a bathymetric survey using a multibeam echo sounder to verify the safety of the above identified course lines. The proposed survey area should extend to a maximum of 30m either side of the course line.

1.5 Identify any potential hazards and areas of riverbed/rock that have the potential to be less than 3m below the surface of the water at lowest low water level (CD). Soundings should then be taken in high detail to provide sufficient information to identify the object. In these areas a 1m grid should be used for collecting sounding data. That is, transects should aim to be spaced 1m apart, with soundings collected at intervals of 1m. This should be considered a base level of data collection for these areas, with more information being considered desirable.

Under Output 2 (GIS format mapping outputs suitable for use in GPS devices)

2.1 Analyze the results of the bathymetric survey using software tools (ArcGIS, Hypack, etc.) to interpolate a surface of the riverbed within the navigation corridor. This surface should then be classified to identify any potential obstacles or constraints to the 60m navigation fairway, based on the following classification at lowest low water levels:

(a) Exposed Obstacles

(b) 0m – 1m below surface

(c) 1m – 2m below surfac

(d) 2m – 3m below surface

(e) >3m below surface

2.2 The bathymetric survey should also record the position of existing features and aids to navigation that are present on these stretches (both newly installed buoys/beacons) including reference waypoints (ports/landings etc.), lateral buoys and beacons, or any other key waypoints that are not already recorded in the hydrographic atlas.

2.3 Attribute the results of Outputs 1 and 2 correctly based on the results of the bathymetric surveys and the recording of waypoints along the river. This will produce the following outputs:

(f) Bathymetric Survey Results (ESRI Point Shapefile)

(g) Navigational Aids (ESRI Point Shapefile)

(h) Isolated Danger Marks (ESRI Point Shapefile)

(i) Navigation Centreline (ESRI Line Shapefile)

(j) Depth Classified Navigation Fairway – As per Output 1 classification scheme (ESRI Polygon Shapefile)

(k) Port and Landing Facilities (ESRI Point Shapefile)

(l) GeoTIF Stitched Sidescan Sonar Imagery (Georeferenced TIF/JPG)

2.4 Integrate this information with data layers from the existing hydrographic atlas and updated chart datum determination to produce a basic GPS dataset in GPX file format that contains the following:

(a) Course Centreline

(b) Port and Lateral Buoys/Beacons

(c) Submerged Danger Marks

(d) Port and Landing Facilities

2.5 Produce an advanced GPS map set using GPSMapper or Mapwel software to create a comprehensive graphical map set of the project area. This information should be integrated with data layers from the existing hydrographic atlas and updated chart datum determination to produce graphical maps in Garmin IMG format that contain the following:

a) Course Centreline

b) Port and Lateral Buoys/Beacons

c) Submerged Danger Marks

d) Port and Landing Facilities

e) Navigation Fairway

f) Classified Navigation Corridor Depths

g) KM Markers

h) River Area

This dataset should include appropriate name and description content based on the entity being displayed (i.e. Port Name, Beacon ID). If necessary this data may be tiled across multiple IMG files to support the efficient functioning of the GPS map.

Under Output 3 (installed GPS equipment and trained vessel captains)

- Select vessel owners and pilots for participation in the project. Larger vessels, those carrying dangerous goods and passenger vessels should take priority as the GPS system will reduce the risk to these important cargoes.
- Supply 20 GPS devices to the participants in the program. The devices must have at least a 5” diagonal screen size and support Garmin format map data in IMG format. Fixed devices must be installed on the aforementioned vessels inclusive of external antenna and power supplies.
- Pre-load the dataset onto each of these devices to cover the stretches of river within the project area. This information should be verified as correct and suitable for use in navigating the river by conducting at least one test run in both directions with the assistance of the river pilots that participated in the Output 1 recording of the traditional navigation route.
- Provide training to the users of this equipment, including:

- Loading of correct map data
- Loading of correct course line
- Waypoint creation
- Destination setting
- Real-time navigation using GPS devices
- Appropriateness of use and safety issues regarding use of GPS for commercial vessel navigation.

BUDGET

Estimated budget is calculated per kilometer stretch and is based on the costs of the GPS project between Huay Xay and Luang Prabang, including indexing. The costs are calculated at a total price of US$ 1,350 per kilometer.

Since the total distance here is 293 km @ 1,350 US$/km equals **US$ 395,000**.

HUMAN RESOURCES

The work can be implemented by the relevant staff of the Waterways and Marine Department but consultants will need to be hired, especially with expertise in bathymetric surveying, navigation and GIS and digital mapping. The trainees will be the ship's captains and pilots.

PROPOSED EXECUTING/IMPLEMENTING AGENCY

Since this is a regional project with cross-border aspects, the Waterways and Marine Department in Myanmar, Lao PDR and Thailand are the implementing agencies together with the MRC Secretariat (MRCS). MRCScould, on behalf of the MRC, serve as the Executing Agency of the project. The National Mekong Committees could be the Coordinating Agencies and assist the MRCS in liaising with the government to obtain any other additional information necessary. Each NMC will be asked to make arrangements for importation procedures including custom clearances of all project equipment purchased and other government formalities.

TIME AND WORK SCHEDULE

The activities under Output 1 and 2, including the tendering and contracting process, could take up to 9 months.

The activities under Output 3, could take 4 months.

Total implementation is 13 months.

SOCIAL ISSUES

This action would improve safety for local passengers and tourists and may increase the use of IWT creating economic opportunities for local waterway users. It will be important that all users have access to the GPS technology, ensure that microfinance loans or other financial mechanisms are available.

ENVIRONMENTAL ISSUES

The project may have positive impacts on the environment. Improving the safety of shipping on the Mekong River reduces the risk of groundings, collisions, accidents and water pollution. This action could increase the number of passengers using IWT so it is important that ports and vessels consider additional waste facilities. The navigation guidance system could be used to indicate waste facilities along the Mekong River. There may also be an opportunity for boat operators to use this system to report the location of dangerous areas, accidents and environmental issues along the waterway.

ECONOMIC ASSESSMENT

This action is likely to have safety improvement benefits, which are difficult to measure in economic terms.

PRIORITY OF ACTION (H/M/L)

Medium(2018).

FINANCING PLAN (PUBLIC/PRIVATE)

Regional: MRCS NAP, ADB - GMS (Greater Mekong Sub region).

International: World Bank, European Union, Flanders / Belgium, Australia aid, KOICA (Korea), JICA (Japan), ASEAN IAI (receiving funds from Australia, Japan, etc.).

PRIOR ACTIONS REQUIRED

None.

FOLLOW-UP ACTIONS REQUIRED

None.

5.4 SHORT TERM AIDS TO NAVIGATION ACTION 4 (SAN4)

TITLE

Improve the existing GPS Navigation Guidance System and make it compulsory for all boats carrying cargo and passengers along the Mekong River between Huay Xay and Luang Prabang

BACKGROUND AND RATIONALE

The Mekong River between Huay Xay and Luang Prabang is not an easy waterway for skippers and boat operators. The river here is full of rocks, shoals, bends and whirlpools. Moreover, debris and strong currents destroy markings in the navigation channel. Installing aids to navigation in these extremely dangerous areas has been done but the complexity of it made the operations very expensive, and not sustainable. The large seasonal variability in water level and substantial amount of flood debris in the wet season mean that the markers are removed and replaced during periods of peak flows, and therefore there is a high probability of equipment damage or loss.

That is why, in April 2012, the Mekong River Commission (MRC) Navigation Programme (NAP) has developed the GPS Vessel Guidance System and Low Water Alert System along the Mekong River between Luang Prabang and Huay Xay. The project is part of the MRC Navigation Strategy and Programme Component 3 (Traffic Safety and Environmental Sustainability), which aims to improve safety of navigation. The GPS Vessel Guidance System for vessel guidance is necessary here. Rather than relying on the physical markers and their associated maintenance and cost challenges, navigators can now utilize new low-cost technologies in the form of GPS course guidance and identification of submerged hazards. Working with the already skilled navigators of river-navigating vessels, the optimal course for wet and dry seasons has been recorded and displayed on a digital chart, providing a visual tool that allows navigators to ensure they are on course, and alert them of any hazards that might be approaching. By recording an ideal course with outer limits for safety and overtaking, it is possible to provide an accurate level of route guidance, while allowing for potential GPS accuracy issues. This system allows the navigator to keep the vessel on a predetermined track and thus avoid underwater obstacles and rocky outcrops. During heavy rains, which seriously reduce visibility, the navigator can still reach the safety of port by steering with assistance from the digital chart.

In 2013 the project results have been evaluated for their efficiency and to define which improvements would be required. During the tests the stakeholders have found the new system and technology as excellent.

The pilots made the following observations and recommendations:

- A dual system of 'Optimal Routes' should be established: one for low and medium water levels and one for thigh water levels. The reason for this request is that the skippers claim that too much fuel is being consumed if the longer Low Water Routes need to be followed when the river levels are safe enough to take the shorter routes. Another factor may be that the Optimal Route needs to be adjusted according to river depths.
- It is an excellent navigation tool especially for the young and new learning pilots.
- The percentage of ships that followed the new Optimal Navigation Route: (i) For upstream sailing: during the low water season almost all boats with capacity less than 50 ton navigated in the ONR, in medium water level around 80 percent followed the ONR, and in the high water season only 50% followed the ONR; (ii) For downstream sailing: around 95% to 100% followed the ONR.
- It will much better if GPS can provide sounding information 100m in advance.
- GPS device don'twork well when boats are out of the track line, especially when boats come in/out of the port areas;

- Currently, if a GPS unit is directly connected to a boat battery it makes it hot at the connection point and can be burned. If possible, pilots requested to have another brand of GPS device with an external battery box so they can charge it at home like a mobile phone charger.
- Nearby Pak Beng, at Pha Mone area, boats are moving but the base map doesn't move.
- GPS devices don't work well in the early morning with heavy fog.
- Nearby the Long Tong area the GPS base map is moving but the arrow doesn't move.
- Need for better hydrographic survey results in the following areas:
    - The Optimal Navigation Routes between Hat Don Keo (km 2,294) and Huay Xay (km2,314.5) given that in these areas there may be a problem during the low water season;
    - Check electric lines crossing the river at Ban Huay Xay (km2,272) and at Keng Phak (km2,254);
    - Of the right channel at Keng Khon Din (km 2,223);
    - Of the Optimal Navigation Route at Keng Khon Din (km 2,223) as on the map the water depth shows more than 3 meters, but in reality it is lower;
    - At the right bank of Keng Oy (km 2,037) for downstream sailing purposes; the existed ONR is useful for upstream sailing only;
    - At the small channel at the right bank at Keng Phoun (km2,109);
    - Of Keng Khen (km2,051) as the designed ONR cannot be navigated during the low water level/season;
    - At the right bank of Keng Oy (km 2,037) for downstream sailing purposes; the existing ONR is useful for upstream sailing only;
    - The Optimal Navigation Route at Ban Sang Hai (km 2,027); the existing ONR is out of track;
    - Need more surveys for new Optimal Navigation Route at Keng Khen (km2051) given that the designed ONR cannot navigate during the low water level.

The following recommendations were made by the Waterway Department, MPWT:

- Coordinating between supplier and users should be established as soon as possible;
- Any activities of the hydrographical survey activities along the Mekong River in Lao territory and between Lao and Thailand should get the permission from the Waterways Department;
- Not all channels have been surveyed where boats can navigate upstream and downstream by different channels;
- The water depth data should be covered to all access ways, port areas and to main villages;
- Need more surveys in some rapids areas where boats navigate with two channels;
- Alternative routes need to be considered;
- One full set of hydrographic survey data should be available at the Waterway Department for monitoring and investigation;
- Language use on the map should be changed to Lao language;
- Need a description on how to read the water depth even if the legend has been provided;
- A local and regional service office should be established;

- The maps should provide useful information not only for GPS base map but also for channel improvement works;
- The system uses high standard, accurate maps and comprehensive software so provision of adequate management and source of financial support should be considered.

The following observations and recommendations were made by the Provincial PWT Department:

- The system provides in short time to be experienced pilots;
- System better than the old learning system " Generations to Generations";
- System helps to reduce the rate of hiring pilots;
- Contact the River Sector before carrying out of any hydrographic survey;
- Technical staff of River Sectors has the right to participate in any survey activities on their river territory;
- The equipment needs a quality expert to closely follow up on its use and maintenance;
- Appropriate training should be organized for technical staff and pilots.

Recommendations made by the Provincial Boat Association:

- Need to upgrade the Map andHand Book for pilots and waterway users;
- Need to mention the flow direction in the map to avoid confusion for pilots when upstream and downstream;
- Seek funds to support maintenance of GPS equipment;
- Work with MRC-NAP for further support and assistance;
- Encourage pilot and boat owners to buy more GPS equipment;
- Expect more training for local training of trainers;
- Promote more use of GPS equipment by pilots;
- Set up foundation among pilots for maintenance and expansion of using GPS;
- Request to extend GPS project from Huay Xay Sai to Golden Triangle;
- Request Provincial Public Work and Transport Department and Waterway Department to issue a regulation for using GPS equipment.

LOCATION

In the Lao PDR.The project area covers the Mekong River from the Huay Xay to Luang Prabang.

OBJECTIVES

The **ultimate objective**is to promote freedom of navigation and increase international trade opportunities for MRC member countries' mutual benefit, and to assist in coordination and cooperation in developing effective and safe waterborne transport in a sustainable and protective manner for the waterway environment. The current project will support the ultimate objective through finding solutions to navigate during low water situations and encouraging effective and safe cross-border waterborne transport on a critical cross-border navigation route.

The **immediate objectives** of the project are:

1) To improve the GPS system including the maps based on the recommendations by the users and stakeholders.
2) To make the GPS system more accessible and usable for the stakeholders.

OUTPUTS AND DELIVERABLES

Output 1: The GPS system between Huay Xay and Luang Prabang is fully functional and correct

Expected Deliverable:

- The system is fully updated.

Output 2: The GPS system is properly maintained, accessible and the users fully trained

Expected Deliverable:

- All the recommendations by the users and stakeholders have been properly analysed and used for the full improvement of the system.

ACTIVITIES

Under Output 1 (The GPS system is fully functional and correct)

All activities related to the stakeholder's recommendations on additional surveys, GIS mapping and actual improvements to the instruments and mountings on board are properly addressed and conducted.

Under Output 2 (The GPS system is properly maintained, accessible and the users fully trained)

All activities related to the stakeholder's recommendations on institutional improvements, accessibility of the system, training, maintenance and budgets are properly addressed and conducted.

BUDGET

The correct budget on the actual requirements for improvements related toadditional surveys, GIS mapping, actual improvements to the instruments and mountings on board, institutional improvements, accessibility of the system and trainingneeds to be calculated in detail but it is estimated at **US$ 180,000.**

HUMAN RESOURCES

The work can be implemented by the relevant staff of the Waterways Department in cooperation with consultants with expertise in bathymetric surveying, navigation and GIS and digital mapping, preferably the consultants who were involved in the actual establishment of the GPS system. The trainees will be the ship's captains and pilots.

PROPOSED EXECUTING/IMPLEMENTING AGENCY

The Waterway Department under the Ministry of Public Works and Transport in cooperation with the pilots, the Provincial Public Works and Transport Department, and the Provincial Boat Association, and the skippers and boat owners.

TIME AND WORK SCHEDULE

Total implementation is 15 months.

SOCIAL ISSUES

This action would improve safety for local passengers and tourists and may increase the use of IWT creating economic opportunities for local waterway users. It will be important that all users have access to the GPS technology. Ensure that microfinance loans or other financial mechanisms are available.

ENVIRONMENTAL ISSUES

The project may have positive impacts on the environment. Improving the safety of shipping on the Mekong River reduces the risk of groundings, collisions, accidents and water pollution. This action could increase the number of passengers using IWT so it is important that ports and vessels consider additional waste facilities. The navigation guidance system could be used to indicate waste facilities

along the Mekong River. There may also be an opportunity for boat operators to use this system to report the location of dangerous areas, accidents and environmental issues along the waterway.

ECONOMIC ASSESSMENT

This action is likely to have safety improvement benefits, which are difficult to measure in economic terms.

PRIORITY OF ACTION (H/M/L)

Very High (2016).

FINANCING PLAN (PUBLIC/PRIVATE)

National: Ministry of Public Works and Transport

Regional: MRCS NAP, ADB - GMS (Greater Mekong Sub region).

International: World Bank, European Union, Flanders / Belgium, Australia aid, KOICA (Korea), JICA (Japan), ASEAN IAI (receiving funds from Australia, Japan, etc.).

PRIOR ACTIONS REQUIRED

None.

FOLLOW-UP ACTIONS REQUIRED

GPS instruments to be procured by the boat owners themselves. One concept could be to make it compulsory and part of the conditions to be met under the insurance policies.Training to be repeated when required.

5.5 SHORT TERM AIDS TO NAVIGATION ACTION 5 (SAN5)

TITLE

Install lights, marks and air clearance at all Mekong, Bassac and Tonle Sap bridges crossing the river

BACKGROUND AND RATIONALE

Many bridges crossing the Mekong, Tonle Sap and Bassac Rivers are an obstruction to smooth navigation. Some of the bridges are designed too low but this is an irrevocable matter and the ship sizes need to adapt to the navigation clearance. What is most important is that these bridges, and their navigation clearance, are clearly marked, especially at night.

This is especially important for vessels carrying dangerous goods and for cruise ships. In fact, the cruise ship industry is a newcomer on the river, especially between Angkor Wat in Cambodia and HCMC in Viet Nam. Cruise liners with more than 50 hotel rooms on board are mushrooming and an average of about 5 cruise liners are being built every year for the Mekong River. Most of these vessels sail at night and spend the day in ports. Night navigation is therefore extremely important for them. If buoys do not mark the channel limits with lanterns, the safety of the people on board and the safety of the people crossing the bridge may be at jeopardy.

In some cases the exact height level of the lowest part of the bridge beam of the navigation passage is not known. To know the exact navigation clearance under the bridge is crucial for the new design of containerships and cruise boats as they have to limit their ship superstructure height to fit the air clearance of the lowest bridges.

Needless to say, the authorities should mark the bridges well. Moreover, similar to airline navigation services and road networks, regular maintenance and upgrades of the marine aids to navigation are necessary. A number of significant obstacles have conspired to prevent the original International Association of Lighthouse Authorities (IALA) standards from being maintained. The Member Countries have signed up to the SOLAS Convention, which automatically implies that the IALA standards should be followed. In Section 13 there is a specific request by SOLAS that if a Member employs IALA aids to navigation, its system reliability should be 98 percent. This is a clear obligation and means that the Member State is fully responsible for following very high aids to navigation maintenance standards.

LOCATION

Cambodia, Lao PDR and Thailand.On all the bridges over the Mekong River and Tonle Sap.

OBJECTIVES

The **ultimate objective** of this project is to ensure the safety on board of the ships and on the bridges crossing the Mekong River System by installing and maintaining internationally recognized lights, markers and indicators of the navigation clearance of the bridges.

The **immediate objectives** of the project are:

1) To prepare the drawings and bills of quantity to order/manufacture the navaids for the bridges, and to define the exact level of the lowest part of the bridge beam.
2) To install the lights, markers and height indicator.

OUTPUTS AND DELIVERABLES

The exact quantified output will depend on the results of immediate objective 1 as this will determine how many will need to be procured.

Output 1: **A detailed design of aids to navigation on the bridges, including the exact calculation of the exact level of the lowest part of the bridge beam (air clearance)**

Expected deliverables:

- Defined quantity and size of the bridge navaids;
- Review of engineering details to exact calculation of the exact level of the lowest part of the bridge beam (air clearance) – new topographic surveys if necessary;
- ToRs and bidding documents for procurement and installation;
- Tender procedures for procurement and installation.

Output 2: **The markers and gauges have been procured and installed properly**

Expected deliverables:

- Equipment list and assembly plan;
- Installation logistical plan;
- Operational logistics ready;
- Localised topo heights and survey results updated;
- Proper survey results - level gauges installed;
- Lights and markers fitted;
- After installation, pilots and waterway users are requested to provide feedback of irregularities;
- Maintenance plan.

ACTIVITIES

Under Output 1.1 (detailed design and survey)

1.1 Review the bridge engineering plans. Define criteria for design and prepare the details for the aids to navigation for the specific bridge (location, type number, condition).

1.2 Site visit to compare the results of 1.1 with the actual situation.

1.3 Define the exact navigation clearance and prepare references for the gauges that will indicate the navigation clearance with reference to the river level.

1.4 Based on the results of 1.1 and 1.2. prepare the ToRs and bidding documents for procurement and installation.

1.5 Start the tender procedures for procurement and installation.

Under Output 2 (procurement and installation)

2.1 After tendering, contracting receive and clear the goods.

2.2 Inspect received equipment and store the goods well.

2.3 Prepare a plan for assembling the markers.

2.4 Prepare a plan for surveying and installing the gauges that will indicate the navigation clearance with reference to the river level.

2.5 Install the markers and prepare an inventory.

2.6 Update the aids to navigation management system.

2.7 Stock checks and review - Spare AtN tested commissioned.

BUDGET

Estimated budget for the part in Cambodia:

Output 1: US$ 40,000 including consultancies, data collection and survey

Output 2: Roughly US$ 90,000 including procurement of polyethylene navaids, and installation

Estimated budget for the part in the Lao PDR and Thailand:

Output 1:US$ 40,000 including consultancies, data collection and survey

Output 2: Roughly US$ 120,000 including procurement of polyethylene navaids, and installation

Total: US$ 290,000

HUMAN RESOURCES

Most of the work under Output 1 can be done by the relevant staff of the Waterways (marine) Department in Cambodia, Lao PDR and Thailand. The manufacturing part under Output 2 needs to be done by a specialized company but the installation can be done by the Waterways (Marine) Department.

PROPOSED EXECUTING/IMPLEMENTING AGENCY

The Waterways Department in Cambodia under the Ministry of Public Works and Transport.

For the bridges spanning the Mekong River between the Lao PDR and Thailand, a joint team of the Lao Waterway Department and the Thai Marine Department should be selected. For the bridges in the Lao PDR only, the Lao Waterway Department should be responsible.

TIME AND WORK SCHEDULE

The activities under Output 1, including the tendering and contracting process, could take up to 4 months.

The activities under Output 2, possibly including manufacturing and shipping, could take 2 months, while installation can be done in 2 months.

Total implementation is 8 months.

SOCIAL ISSUES

This project is not expected to have any adverse social impacts. A communication plan to all waterway users on the lights, marks and air clearances would improve the effectiveness of the system.

ENVIRONMENTAL ISSUES

There will be no significant negative impacts from this project to the environment. This project will reduce the risks of shipping accidents and water pollution by improving waterway safety.

ECONOMIC ASSESSMENT

This action is likely to have safety improvement benefits, which are difficult to measure in economic terms.

PRIORITY OF ACTION (H/M/L)

High (2017).

FINANCING PLAN (PUBLIC/PRIVATE)

National (in-country): National budget of the Ministry of Public Works and Transport in Cambodia, Lao PDR and Thailand.

Regional: MRCS NAP, ADB - GMS (Greater Mekong Sub region).

International: World Bank, European Union, Flanders / Belgium, Australia aid, KOICA (Korea), JICA (Japan), ASEAN IAI (receiving funds from Australia, Japan, etc.).

PRIOR ACTIONS REQUIRED

None.

FOLLOW-UP ACTIONS REQUIRED

None.

5.6 SHORT TERM AIDS TO NAVIGATION ACTION 6 (SAN6)

TITLE

Upgrade the Existing Aids to Navigation System along the Mekong River between Kompong Cham and the entrance (estuary) to the Mekong River.

BACKGROUND AND RATIONALE

The Mekong River from Kompong Cham to the sea is used by sea going vessels as a transit route to transport the goods and passengers to Cambodia. The physical constraints are related to ship maneuvering and fairway conditions such as shoals and sedimentation, insufficient waterway maintenance but especially the lack of aids to navigation, making navigation dangerous, difficult and increasing the risk of pollution. This stretch of the Mekong River is part of the international shipping route that connects Phnom Penh port with the sea passing through Viet Nam. Shipping is being hindered by a lack of a proper system of channel markers, buoys, beacons and other aids to navigation to guide vessels through numerous shoals, sand banks, ship wrecks and other obstacles. A lack of proper aids also results in a loss of opportunities as investors see navigation as an adventure rather than a transport mode that can provide a reliable schedule for cargo forwarders. The ultimate goal of this project is to improve this waterway so that seagoing vessels and inland water traffic can make the most of the natural navigation potential of this river, under safe conditions, day and night,and on a continuous basis based on the design and installation of an internationally recognized system of aids to navigation. Without the need for major infrastructure works, which may create at times irreversible changes with dubious impacts, indicating the deepest channel to the waterway users by beaconing and buoying can be considered as one of the most environmentally friendly exercises in the process of waterborne transport improvement.

Pollution from spills is particularly important in this region as millions of the people in the Mekong Basin, particularly in Cambodia, depend largely on the resources of the Mekong for their daily living and pollution accidents could be a serious threat to their livelihoods. Proper channel marking will reduce these risks significantly.

Moreover, this system will be of huge assistance to Cambodia in increasing its export potential, as the river will become a reliable and more economic form of transport. The quality of waterborne transport will be improved, waiting times will be shortened, night navigation will be possible, and river transportation will be more cost-effective and efficient.

Finally, this project will also bring new commitments and closer cooperation between Cambodia and Viet Nam with anaim to improve international navigation on the Mekong estuarine system between the sea and Kompong Cham. An upgraded navigational aids system will also form a basis for new commitments and closer cooperation between Cambodia and Viet Nam as well as opening up more trade opportunities between the two countries.

The design buoys and beacons should be of the same specifications, type and material as used by MRC when the organization procured and installed the navaids along the Bassac and Mekong Rivers between 2007 and 2015.

LOCATION

Cambodia and Viet Nam.All along the Mekong River between Kompong Cham and the Cambodia-Viet Nam border, and the sea.

OBJECTIVES

The **ultimate objective** of this project is to improve safety and quality of navigation along the shipping route of the Mekong River by the installation of an internationally recognized system of Aids to Navigation and to increase the international trade opportunities between Cambodia and Viet Nam, and overseas partners.

The **immediate objectives** of the project are:

1) To design14 a detailed aids to navigation system on the selected stretches of the Mekong River to be ready for installation.
2) To procure and install the required navaids.
3) To strengthen the capability of the related line agencies.

OUTPUTS AND DELIVERABLES

The exact quantified output will depend on the results of immediate objective 1 as this will determine how many will need to be procured. To be consistent with the other stretches it is recommended to go for the more sustainable and less costly polyethylene buoys and beacons.

Output 1: A detailed design of aids to navigation on the Mekong River prepared in Cambodia and Viet Nam

Expected deliverables:

- Maps of the navaids, including design criteria;
- Site visits and final plans;
- ToRs and bidding documentsfor procurement and installation15;
- Workshop to present and discuss the drafts;
- Tender procedures for procurement and installation.

Output 2: The aids to navigation have been procured and installed properly

Expected deliverables:

- Equipment list and assembly plan;
- Installation logistical plan;
- Assembly workshop and area selected beforehand;
- Operational logistics ready;
- Localized hydrographic maps and survey results updated;
- Awareness campaign;
- Buoys and moorings on the barge, ready to be dropped;
- Advice given by pilots during planning and buoy positioning;
- Moorings checked for correct length;
- Detailed list of positions, positions are mapped available;
- After installation, pilots and waterway users are requested to provide feedback of irregularities;
- Spare AtN tested, commissioned and stored.

[14] For Cambodia reference is made to the 2014 MRC – NAPO Report on "*The Assessment of the Existing Aids to Navigation Design on the Mekong River and Tonle Sap in Cambodia, Including Recommendations*".

[15] Many of the specification details and documents are available at the MRC Secretariat as they were used to install the navaids between 2007 and 2015.

Output 3: Selected officials of the relevant Waterway Department under the MPWT in Cambodia, and VIWA, VINAMARINE and the relevant River Stations under the MoT in Viet Nam, have been trained in the design and installation of navaids

Expected deliverables:

- Assigned staff inthe Waterway Department in Cambodia, and VIWA, VINAMARINE and the River Stationsin Viet Nam can independently design the aids to navigation system, and install the buoys, beacons and other markers.

ACTIVITIES

Under Output 1.1 (detailed design of aids to navigation)

1.1 Review the latest updated charts and identify the leading lines and channels according to the required water depth and ship size. Define criteria for design and prepare the details for the aids to navigation for the specific project area (location, type number, condition);

1.2 Site visit to compare the results of 1.1 with the actual situation;

1.3 Based on the results of 1.1 and 1.2.prepare maps of the navigational aids system;

1.4 Prepare the ToRs and bidding documents for procurement and installation;

1.5 Organize a workshop to present and discuss the draft of the detailed design of the aids to navigation and obtain agreement on the final proposal for the detailed design and specifications;

1.6 Start the tender procedures for procurement and installation.

Under Output 2 (procurement and installation)

1.1 After tendering, contracting receive and clear the goods;

1.2 Inspect received equipment and store the goods well;

1.3 Prepare a plan for assembling the buoys and markers;

1.4 Prepare a plan for loading the buoys on the barge or boat and installing the buoy at the correct location;

1.5 Prepare adequate assembly location with modern tools available;

1.6 Prepare the concrete sinkers, chains and swivels, and assemble;

1.7 Connect the chains and swivels to the concrete blocks;

1.8 Expected deliverable: operational logistics ready;

1.9 Review and confirm river survey data, discuss with pilots to obtain the best and suitable location for dropping the buoys;

1.10 Establish a public awareness campaign for pilots and local people;

1.11 Load the barges/boats;

1.12 Pilot to exactly determine the location for drop;

1.13 Use echo-sounding equipment and GPS to verify position. Some places may require more detailed surveys to find the best spot for dropping and positioning the anchor;

1.14 Verify chain length according to location and river depth, then drop buoy and moorings and prepare for use;

1.15 Prepare an inventory with exact location of buoys;

1.16 Monitor position and movement of the buoy;

1.17 Update the aids to navigation management system;

1.18 Stock checks and review - Spare AtN tested commissioned.

Under Output 3 (training and capacity building)

3.1 Prepare a Training Needs Assessment, and on-the-job training plan;

3.2 Select the relevant staff members to be trained;

3.3 Train the staff in all relevant fields identified in the Assessment.

BUDGET

Estimated budget for the part in Cambodia:

Output 1:US$ 70,000 including consultancies, data collection and survey

Output 2: Roughly US$ 850,000 including procurement of polyethylene navaids, and installation

Output 3:US$ 50,000 including training material and consultancy

Estimated budget for the part in Viet Nam:

Output 1:US$ 80,000 including consultancies, data collection and survey

Output 2: Roughly US$ 1,650,000 including procurement of polyethylene navaids, and installation

Output 3:US$ 80,000 including training material and consultancy

Total:US$ 2,780,000

HUMAN RESOURCES

Most of the work under Outputs 1 and 3 can be done by the relevant staff of the Waterways Department in Cambodia, and by the River Stations (under VIWA) and VINAMARINE in Viet Nam, assisted by an international navaids consultant. The manufacturing part under Output 2 needs to be done by a specialized company but the installation can be done by the Waterways Department in Cambodia, and the River Stations, VIWA and VINAMARINE in Viet Nam.

PROPOSED EXECUTING/IMPLEMENTING AGENCY

The Waterways Department in Cambodia under the Ministry of Public Works and Transport.

By the River Stations and VIWA for the stretch between the border and My Tho and by VINAMARINE between My Tho and the sea. All are under the Ministry of Transportation (MoT) in Viet Nam.

TIME AND WORK SCHEDULE

The activities under Output 1, including the tendering and contracting process, could take up to 9 months.

The activities under Output 2, possibly including manufacturing and shipping, could take 6 months, while installation can be done in 2 months.

The implementation under Output 3 can be done simultaneously with Outputs 1 and 2.

Total implementation is 17 months.

SOCIAL ISSUES

This project will improve safety for all boat operators and waterway users. A communications plan on using the aids to navigation system may further reduce the risk of shipping accidents.

ENVIRONMENTAL ISSUES

This project is not expected to have any significant negative impacts to the environment. Selecting buoys made of recyclable polyethylene would improve the sustainability of this project. During the installation of the aids to navigation system, the contractors should ensure a waste management plan is developed for the collection and treatment of solid wastes.

ECONOMIC ASSESSMENT

This action is likely to have safety improvement benefits, which are difficult to measure in economic terms.

PRIORITY OF ACTION (H/M/L)

Medium(2018-2019),but before the project on the navaids on the Vam Nao Pass and Bassac.

FINANCING PLAN (PUBLIC/PRIVATE)

National (in-country): National budget of the Ministry of Public Works and Transport in Cambodia, and VIWA and VINAMARINE in Viet Nam.

Regional: MRCS NAP, ADB - GMS (Greater Mekong Sub region).

International: World Bank, European Union, Flanders / Belgium, Australia aid, KOICA (Korea), JICA (Japan), ASEAN IAI (receiving funds from Australia, Japan, etc.).

PRIOR ACTIONS REQUIRED

None.

FOLLOW-UP ACTIONS REQUIRED

None.

5.7 SHORT TERM AIDS TO NAVIGATION ACTION 7 (SAN7)

TITLE

Upgrade the existing Aids to Navigation System along the Vam Nao Pass and the Bassac River between the east entrance of the Vam Nao Pass and the entrance to the Quan Chanh Bo Canal.

BACKGROUND AND RATIONALE

This stretch of the Mekong River is part of the international shipping route that connects Phnom Penh Port with the sea passing through Viet Nam's territory. Shipping is being hindered by a lack of a proper system of channel markers, buoys, beacons and other aids to navigation to guide the vessel's master through numerous shoals, sand banks, ship wrecks and other obstacles. A lack of proper aids to navigation is the main cause for collisions, ships running aground, and risks for pollution. This also results in a loss of opportunities as investors see navigation as an adventure rather than a transport mode which can provide a reliable schedule for cargo forwarders.The ultimate goal of this project is to improve this waterway so that seagoing vessels and inland water traffic can make the most of the natural navigation potential of this river, under safe conditions, day and night and on a continuous basis based on the design and installation of an internationally recognized system of aids to navigation.Without the need for major infrastructure works, which may create at times irreversible changes with dubious impacts, indicating the deepest channel to the waterway users by beaconing and buoying can be considered as one of the most environmentally friendly exercises in the process of waterborne transport improvement.

This project will also bring new commitments and closer cooperation between Cambodia and Viet Nam to aim for improvement of international navigation on the Mekong estuarine system between the sea and Phnom Penh.

'Condition Surveys and Development of Base Maps for Electronic Navigation Charts for the Mekong, Vam Nao and Bassac Rivers in Viet Nam', were conducted in 2009-10. The area covered the channel designand design for visual aids to navigation on the Mekong River from the border in Cambodia/Viet Nam to the sea, on the Vam Nao River, and on the Bassac River from the western confluence of the Vam Nao River down to Can Tho.

Even though the navaids experts prepared the design for aids to navigation on the selected stretches, it is necessary to identify and quantify what is exactly required before ordering the equipment.

The design buoys and beacons should be of the same specifications, type and material as used by MRC when the organization procured and installed the navaids along the Bassac and Mekong Rivers between 2007 and 2015.

LOCATION

Only Viet Nam, all along the Vam Nao Pass, and along the Bassac River between the east entrance of the Vam Nao Pass and the entrance to the Quan Chanh Bo Canal.

OBJECTIVES

The **ultimate objective** of this project is to improve safety and quality of navigation along the shipping route of the Mekong River, Vam Nao Pass and Bassac River by the installation of an internationally recognized system of Aids to Navigation and to increase the international trade opportunities between Cambodia and Viet Nam, and overseas partners.

The **immediate objectives** of the project are:

- To design a detailed aids to navigation system on the selected stretches of the Vam Nao Pass and Bassac River to be ready for installation;
- To procure and install the required navaids;
- To strengthen the capability of the related line agencies.

OUTPUTS AND DELIVERABLES

The exact quantified output will depend on the results of immediate objective 1 as this will determine how many will need to be procured. To be consistent with the other stretches it is recommended to go for the more sustainable and less costly polyethylene buoys and beacons.

Output 1: A detailed design of aids to navigation on the Vam Nao Pass and Bassac River are prepared

Expected deliverables:

- Maps of the navaids, including design criteria;
- Site visits and final plans;
- ToRs and bidding documents16 for procurement and installation;
- Workshop to present and discuss the drafts;
- Tender procedures for procurement and installation.

Output 2: The aids to navigation have been procured and installed properly

Expected deliverables:

- Equipment list and assembly plan;
- Installation logistical plan;
- Assembly workshop and area selected beforehand;
- Operational logistics ready;
- Localized hydrographic maps and survey results updated;
- Awareness campaign;
- Buoys and moorings on the barge, ready to be dropped;
- Advice given by pilots during planning and buoy positioning;
- Moorings checked for correct length;
- Detailed list of positions, positions are mapped available;
- After installation, pilots and waterway users are requested to provide feedback of irregularities;
- Spare AtN tested, commissioned and stored.

Output 3: Selected officials of VIWA and the relevant River Station have been trained in the design and installation of navaids

Expected deliverables:

- An assigned number of staff of VIWA and the River Station can independently design the aids to navigation systemand install the buoys, beacons and other markers.

[16] Many of the specification details and documents are available at the MRC Secretariat as they were used to install the navaids between 2007 and 2015.

ACTIVITIES

Under Output 1.1 (detailed design of aids to navigation)

1.1 Review the latest updated charts and identify the leading lines and channels, according to the required water depth and ship size. Define criteria for design and prepare the details for the aids to navigation for the specific project area (location, type number, condition);

1.2 Site visit to compare the results of 1.1 with the actual situation;

1.3 Based on the results of 1.1 and 1.2. prepare maps of the navigational aids system;

1.4 Prepare the ToRs and bidding documents for procurement and installation;

1.5 Organize a workshop to present and discuss the draft of the detailed design of the aids to navigation and obtain agreement of the final proposal for the detailed design and specifications;

1.6 Start the tender procedures for procurement and installation.

Under Output 2. (procurement and installation)

2.1 After tendering and contracting receive and clear the goods;

2.2 Inspect received equipment and store the goods well;

2.3 Prepare a plan for assembling the buoys and markers;

2.4 Prepare a plan for loading the buoys on the barge or boat and installing the buoy at the correct location;

2.5 Prepare adequate assembly locations with modern tools available;

2.6 Prepare the concrete sinkers, chains and swivels, and assemble;

2.7 Connect the chains and swivels to the concrete blocks;

2.8 Expected deliverable: operational logistics ready;

2.9 Review and confirm river survey data, discuss with pilots to obtain the best and most suitable location for dropping the buoys;

2.10 Establish a public awareness campaign for pilots and local people;

2.11 Load the barges/boats;

2.12 Pilot to exactly determine the location for drop;

2.13 Use echo-sounding equipment and GPS to verify position. Some places may require more detailed surveys to find the best spot for dropping and positioning the anchor;

2.14 Verify chain length according to location and river depth, then drop buoy and moorings and prepare for use;

2.15 Prepare an inventory with exact location of buoys;

2.16 Monitor position and movement of the buoy;

2.17 Update the aids to navigation management system;

2.18 Stock checks and review - Spare AtN tested commissioned.

Under Output 3. (training and capacity building)

1.1 Prepare a Training Needs Assessment, and on-the-job training plan;

1.2 Select the relevant staff members to be trained;

1.3 Train the staff in all relevant fields identified in the Assessment.

BUDGET

Estimated budget for:

Output 1:US$ 80,000 including consultancies, data collection and survey

Output 2:US$ 1,250,000 including procurement of polyethylene navaids and installation

Output 3:US$ 60,000 including training material and consultancy

Total: US$ 1,390,000

HUMAN RESOURCES

The relevant staff of River Stations 12 and 13 can do most of the work under Outputs 1 and 3, assisted by an international navaids consultant. The manufacturing part under Output 2 needs to be done by a specialized company but the installation can be done by the River Stations, VIWA and VINAMARINE.

PROPOSED EXECUTING/IMPLEMENTING AGENCY

The River Station 12 and VIWA for the Vam Nao Pass 13 and VIWA for the Bassac River between the Vam Nao Pass and Can Tho and VINAMARINE between Can Tho and the Quan Chanh Bo Channel. All are under the Ministry of Transportation (MoT).

TIME AND WORK SCHEDULE

The activities under Output 1, including the tendering and contracting process, could take up to 8 months.

The activities under Output 2, possibly including manufacturing and shipping, could take 6 months while installation can be done in 1 month.

The implementation under Output 3 can be done simultaneously with Outputs 1 and 2.

Total implementation is 14 months.

SOCIAL ISSUES

This project will improve safety for all boat operators and waterway users. A communications plan on using the aids to navigation system may further reduce the risk of shipping accidents.

ENVIRONMENTAL ISSUES

This project is not expected to have any significant negative impacts to the environment. Selecting buoys made of recyclable polyethylene would improve the sustainability of this project. During the installation of the aids to navigation system the contractors should ensure a waste management plan is developed for the collection and treatment of solid wastes.

ECONOMIC ASSESSMENT

This action is likely to have safety improvement benefits, which are difficult to measure in economic terms.

PRIORITY OF ACTION (H/M/L)

Medium (2018-2019).

FINANCING PLAN (PUBLIC/PRIVATE)

National (in-country): National budget of VIWA and VINAMARINE.

Regional: MRCS NAP, ADB - GMS (Greater Mekong Sub region).

International: World Bank, European Union, Flanders / Belgium, Australia aid, KOICA (Korea), JICA (Japan), ASEAN IAI (receiving funds from Australia, Japan, etc.).

PRIOR ACTIONS REQUIRED

None.

FOLLOW-UP ACTIONS REQUIRED

None.

5.8 LONG TERM AIDS TO NAVIGATION ACTION 1 (LAN1)

TITLE

(Scenario 1) Develop and install the GPS Navigation Guidance System and make it compulsory for all commercial boats carrying cargo and/or passengers along the Mekong River between Luang Prabang and Savannakhet

BACKGROUND AND RATIONALE

To develop short term (2020) and long term (2040) development scenarios for the Master Plan for Regional Waterborne Transport in the Mekong River Basin, the River has been subdivided into 15 stretches. The scenarios are developed with the assumption that,in the long term, all planned dams in the PR China and five dams in the Huay Xay - Vientiane stretch of the River will be built. On the contrary, between Savannakhet and Kratie, two long term scenarios are proposed: one scenario in case one of these dams is not built (scenario 1), one scenario with all dams in this reach built (scenario 2). This Action is part of scenario 1. This means that the stretch between Savannakhet and Kratie will not be so important.

Low water levels in the Mekong River are a problem for navigation. Ships have no other option but to use the deepest channel in the river or risk grounding or striking a rocky bed. Means have to be found to guide the skippers through these channels. Without guidance these channels cannot be observed unless the vessels are piloted by extremely knowledgeable experts who have done this throughout their life and know the channel's location. Even then, accidents happen or boats get stuck. Needless to say, climate change and low water levels are impacting navigation. Tracing the deepest channels will therefore become even more challenging and vessels will need to adapt.

Physical marking of the navigation channel of the Mekong River in the Upper sections in the Lao PDR and between the Lao PDR and Thailand has not been an easy or effective task. Installing aids to navigation in extremely dangerous sections has been considered. However the complexity of the waterways in these regions and the large number of dangerous stretches makes this option prohibitively expensive. The large seasonal variability in water levels and substantial amount of flood debris in the wet season mean that, unless the markers are removed and replaced during periods of peak flows, there is a high probability of equipment damage or loss. The Middle/Upper Mekong River is difficult to navigate because of the numerous rocks and rocky outcrops, and because of the changing river levels that submerge the obstacles. These factors all create a challenging environment for maintaining a safe and reliable channel marking system in the Upper Mekong.

An alternative approach to vessel guidance is therefore necessary on these stretches. Rather than relying on the physical markers and their associated maintenance and cost challenges, navigators should utilize new low-cost technologies in the form of GPS course guidance and identification of submerged hazards. Working with the already skilled navigators of river-navigating vessels, the optimal course for wet and dry seasons could be recorded and displayed on a digital chart, providing a visual tool that would allow navigators to ensure they are on course, and alert them of any hazards that might be approaching. By recording an ideal course with outer limits for safety and overtaking, it is possible to provide an accurate level of route guidance, while allowing for potential GPS accuracy issues. This system would allow the navigator to keep the vessel on a predetermined track and as such avoid underwater obstacles and rocky outcrops. During heavy rains, which seriously reduce visibility, the navigator could still reach the safety of port by steering with assistance from the digital chart.

The proposed system would incorporate a number of other advantages including:

1) The ETA (Estimated Time of Arrival) of vessels could be determined with great accuracy as the pilots could determine the distance remaining to reach the next destination.
2) Vessels could sail cautiously in conditions with bad visibility caused by dense rain, fog, and during twilight hours.

3) In emergency situations, vessels could continue to sail in extreme weather such as heavy rain and winds.

4) The Government could have control and registration of accidents by checking the GPS readings and track logs of vessels.

In addition to the aforementioned benefits, vessels could continue to sail into the late evening and night just to reach a safe port (although due diligence would be required as it is strongly advised only to sail during daylight hours).

The Project will also include the purchase of twenty (20) fixed GPS units that will be installed on selected boats in the project area for trial purposes. In addition to the aforementioned tasks, data collected from the early stages of the project must be combined with other spatial datasets including the updated digital hydrographic atlas, and uploaded to the GPS units to provide a resource of handheld devices containing a universal navigation dataset of the basin for use in future projects and research.

In 2014 a GPS pilot project was done from Huay Xay downstream to Luang Prabang Cargo Port. This project was highly successful and is being used constantly by the river pilots in this stretch.

LOCATION

Lao PDR and Thailand.The project area covers the Mekong River from Luang Prabang downstream to Savannakhet for a total length of 882 km.

OBJECTIVES

The **ultimate objective**is to promote freedom of navigation and increase international trade opportunities for MRC member countries' mutual benefit, and to assist in coordination and cooperation in developing effective and safe waterborne transport in a sustainable and protective manner for the waterway environment. The current project will support the ultimate objective through finding solutions to navigate during low water situations and encouraging effective and safe cross-border waterborne transport on a critical cross-border navigation route.

The **immediate objectives** of the project are:

1) To identify and record the deepest navigation route along the river thereby improving navigation safety through the establishment of an officially recommended course;

2) To promote waterway use, improved safety and better environmental outcomes through the use of electronic mapping resources;

3) To test the feasibility of GPS navigation devices as an aid to navigation on the Upper Mekong and build capacity in the use of this technology amongst waterway users.

OUTPUTS AND DELIVERABLES

Output 1: Completed 60m wide high resolution bathymetric survey of the traditional navigation route

Expected Deliverables:

- The traditional navigation route used by vessels is recorded;
- Bathymetric survey results (multibeam echosounding) with imagery 'sweep' of the 60m channel to identify any potential hazards to navigation;
- A classification at lowest low water levels (0m – 1m below surface, 1m – 2m below surface, 2m – 3m below surface, >3m below surface).

Output 2: GIS format mapping outputs suitable for use in GPS devices

Expected Deliverable:

- The results of Output 1 are digitally attributed on advanced GIS map sets with different layers (optimal route, course centreline, buoys/beacons, submerged danger marks, ports, etc.).

Output 3: GPS equipment is installed on 40 vessels, vesselcaptains are trained on the use of new GPS maps and vessel tracking systems

Expected Deliverables:

- Vessel owners and pilots are identified for participation in the project;
- GPS devices are supplied to the participants in the program;
- The advanced map dataset is pre-loaded onto each of these devices to cover the stretches of river within the project area;
- This information is correct and suitable for use in navigating the river;
- Training is provided to the users of this equipment.

ACTIVITIES

Under Output 1 (completed 60m wide bathymetric survey of the traditional navigation route

1.1 Before the deepest (or optimal) route is found, recordthe traditional route (routes taken by the best pilots on the river) using high accuracy (differential, where possible) GPS receivers with external antennas. Nominate three separate vessels of at least 200 DWT (as large as possible) to be used for plotting the courses. GPS antenna should be placed at the centre point of the bridge of the vessel and the track of the vessel recorded at one second intervals. The traditional route should be recorded on three separate occasions for each of the two scenarios outlined below. The traditional vessel route should be recorded in both upstream and downstream directions to ensure consistency.

1.2 Analyse the results from recording the traditional navigation route and merge to create a definitive line representing the traditional navigation route for the project area.

1.3 Conduct a bathymetric survey using a multibeam echosounder to verify the safety of the above identified course lines. The proposed survey area should extend to a maximum of 30m either side of the course line.

Identify any potential hazards and areas of riverbed/rock that have the potential to be less than 3m below the surface of the water at lowest low water level (CD). Soundings should then be taken in high detail to provide sufficient information to identify the object. In these areas a 1m grid should be used for collecting sounding data. That is, transects should aim to be spaced 1m apart, with soundings collected at intervals of 1m. This should be considered a base level of data collection for these areas, with more information being considered desirable.

Under Output 2(GIS format mapping outputs suitable for use in GPS devices)

2.1 Analyze the results of the bathymetric survey using software tools (ArcGIS, Hypack, etc.) to interpolate a surface of the riverbed within the navigation corridor. This surface should then be classified to identify any potential obstacles or constraints to the 60m navigation fairway, based on the following classification at lowest low water levels:

a) Exposed Obstacles

b) 0m – 1m below surface

c) 1m – 2m below surface

d) 2m – 3m below surface

e) >3m below surface

2.2 The bathymetric survey should also record the position of existing features and aids to navigation that are present on these stretches (both newly installed buoys/beacons) including reference waypoints (ports/landings etc.), lateral buoys and beacons, or any other key waypoints that are not already recorded in the hydrographic atlas.

2.3 Attribute the results of Outputs 1 and 2 correctly based on the results of the bathymetric surveys and the recording of waypoints along the river. This will produce the following outputs:

a) Bathymetric Survey Results (ESRI Point Shapefile)

b) Navigational Aids (ESRI Point Shapefile)

c) Isolated Danger Marks (ESRI Point Shapefile)

d) Navigation Centreline (ESRI Line Shapefile)

e) Depth Classified Navigation Fairway – As per Output 1 classification scheme (ESRI Polygon Shapefile)

f) Port and Landing Facilities (ESRI Point Shapefile)

g) GeoTIF Stitched Sidescan Sonar Imagery (Georeferenced TIF/JPG)

2.4 Integrate this information with data layers from the existing hydrographic atlas and updated chart datum determination to produce a basic GPS dataset in GPX file format that contains the following:

a) Course Centreline

b) Port and Lateral Buoys/Beacons

c) Submerged Danger Marks

d) Port and Landing Facilities

2.5 Produce an advanced GPS map set using GPSMapper or Mapwel software to create a comprehensive graphical map set of the project area. This information should be integrated with data layers from the existing hydrographic atlas and updated chart datum determination to produce graphical maps in Garmin IMG format that contain the following:

a) Course Centreline

b) Port and Lateral Buoys/Beacons

c) Submerged Danger Marks

d) Port and Landing Facilities

e) Navigation Fairway

f) Classified Navigation Corridor Depths

g) KM Markers

h) River Area

This dataset should include appropriate name and description content based on the entity being displayed (i.e. Port Name, Beacon ID). If necessary, this data may be tiled across multiple IMG files to support the efficient functioning of the GPS map.

Under Output 3 (installed GPS equipment and trained vessel captains)

3.1 Select vessel owners and pilots for participation in the project. Larger vessels, those carrying dangerous goods and passenger vessels should take priority as the GPS system will reduce the risk to these important cargoes.

3.2 Supply 40 GPS devices to the participants in the program. The devices must have at least a 5" diagonal screen size and support Garmin format map data in IMG format. Fixed devices must be installed on the aforementioned vessels inclusive of external antenna and power supplies.

3.3 Pre-load the dataset onto each of these devices to cover the stretches of river within the project area. This information should be verified as correct and suitable for use in navigating the river by conducting at least one test run in both directions with the assistance of the river pilots that participated in the Output 1 recording of the traditional navigation route.

3.4 Provide training to the users of this equipment, including:

a) Loading of correct map data;

b) Loading of correct course line;

c) Waypoint creation;

d) Destination setting;

e) Real-time navigation using GPS devices;

f) Appropriateness of use and safety issues regarding use of GPS for commercial vessel navigation.

BUDGET

Estimated budget is calculated per kilometer stretch and is based on the costs of the GPS project between Huay Xay and Luang Prabang, including indexing. The costs are calculated at a total price of US$ 1,350 per kilometer.

Since the total distance here is 883 km @ 1,350 US$/km equals **US$ 1,190,000**.

HUMAN RESOURCES

The work can be implemented by the relevant staff of the Waterways and Marine Department but consultants will need to be hired, especially with expertise in bathymetric surveying, navigation and GIS and digital mapping. The trainees will be the ship's captains and pilots.

PROPOSED EXECUTING/IMPLEMENTING AGENCY

Since this is a regional project with cross-border aspects, the Waterways and Marine Department in the Lao PDR and Thailand are the implementing agencies together with the MRC Secretariat (MRCS). MRCScould, on behalf of the MRC, serve as theExecuting Agency of the project. The National Mekong Committees could be the Coordinating Agencies and assist the MRCS in liaising with the government to obtain any other additional information necessary. Each NMC will be asked to make arrangements for importation procedures including custom clearances of all project equipment purchased and other government formalities.

TIME AND WORK SCHEDULE

The activities under Output 1 and 2, including the tendering and contracting process, could take up to 16 months.

The activities under Output 3, could take 5 months.

Total implementation is 21 months.

SOCIAL ISSUES

This project is not expected to have any adverse social impacts. A communications plan for all waterway users on the lights, marks and air clearances would improve the effectiveness of the system.

ENVIRONMENTAL ISSUES

The project may have a positive impact on the environment. Improving the safety of shipping on the Mekong River reduces the risk of groundings, collisions, accidents and water pollution. This action could increase the number of passengers using IWT so it is important that ports and vessels consider additional waste facilities. The navigation guidance system could be used to indicate waste facilities along the Mekong River. There may also be an opportunity for boat operators to use this system to report the location of dangerous areas, accidents and environmental issues along the waterway.

ECONOMIC ASSESSMENT

This action is likely to have safety improvement benefits, which are difficult to measure in economic terms.

PRIORITY OF ACTION (H/M/L)

Medium(2029-2030).

FINANCING PLAN (PUBLIC/PRIVATE)

Regional: MRCS NAP, ADB - GMS (Greater Mekong Sub region).

International: World Bank, European Union, Flanders / Belgium, Australia aid, KOICA (Korea), JICA (Japan), ASEAN IAI (receiving funds from Australia, Japan, etc.).

PRIOR ACTIONS REQUIRED

None.

FOLLOW-UP ACTIONS REQUIRED

None.

5.9 LONG TERM AIDS TO NAVIGATION ACTION 2 (LAN2)

TITLE

(Scenario 2) Develop and install the GPS Navigation Guidance System and make it compulsory for all commercial boats carrying cargo and/or passengers along the Mekong River between Luang Prabang and Kratie.

BACKGROUND AND RATIONALE

To develop short term (2020) and long term (2040) development scenarios for the Master Plan for Regional Waterborne Transport in the Mekong River Basin, the River has been subdivided into 15 stretches. The scenarios are developed with the assumption that,in the long term, all planned dams in the PR China and five dams in the Huay Xay - Vientiane stretch of the River will be built. On the contrary, between Savannakhet and Kratie two long term scenarios are proposed: one scenario in case one of these dams is not built (scenario 1), one scenario with all dams in this reach built (scenario 2). This Action is part of scenario 2.

Low water levels in the Mekong River are a problem for navigation. Ships have no other option but to use the deepest channel in the river or risk grounding or striking a rocky bed. Means have to be found to guide the skippers through these channels. Without guidance, these channels cannot be observed unless the vessels are piloted by extremely knowledgeable experts who have done this throughout their life and know the channel's location. Even then, accidents happen or boats get stuck. Needless to say, climate change and low water levels are impacting navigation. Tracing the deepest channels will therefore become even more challenging and vessels need to adapt.

Physical marking of the Mekong River's navigation channel in the upper sections in the Lao PDR and between the Lao PDR and Thailand has not been an easy or effective task. Installing aids to navigation in extremely dangerous sections has been considered. However the complexity of the waterways in these regions and the large number of dangerous stretches makes this option prohibitively expensive. The large seasonal variability in water levels and substantial amount of flood debris in the wet season means that, unless the markers are removed and replaced during periods of peak flows there is a high probability of equipment damage or loss. The Middle/Upper Mekong River is difficult to navigate because of the numerous rocks and rocky outcrops, and because of the changing river levels that submerge the obstacles. These factors all create a challenging environment for maintaining a safe and reliable channel marking system in the Upper Mekong.

On these stretches,an alternative approach to vessel guidance is therefore necessary. Rather than relying on the physical markers and their associated maintenance and cost challenges, navigators should utilize new low-cost technologies in the form of GPS course guidance and identification of submerged hazards. Working with the already skilled navigators of river-navigating vessels, the optimal course for wet and dry seasons could be recorded and displayed on a digital chart, providing a visual tool that would allow navigators to ensure they are on course, and alert them of any hazards that might be approaching. By recording an ideal course with outer limits for safety and overtaking, it is possible to provide an accurate level of route guidance, while allowing for potential GPS accuracy issues. This system would allow the navigator to keep the vessel on a predetermined track and avoid underwater obstacles and rocky outcrops. During heavy rains, which seriously reduce visibility, the navigator could still reach the safety of port by steering with assistance from the digital chart.

The proposed system would incorporate a number of other advantages including:

1) The Estimated Time of Arrival (ETA) of vessels could be determined with great accuracy as the pilots could determine the distance remaining to reach the next destination.
2) Vessels could sail cautiously in conditions with bad visibility caused by dense rain, fog, and during twilight hours.
3) In emergency situations, vessels could continue to sail in extreme weather such as heavy rain and winds.

4) The Government could have control and registration of accidents by checking the GPS readings and track logs of vessels.

In addition to the aforementioned benefits, vessels could continue to sail into the late evening and night just to reach a safe port (although due diligence would be required as it is strongly advised only to sail during daylight hours).

The Project will also include the purchase of twenty (20) fixed GPS units that will be installed on selected boats in the project area for trial purposes. In addition to the aforementioned tasks, data collected from the early stages of the project must be combined with other spatial datasets including the updated digital hydrographic atlas and uploaded to the GPS units to provide a resource of handheld devices containing a universal navigation dataset of the basin for use in future projects and research.

In 2014 a GPS pilot project was done from Huay Xay downstream to Luang Prabang Cargo Port. This project was highly successful and is being used constantly by the river pilots in this stretch.

LOCATION

Cambodia, Lao PDR and Thailand.The project area covers the Mekong River from Luang Prabang downstream to Kratie for a total length of 1,446 km.

OBJECTIVES

The **ultimate objective**is to promote freedom of navigation and increase international trade opportunities for MRC member countries' mutual benefit, and to assist in coordination and cooperation in developing effective and safe waterborne transport in a sustainable and protective manner for the waterway environment. The current project will support the ultimate objective through finding solutions to navigate during low water situations and encouraging effective and safe cross-border waterborne transport on a critical cross-border navigation route.

The **immediate objectives** of the project are:

a) a)To identify and record the deepest navigation route along the river thereby improving navigation safety through the establishment of an officially recommended course.

b) b)To promote waterway use, improved safety and better environmental outcomes through the use of electronic mapping resources.

c) c)To test the feasibility of GPS navigation devices as an aid to navigation on the Upper Mekong and build capacity in the use of this technology among waterway users.

OUTPUTS AND DELIVERABLES

Output 1: Completed 60m wide high resolution bathymetric survey of the traditional navigation route

Expected Deliverable:

- The traditional navigation route used by vessels is recorded;
- Bathymetric survey results (multibeam echosounding) with imagery 'sweep' of the 60m channel to identify any potential hazards to navigation;
- A classification at lowest low water levels (0m – 1m below surface, 1m – 2m below surface, 2m – 3m below surface, >3m below surface).

Output 2: GIS format mapping outputs suitable for use in GPS devices

Expected Deliverable:

- The results of Output 1 are digitally attributed on advanced GIS map sets with different layers (optimal route, course centreline, buoys/beacons, submerged danger marks, ports, etc.)

Output 3: GPS equipment is installed on 40 vessels, vesselcaptains are trained on the use of new GPS maps and vessel tracking systems

Expected Deliverable:

- Vessel owners and pilots are identified for participation in the project;
- GPS devices are supplied to the participants in the program;
- The advanced map dataset is pre-loaded onto each of these devices to cover the stretches of river within the project area;
- This information is correct and suitable for use in navigating the river;
- Training is provided to the users of this equipment.

ACTIVITIES

Under Output 1 (completed 60m wide bathymetric survey of the traditional navigation route

1.1. Before the deepest (or optimal) route is found, record the traditional route (routes taken by the best pilots on the river) using high accuracy (differential, where possible) GPS receivers with external antennas. Nominate three separate vessels of at least 200 DWT (as large as possible) to be used for plotting the courses. GPS antenna should be placed at the centre point of the bridge of the vessel and the track of the vessel recorded at one second intervals. The traditional route should be recorded on three separate occasions for each of the two scenarios outlined below. The traditional vessel route should be recorded in both upstream and downstream directions to ensure consistency.

1.2. Analyse the results from recording the traditional navigation route and merge to create a definitive line representing the traditional navigation route for the project area.

1.3. Conduct a bathymetric survey using a multibeam echosounder to verify the safety of the above identified course lines. The proposed survey area should extend to a maximum of 30m either side of the course line.

1.4. Identify any potential hazards and areas of riverbed/rock that have the potential to be less than 3m below the surface of the water at lowest low water level (CD). Soundings should then be taken in high detail to provide sufficient information to identify the object. In these areas a 1m grid should be used for collecting sounding data. That is, transects should aim to be spaced 1m apart, with soundings collected at intervals of 1m. This should be considered a base level of data collection for these areas, with more information being considered desirable.

Under Output 2 (GIS format mapping outputs suitable for use in GPS devices)

2.1. Analyze the results of the bathymetric survey using software tools (ArcGIS, Hypak, etc.) to interpolate a surface of the riverbed within the navigation corridor. This surface should then be classified to identify any potential obstacles or constraints to the 60m navigation fairway, based on the following classification at lowest low water levels:

a) Exposed Obstacles;

b) 0m – 1m below surface;

c) 1m – 2m below surface;

d) 2m – 3m below surface;

e) >3m below surface.

2.2. The bathymetric survey should also record the position of existing features and aids to navigation that are present on these stretches (both newly installed buoys/beacons)

including reference waypoints (ports/landings etc.), lateral buoys and beacons, or any other key waypoints that are not already recorded in the hydrographic atlas.

2.3 Attribute the results of the Outputs 1 and 2 correctly based on the results of the bathymetric surveys and the recording of waypoints along the river. This will produce the following outputs:

a) Bathymetric Survey Results (ESRI Point Shapefile);

b) Navigational Aids (ESRI Point Shapefile);

c) Isolated Danger Marks (ESRI Point Shapefile);

d) Navigation Centreline (ESRI Line Shapefile);

e) Depth Classified Navigation Fairway – As per output 1 classification scheme (ESRI Polygon Shapefile);

f) Port and Landing Facilities (ESRI Point Shapefile);

g) GeoTIF Stitched Sidescan Sonar Imagery (Georeferenced TIF/JPG).

2.4 Integrate this information with data layers from the existing hydrographic atlas and updated chart datum determination to produce a basic GPS dataset in GPX file format that contains the following:

a) Course Centreline;

b) Port and Lateral Buoys/Beacons;

c) Submerged Danger Marks;

d) Port and Landing Facilities.

2.5 Produce an advanced GPS map set using GPSMapper or Mapwel software to create a comprehensive graphical map set of the project area. This information should be integrated with data layers from the existing hydrographic atlas and updated chart datum determination to produce graphical maps in Garmin IMG format that contain the following:

a) Course Centreline;

b) Port and Lateral Buoys/Beacons;

c) Submerged Danger Marks;

d) Port and Landing Facilities;

e) Navigation Fairway;

f) Classified Navigation Corridor Depths;

g) KM Markers;

h) River Area.

This dataset should include appropriate name and description content based on the entity being displayed (i.e. Port Name, Beacon ID). If necessary this data may be tiled across multiple IMG files to support the efficient functioning of the GPS map.

Under Output 3 (installed GPS equipment and trained vessel captains)

3.1. Select vessel owners and pilots for participation in the project. Larger vessels, those carrying dangerous goods and passenger vessels should take priority as the GPS system will reduce the risk to these important cargoes.

3.2. Supply 60 GPS devices to the participants in the program. The devices must have at least a 5” diagonal screen size and support Garmin format map data in IMG format. Fixed devices

must be installed on the aforementioned vessels inclusive of external antenna and power supplies.

3.3. Pre-load the dataset onto each of these devices to cover the stretches of river within the project area. This information should be verified as correct and suitable for use in navigating the river by conducting at least one test run in both directions with the assistance of the river pilots that participated in the Output 1 recording of the traditional navigation route.

3.4. Provide training to the users of this equipment, including:

a) Loading of correct map data;

b) Loading of correct course line;

c) Waypoint creation;

d) Destination setting;

e) Real-time navigation using GPS devices;

f) Appropriateness of use and safety issues regarding use of GPS for commercial vessel navigation.

BUDGET

Estimated budget is calculated per kilometer stretch and is based on the costs of the GPS project between Huay Xay and Luang Prabang, including indexing. The costs are calculated at a total price of US$ 1,350 per kilometer.

Since the total distance here is 1446 km @ 1,350 US$/km equals **US$ 1,950,000**.

HUMAN RESOURCES

The work can be implemented by the relevant staff of the Waterways and Marine Department but consultants will need to be hired, especially with expertise in bathymetric surveying, navigation and GIS and digital mapping. The trainees will be the ship's captains and pilots.

PROPOSED EXECUTING/IMPLEMENTING AGENCY

Since this is a regional project with cross-border aspects, the Waterways and Marine Department in Cambodia, the Lao PDR and Thailand are the implementing agencies together with the MRC Secretariat (MRCS). MRCScould, on behalf of the MRC, serve as the Executing Agency of the project. The National Mekong Committees could be the Coordinating Agencies and assist the MRCS in liaising with the government to obtain any other additional information necessary. Each NMC will be asked to make arrangements for importation procedures including custom clearances of all project equipment purchased and other government formalities.

TIME AND WORK SCHEDULE

The activities under Output 1 and 2, including the tendering and contracting process, could take up to 21 months.

The activities under Output 3, could take 7 months.

Total implementation is 28 months.

SOCIAL ISSUES

This project is not expected to have any adverse social impacts. A communications plan for all waterway users on the lights, marks and air clearances would improve the effectiveness of the system.

ENVIRONMENTAL ISSUES

The project may have a positive impact on the environment. Improving the safety of shipping on the Mekong River reduces the risk of groundings, collisions, accidents and water pollution. This action

could increase the number of passengers using IWT so it is important that ports and vessels consider additional waste facilities. The navigation guidance system could be used to indicate waste facilities along the Mekong River. There may also be an opportunity for boat operators to use this system to report the location of dangerous areas, accidents and environmental issues along the waterway.

ECONOMIC ASSESSMENT

This action is likely to have safety improvement benefits, which are difficult to measure in economic terms

PRIORITY OF ACTION (H/M/L)

Medium(2029-2030).

FINANCING PLAN (PUBLIC/PRIVATE)

Regional: MRCS NAP, ADB - GMS (Greater Mekong Sub region).

International: World Bank, European Union, Flanders / Belgium, Australia aid, KOICA (Korea), JICA (Japan), ASEAN IAI (receiving funds from Australia, Japan, etc.).

PRIOR ACTIONS REQUIRED

None.

FOLLOW-UP ACTIONS REQUIRED

None.

5.10 LONG TERM AIDS TO NAVIGATION ACTION 3 (LAN3)

TITLE

Develop and install a GPS Navigation Guidance System, compulsory for all boats carrying cargo and passengers along the Tonle Sap River and Lake

BACKGROUND AND RATIONALE

Physical marking of the navigation channel of the Tonle Sap River has not been an easy or effective task. The large seasonal variability in water levels and substantial amount of flood debris in the wet season mean that unless the markers are removed and replaced during periods of peak flows, there is a high probability of equipment damage or loss. Also, the Lake is so ample that it would be useless to install visual markers there, more so because there are no real channels in the Lake.

Therefore, rather than relying on the physical markers and their associated maintenance and cost challenges, navigators should utilize new low-cost technologies in the form of GPS course guidance and identification of submerged hazards. Working with the already skilled navigators of river-faring vessels, the optimal course for wet and dry seasons could be recorded and displayed on a digital chart, providing a visual tool that would allow navigators to ensure they are on course, and alert them of any hazards that might be approaching. By recording an ideal course with outer limits for safety and overtaking, it is possible to provide an accurate level of route guidance, while allowing for potential GPS accuracy issues.This system would allow the navigator to keep the vessel on a predetermined track and as such avoid underwater obstacles and rocky outcrops. During heavy rains, which seriously reduce visibility, the navigator could still reach the safety of port by steering with assistance from the digital chart.

The proposed system would incorporate a number of other advantages including:

1) The Estimated Time of Arrival (ETA) of vessels could be determined with great accuracy as the pilots could determine the distance remaining to reach the next destination.
2) Vessels could sail cautiously in conditions with bad visibility caused by dense rain, fog, and during twilight hours.
3) In emergency situations, vessels could continue to sail in extreme weather such as heavy rain and winds.
4) The Government could have control and registration of accidents by checking the GPS readings and track logs of vessels.

In addition to the aforementioned benefits, vessels could continue to sail into the late evening and night just to reach a safe port (although due diligence would be required as it is strongly advised only to sail during daylight hours).

The Project will also include the purchase of twenty (20) fixed GPS units that will be installed on selected boats in the project area for trial purposes.

In addition to the aforementioned tasks, data collected from the early stages of the project must be combined with other spatial datasets including the updated digital hydrographic atlas and uploaded to the GPS units to provide a resource of handheld devices containing a universal navigation dataset of the basin for use in future projects and research.

In 2014 a GPS pilot project was done from Huay Xay downstream to Luang Prabang Cargo Port. This project was highly successful and is being used constantly by the river pilots in this stretch.

Cambodia.The project area covers the Tonle Sap from Phnom Penh to Chhong Kneas for a total length of 244 km.

OBJECTIVES

The **ultimate objective** is to promote freedom of navigation and increase international trade opportunities for MRC member countries' mutual benefit, and to assist in coordination and cooperation in developing effective and safe waterborne transport in a sustainable and protective manner for the waterway environment. The current project will support the ultimate objective through finding solutions to navigate during low water situations and encouraging effective and safe cross-border waterborne transport on a critical cross-border navigation route.

The **immediate objectives** of the project are:

1) To identify and record the deepest navigation route along the river thereby improving navigation safety through the establishment of an officially recommended course.
2) To promote waterway use, improved safety and better environmental outcomes through the use of electronic mapping resources.
3) To test the feasibility of GPS navigation devices as an aid to navigation and build capacity in the use of this technology amongwaterway users.
4) To make the system compulsory for all commercial vessels carrying cargo and passengers.

OUTPUTS AND DELIVERABLES

Output 1: Completed 60m wide high resolution bathymetric survey of the traditional navigation route

Expected Deliverables:

- The traditional navigation route used by vessels is recorded;
- Bathymetric survey results (multibeam echo sounding) with imagery 'sweep' of the 60m channel to identify any potential hazards to navigation;
- A classification at lowest low water levels (0m – 1m below surface, 1m – 2m below surface, 2m – 3m below surface, >3m below surface).

Output 2: GIS format mapping outputs suitable for use in GPS devices

Expected Deliverable:

- The results of Output 1 are digitally attributed on advanced GIS map sets with different layers (optimal route, course centreline, buoys/beacons, submerged danger marks, ports, etc.)

Output 3: GPS equipment is installed on 20 vessels, vessel captains are trained on the use of new GPS maps and vessel tracking systems

Expected Deliverables:

- Vessel owners and pilots are identified for participation in the project;
- GPS devices are supplied to the participants in the program;
- The advanced map dataset is pre-loaded onto each of these devices to cover the stretches of river within the project area;
- This information is correct and suitable for use in navigating the river;
- Training is provided to the users of this equipment.

Output 4: The GPS system is compulsory for all vessels carrying cargo and passengers

Expected Deliverable:

- All vessels carrying cargo and passengers have the GPS on board and are familiarwith its use.

ACTIVITIES

Under Output 1 (completed 60m wide bathymetric survey of the traditional navigation route

1.1 Before the deepest (or optimal) route is found, record the traditional route (routes taken by the best pilots on the river) using high accuracy (differential, where possible) GPS receivers with external antennas. Nominate three separate vessels of at least 200 DWT (as large as possible) to be used for plotting the courses. GPS antenna should be placed at the centre point of the bridge of the vessel and the track of the vessel recorded at one second intervals. The traditional route should be recorded on three separate occasions for each of the two scenarios outlined below. The traditional vessel route should be recorded in both upstream and downstream directions to ensure consistency.

1.2 Analyze the results from recording the traditional navigation route and merge to create a definitive line representing the traditional navigation route for the project area.

1.3 Conduct a bathymetric survey using a multibeam echo sounder to verify the safety of the above identified course lines. The proposed survey area should extend to a maximum of 30m either side of the course line.

1.4 Identify any potential hazards and areas of river bed that have the potential to be less than 3m below the surface of the water at lowest low water level (CD). Soundings should then be taken in high detail to provide sufficient information to identify the object. In these areas a 1m grid should be used for collecting sounding data. That is, transects should aim to be spaced 1m apart, with soundings collected at intervals of 1m. This should be considered a base level of data collection for these areas, with more information being considered desirable.

Under Output 2 (GIS format mapping outputs suitable for use in GPS devices)

2.1 Analyze the results of the bathymetric survey using software tools (ArcGIS, Hypak, etc.) to interpolate a surface of the riverbed within the navigation corridor. This surface should then be classified to identify any potential obstacles or constraints to the 60m navigation fairway, based on the following classification at lowest low water levels:

a) Exposed Obstacles;

b) 0m – 1m below surface;

c) 1m – 2m below surface;

d) 2m – 3m below surface;

e) >3m below surface.

2.2 The bathymetric survey should also record the position of existing features and aids to navigation that are present on these stretches (both newly installed buoys/beacons) including reference waypoints (ports/landings etc.), lateral buoys and beacons, or any other key waypoints that are not already recorded in the hydrographic atlas.

2.3 Attribute the results of the Outputs 1 and 2 correctly based on the results of the bathymetric surveys and the recording of waypoints along the river and lake. This will produce the following outputs:

a) Bathymetric Survey Results (ESRI Point Shapefile);

b) Navigational Aids (ESRI Point Shapefile);

c) Isolated Danger Marks (ESRI Point Shapefile);

d) Navigation Centreline (ESRI Line Shapefile);

e) Depth Classified Navigation Fairway – As per Output 1 classification scheme (ESRI Polygon Shapefile);

f) Port and Landing Facilities (ESRI Point Shapefile);

g) GeoTIF Stitched Sidescan Sonar Imagery (Georeferenced TIF/JPG).

2.4 Integrate this information with data layers from the existing hydrographic atlas and updated chart datum determination to produce a basic GPS dataset in GPX file format that contains the following:

a) Course Centreline;

b) Port and Lateral Buoys/Beacons;

c) Submerged Danger Marks;

d) Port and Landing Facilities.

2.5 Produce an advanced GPS map set using GPSMapper or Mapwel software to create a comprehensive graphical map set of the project area. This information should be integrated with data layers from the existing hydrographic atlas and updated chart datum determination to produce graphical maps in Garmin IMG format that contain the following:

a) Course Centreline;

b) Port and Lateral Buoys/Beacons;

c) Submerged Danger Marks;

d) Port and Landing Facilities;

e) Navigation Fairway;

f) Classified Navigation Corridor Depths;

g) KM Markers;

h) River Area.

This dataset should include appropriate name and description content based on the entity being displayed (i.e. Port Name, Beacon ID). If necessary this data may be tiled across multiple IMG files to support the efficient functioning of the GPS map.

Under Output 3 (installed GPS equipment and trained vessel captains)

3.1 Select vessel owners and pilots for participation in the project. Larger vessels, those carrying dangerous goods and passenger vessels should take priority as the GPS system will reduce the risk to these important cargoes.

3.2 Supply 20 GPS devices to the participants in the program. The devices must have at least a 5” diagonal screen size and support Garmin format map data in IMG format. Fixed devices must be installed on the aforementioned vessels inclusive of external antenna and power supplies.

3.3 Pre-load the dataset onto each of these devices to cover the stretches of river within the project area. This information should be verified as correct and suitable for use in navigating the river by conducting at least one test run in both directions with the assistance of the river pilots that participated in the Output 1 recording of the traditional navigation route.

3.4 Provide training to the users of this equipment, including:

a) Loading of correct map data;

b) Loading of correct course line;

c) Waypoint creation;

d) Destination setting;

e) Real-time navigation using GPS devices;

f) Appropriateness of use and safety issues regarding use of GPS for commercial vessel navigation.

Under Output 4 (the GPS system is compulsory for all vessels carrying cargo and passengers)

1.1 Make the system compulsory by incorporating it into the legal system of Cambodia, and conduct law enforcement.

1.2 Prepare awareness and training campaigns.

BUDGET

Estimated budget is calculated per kilometer stretch and is based on the costs of the GPS project between Huay Xay and Luang Prabang, including indexing. The costs are calculated at a total price of US$ 1,350 per kilometer.

Since the total distance here is 244 km @ 1,350 US$/km equals US$ 330,000. An additional amount of US$ 80,000 is required to make the system compulsory by law and prepare awareness and training campaigns.

Total US$ 410,000.

HUMAN RESOURCES

The work can be implemented by the relevant staff of the Waterways Department but consultants will need to be hired, especially with expertise in bathymetric surveying, navigation and GIS and digital mapping. The trainees will be the ship's captains and pilots.

PROPOSED EXECUTING/IMPLEMENTING AGENCY

Since this is a regional project with cross-border aspects, the Waterways Department in Cambodiaisthe implementing agency together with the MRC Secretariat (MRCS). MRCS could, on behalf of the MRC, serve as the Executing Agency of the project. The Cambodia National Mekong Committee could be the Coordinating Agency and assist the MRCS in liaising with the government to obtain any other additional information necessary. The CNMC will be asked to make arrangements for importation procedures including custom clearances of all project equipment purchased and other government formalities.

TIME AND WORK SCHEDULE

The activities under Output 1 and 2, including the tendering and contracting process could take up to 9 months.

The activities under Output 3, could take 4 months.

The activities under Output 4, could take 6 months.

Total implementation is 19 months.

SOCIAL ISSUES

This project is not expected to have any adverse social impacts. A communications plan for all waterway users on the lights, marks and air clearances would improve the effectiveness of the system.

ENVIRONMENTAL ISSUES

The project may have a positive impact on the environment. Improving the safety of shipping on the Mekong River reduces the risk of groundings, collisions, accidents and water pollution. This action could increase the number of passengers using IWT so it is important that ports and vessels consider

additional waste facilities. The navigation guidance system could be used to indicate waste facilities along the Mekong River. There may also be an opportunity for boat operators to use this system to report the location of dangerous areas, accidents and environmental issues along the waterway.

ECONOMIC ASSESSMENT

This action is likely to have safety improvement benefits, which are difficult to measure in economic terms.

PRIORITY OF ACTION (H/M/L)

High (2025-2026).

FINANCING PLAN (PUBLIC/PRIVATE)

National: Ministry of Public Works and Transport

Regional: MRCS NAP, ADB - GMS (Greater Mekong Sub region).

International: World Bank, European Union, Flanders / Belgium, Australia aid, KOICA (Korea), JICA (Japan), ASEAN IAI (receiving funds from Australia, Japan, etc.).

PRIOR ACTIONS REQUIRED

None.

FOLLOW-UP ACTIONS REQUIRED

None.

5.11 LONG TERM AIDS TO NAVIGATION ACTION 4 (LAN4)

TITLE

Install buoys and beacons between Kratie and Kompong Cham for day and night navigation

BACKGROUND AND RATIONALE

According to the new development plans between Cambodia and KOICA, this stretch of the Mekong River will become part of the international shipping route that connects Kratie and Kompong Cham ports with the sea passing through Viet Nam's territory. Shipping is being hindered by a lack of a proper system of channel markers, buoys, beacons and other aids to navigation to guide the vessel's master through numerous shoals, sand banks, ship wrecks and other obstacles. A lack of proper aids to navigation is the main cause for collisions, ships running aground, and risks for pollution. This also results in a loss of opportunities as investors see navigation as an adventure rather than a transport mode that can provide a reliable schedule for cargo forwarders.The ultimate goal of this project is to improve this waterway so that vessels can make the most of this river, under safe conditions, day and night, and on a continuous basis based on the design and installation of an internationally recognized system of aids to navigation.

This project will also bring new commitments and closer cooperation between Cambodia and Viet Nam to aim for improvement of international navigation on the Mekong estuarine system between the sea and Phnom Penh.

The design buoys and beacons should be of the same specifications, type and material as used by MRC when the organization procured and installed the navaids along the Bassac and Mekong Rivers between 2007 and 2015.

LOCATION

Only Cambodia, all along the Mekong River between Kratie and Kompong Cham.

OBJECTIVES

The **ultimate objective** of this project is to improve safety and quality of navigation along the shipping route of the Mekong River, Vam Nao Pass and Bassac River by the installation of an internationally recognized system of Aids to Navigation and to increase the international trade opportunities between Cambodia and Viet Nam, and overseas partners.

The **immediate objectives** of the project are:

1) To design a detailed aids to navigation system on the selected stretches of the Mekong River to be ready for installation;
2) To procure and install the required navaids;
3) To strengthen the capability of the related line agencies.

OUTPUTS AND DELIVERABLES

The exact quantified output will depend on the results of immediate objective 1 as this will determine how many will need to be procured. To be consistent with the other stretches it is recommended to go for the more sustainable and less costly polyethylene buoys and beacons.

Output 1: A detailed design of aids to navigation on the Mekong River is prepared

Expected deliverables:

- Maps of the navaids, including design criteria;

- Site visits and final plans;
- ToRs and bidding documents17 for procurement and installation;
- Workshop to present and discuss the drafts;
- Tender procedures for procurement and installation.

Output 2: The aids to navigation have been procured and installed properly

Expected deliverables:

- Equipment list and assembly plan;
- Installation logistical plan;
- Assembly workshop and area selected beforehand;
- Operational logistics ready;
- Localized hydrographic maps and survey results updated;
- Awareness campaign;
- Buoys and moorings on the barge, ready to be dropped;
- Advice given by pilots during planning and buoy positioning;
- Moorings checked for correct length;
- Detailed list of positions, positions are mapped available;
- After installation, pilots and waterway users are requested to provide feedback of irregularities;
- Spare AtN tested, commissioned and stored.

Output 3: Selected officials of the Waterways Department have been trained in the design and installation of navaids

Expected deliverable:

- An assigned number of staff of the Waterways Department can independently design the aids to navigation system, and install the buoys, beacons and other markers.

ACTIVITIES

Under Output 1.1 (detailed design of aids to navigation)

1.1 Review the latest updated charts and identify the leading lines and channels, according to the required water depth and ship size. Define criteria for design and prepare the details for the aids to navigation for the specific project area (location, type number, condition).

1.2 Site visit to compare the results of 1.1 with the actual situation.

1.3 Based on the results of 1.1 and 1.2. prepare maps of the navigational aids system.

1.4 Prepare the ToRs and bidding documents for procurement and installation.

[17] Many of the specification details and documents are available at the MRC Secretariat as they were used to install the navaids between 2007 and 2015.

1.5 Organize a workshop to present and discuss the draft of the detailed design of the aids to navigation and obtain agreement of the final proposal for the detailed design and specifications.

1.6 Start the tender procedures for procurement and installation.

Under Output 2 (procurement and installation)

2.1 After tendering and contracting, receive and clear the goods.

2.2 Inspect received equipment and store the goods well.

2.3 Prepare a plan for assembling the buoys and markers.

2.4 Prepare a plan to load the buoys on the barge and install the buoy at the correct location.

2.5 Prepare adequate assembly location with modern tools available.

2.6 Prepare the concrete sinkers, chains and swivels, and assemble.

2.7 Connect the chains and swivels to the concrete blocks.

2.8 Expected deliverable: operational logistics ready.

2.9 Review and confirm river survey data, discuss with pilots to obtain the best and most suitable location for dropping the buoys.

2.10 Establish a public awareness campaign for pilots and local people.

2.11 Load the barges/boats.

2.12 Pilot to exactly determine the location for drop.

2.13 Use echo-sounding equipment and GPS to verify position. Some places may require more detailed surveys to find the best spot for dropping and positioning the anchor.

2.14 Verify chain length according to location and river depth, then drop buoy and moorings and prepare for use.

2.15 Prepare an inventory with exact location of buoys.

2.16 Monitor position and movement of the buoy.

2.17 Update the aids to navigation management system.

2.18 Stock checks and review - Spare AtN tested commissioned.

Under Output 3 (training and capacity building)

1.1 Prepare a Training Needs Assessment, and on-the-job training plan.

1.2 Select the relevant staff members to be trained.

1.3 Train the staff in all relevant fields identified in the Assessment.

BUDGET

Estimated budget for:

Output 1:US$ 80,000 including consultancies, data collection and survey

Output 2: US$ 450,000 including procurement of polyethylene navaids and installation

Output 3:US$ 60,000 including training material and consultancy

Total: US$ 590,000

HUMAN RESOURCES

The relevant staff of the Waterways Department, assisted by an international navaids consultant, can do most of the work under Outputs 1 and 3. The manufacturing part under Output 2 needs to be done by a specialized company but the installation can be done by the Waterways Department.

PROPOSED EXECUTING/IMPLEMENTING AGENCY

The Waterways Department under the Ministry of Public Works and Transport (MPWT).

TIME AND WORK SCHEDULE

The activities under Output 1, including the tendering and contracting process, could take up to 8 months.

The activities under Output 2, possibly including manufacturing and shipping, could take 6 months while installation can be done in 1 month.

The implementation under Output 3 can be done simultaneously with Outputs 1 and 2.

Total implementation is 15 months.

SOCIAL ISSUES

This project will improve safety for all boat operators and waterway users. A communications plan on using the aids to navigation system may further reduce the risk of shipping accidents. This project would also require restrictions on the types of vessels and safety equipment required onboard for night navigation.

ENVIRONMENTAL ISSUES

This project is not expected to have any significant negative impacts to the environment. Selecting buoys made of recyclable polyethylene would improve the sustainability of this project. As this is a long-term project, the use of virtual buoys could also be considered. During the installation of the aids to navigation system the contractors should ensure a waste management plan is developed for the collection and treatment of solid wastes.

ECONOMIC ASSESSMENT

This action is likely to have safety improvement benefits, which are difficult to measure in economic terms.

PRIORITY OF ACTION (H/M/L)

Low (2033-2034).

FINANCING PLAN (PUBLIC/PRIVATE)

National (in-country): National budget of MPWT.

Regional: MRCS NAP, ADB - GMS (Greater Mekong Sub region).

International: World Bank, European Union, Flanders / Belgium, Australia aid, KOICA (Korea), JICA (Japan), ASEAN IAI (receiving funds from Australia, Japan, etc.).

PRIOR ACTIONS REQUIRED

None.

FOLLOW-UP ACTIONS REQUIRED

None.

5.12 LONG TERM AIDS TO NAVIGATION ACTION 5 (LAN5)

TITLE

Monitor and maintain the Aids to Navigation System along the Mekong River between Kompong Cham and the entrance (estuary) to the Mekong River, including the Cho Gao Canal between 2020 and 2040.

BACKGROUND AND RATIONALE

Aids to Navigation are very important for the import/export economy on the Mekong River.This is especially the case over the past few years as navigation activities along the Mekong River system in Cambodia and Viet Nam have dramatically increased. Cargo passing through Phnom Penh Autonomous Port (PPAP) is increasing at an annual rate of about 20 percent.In 2014, cargo reached 140,000 TEU. Trade of petroleum products is also steadily increasing.

To keep up with the pace of growth,the Port of Phnom Penhwill require the best possible access for ships. Moreover, the bridge over the Mekong River at Neak Leung is now completed. This will make Road No. 1 to Viet Nam the most important road in the country. If no better access can be guaranteed on the river, much of the cargo will shift to the road. Another newcomer on the river is the cruise ship industry, which operates between Angkor Wat in Cambodia and HCMC Port in Viet Nam. Cruise liners with more than 50 hotel rooms on board are mushrooming and an average of about 5 cruise liners are being built every year for the Mekong River. This is an industry with important spin-offs for the Cambodian economy. Most of these vessels sail at night and spend the day in ports. Night navigation is therefore extremely important for them. If buoys do not mark the channel limits with lanterns, the safety of the people on board may be at jeopardy. Needless to say, a reliable system to aid navigation is the way forward and PPAP and the authorities should make aneffort tobetter maintain the aids to navigation so that there is a comprehensive system, especially in the areas which are transit routes under the Bilateral Navigation Agreement between Cambodia and Viet Nam.

In the years 2006, 2009 and 2012, the Mekong River Commission assisted the Cambodian and Vietnamese governments to install aids to navigation along the Mekong, Tonle Sap,Vam Nao, and Bassac Rivers. The current situation requires improvements. Some of the aids to navigation have gone missing due to environmental causessuch as fast currents and considerable debris. Other reasons are vandalism – stealing of steel chains and lights and vandalism by the fishermen who are against the presence of buoys. Another inhibiting factor is the age of the equipment. If a light becomes unlit, it becomes invisible at night and therefore prone to be hit by a ship or boat, especially by sand dredgers who are less concerned by 'rules of the road' and cross the channel in inappropriate directions.

Similar to airlinenavigation services and road networks, regular maintenance and upgrades of the marine aids to navigation are necessary.A number of significant obstacles have conspired to prevent the original International Association of Lighthouse Authorities (IALA) standards from being maintained. The stretch from the Viet Nam border to Phnom Penh, although well designed, is now plagued with equipment failures and losses due to vandalism, lack of routine maintenance, ships striking buoys and other causes.The PPAP has tried to compensate by prioritizing and using buoys and lights from other sectors but has not been able to maintain the minimum IALA standard.Cambodia and Viet Nam have both signed up to the SOLAS Convention, which automatically implies that the IALA standards should be followed. Much more should be done to maintain the aids to navigation system, and procure new parts when and where necessary.

Some of the problems identified during the *'Assessment of the Existing Aids to navigation in Cambodia, MRC January 2014'* regarding monitoring and maintenance, were:

- **Inventories:**There are available spare parts but there is neitheran inventory list, nor a designated area for storage.Hence it is impossible to estimate what can be used for

where.This is clearly a management issue, which needs to be resolved under the aspect of maintenance.

- **SOLAS Convention and member state responsibility:**Cambodia and Viet Nam have both signed up to the SOLAS Convention, which automatically implies that the IALA standards should be followed. In Section 13 there is a specific request by SOLAS that if a Member employs IALA aids to navigation its system reliability should be 98 percent. This is a clear obligation and means that the member state is fully responsible to follow very high aids to navigation maintenance standards. In the case of Cambodia, for all surveyed three stretches this is not the case.
- **Institutional Responsibility:**In Cambodia there is no delineation of responsibilities with regard to aids to navigation between the Waterways Department and PPAP.
- **Financing:**Costs towards the capital and maintenance costs for aids to navigation are not being used for its correct purpose. Funds from channel fees and light dues that are paid by the cross-border vessels are not being used for their correct purpose. Money from tolls on a road is used to maintain and improve the road. This should be exactly the same with regards to waterways. What happens is that the navigation dues are collected butthen transferred to the Finance Department general revenue fund and allocations for necessary work to be performed by PPAP are then requested by the Waterway Department and, if provided, funds are transferred back to the port.
- **Vandalism and theft:**Many of the buoy lights/solar panels are missing. Although the level of vandalism protection is as high as anywhere in the consultant's experience, it is still not enough to protect the system. This indicates that there truly is no technical solution for vandalism yet and that only when technical discouragement is combined with a community engagement program can vandalism be reduced to near zero.
- **Poor maintenance:** There is no evidence of a formal maintenance plan, and the struggle against the deteriorating aids to navigation system seems to be a losing battle. The widespread belief that if you have polyethylene buoys there is nothing to be maintained, is false. The buoys still need very close follow-up, especially in this stretch as there is significant debris of logs, floating bamboo and other flotsam. If the debris builds up then the buoy will sink or be dislocated. Lights have to be checked on a daily basis and replaced when not working. On average, a boat will hit a buoy without a light within 3 days. Proper and reliably functioning lights on the buoys would help prevent this type of encounter where the navigation aid is usually damaged or destroyed. A crew in a small boat can easily clear debris and regular patrols during "debris" season should be undertaken.
- **Monitoring done but no follow-up:** The pilots report problems to the aids to navigation. When the buoys were installed and the pilots warned PPAP about mishaps with the buoy (debris, damage, no light, vandalism, etc.), the buoy was fixed. Over the years,responses to fix the buoy have been slower.
- **Lack of agreement with the fishermen**: There is heavy fishing throughout the Mekong River system but especially on the stretch between Phnom Penh and Kompong Cham, and on the Tonle Sap. On the stretch Phnom Penh – Kompong Cham, most of the fishing occurs with purse (seine) nets just below the Prek Tameakbridge. Most intense fishing is done during full moon periods as the fish tend to migrate (approximately for one week during the full moon in January and another week during the full moon in February, so the total serious interference with navigation is only about two weeks per year).The type of net used is in itself a problem as once the traffic is inside an open purse (generally open on the downstream side to catch fish migrating upstream) it is very difficult to maneuver out as the nets are on the surface.

As already stated, securing nautical accessibility is not a one-time operation. Once the navigational aids are installed it requires constant monitoring, operating, maintaining, repairing, and making new plans for capital investments, among other things.

LOCATION

Mekong River in Cambodia and Viet Nam between Kompong Cham and the Cambodia - Viet Nam border, and between the border and the sea.

OBJECTIVES

The **ultimate objective** of this project is to improve safety and quality of navigation along the shipping route of the Mekong River by monitoring and maintaining an internationally recognized system of Aids to Navigation and to increase the international trade opportunities between Cambodia and Viet Nam, and overseas partners.

The **immediate objectives** of the project are:

1) To prepare a monitoring and management plan for Cambodia and for Viet Nam.
2) To implement the monitoring and management plan in Cambodia andViet Nam.
3) To strengthen the capability of the related line agencies in monitoring and management.

OUTPUTS AND DELIVERABLES

Output 1: Awell prepared and feasible monitoring and management plan for Cambodia and for Viet Nam for the stretch between Kompong Cham and the Cambodia - Viet Nam border, and between the border and the sea

Expected deliverable:

- A plan for monitoring and maintaining the aids to navigation in Cambodia and Viet Nam for the next 10 years is in place.

Output 2: A well implemented monitoring and management plan for Cambodia and for Viet Namfor the stretch between Kompong Cham and the sea

Expected deliverable:

- The aids to navigation in Cambodia and Viet Nam are carefully monitored and well maintained throughout the initial period of 10 years. After 10 years, another plan is made.

Output 3: Establishment of an Aids to Navigation Coordinating Agency and training of the selected officials of the Waterways Department in monitoring and maintaining the navaids

Expected deliverable:

- An Aids to Navigation Coordinating Agency is established. An assigned number of staff of the Waterways Department can independently monitor and maintain the aids to navigation in Cambodia and in Viet Nam.

ACTIVITIES

Under Output 1 (monitoring and management plan for Cambodia and Viet Nam)

1.1 Separately in Cambodia and in Viet Nam, prepare a detailed database of inventory of the navaids (location, type number, condition, spares, etc.), and an inventory of the available equipment for logistics and maintenance.

1.2 Based on the assessment report and the procurement plan, define which new navaids will be procured and which will be repaired.

1.3 Site visits to compare the results of 1.1 and 1.2 with the actual situation.

1.4 Prepare a 10-year feasible monitoring and management plan, including budget, for the navaids in the stretch between Kompong Cham and the Cambodia-Viet Nam border, and between the border and the sea. Include not only regular checking and maintenance of the system, but also policies and procedures that support the high performance standards set by IALA.

The Plan should bear in mind the following Managerial, Operational and Maintenance considerations and recommendations:

- The maintenance plan is a fairly complicated proposition which does not simply mean 'go and fix an aid'. This has failed in Cambodia so a thorough plan is required;
- Incorporate an awareness campaign in the plan. In the future ships will become wider, longer and deeper and the old mentality and myths of "she will be alright" will not be valid anymore: accidents will happen, oil spills will occur and people will die if the channel is not properly marked, and maintained to remain operational;
- Allocate a higher budget for maintenance and repairs than what is expected to cost as there will always be unforeseen circumstances;
- Funds from channel fees and light dues that are paid by the cross-border vessels should be dedicated for maintenance and repairs;
- Set up a dedicated department consisting of an Aids to Navigation (AtN) Maintenance Unit, a Survey Unit and a Dredging Unit;
- Make facilities and equipment available for survey, maintenance of AtN and dredging including tugboat, pontoon, crane, and speed boat – if need be they can be hired;
- Make an annual plan for surveys, maintenance of AtN and the dredging of the navigation channel;
- Assign tasks to pilots to monitor daily, report and take notes on the status of aids to navigation;
- Organize a workshop at the Ministry with participation from stakeholders to inform about the role of the Aids to Navigation system, and discuss ways to maintain and protect AtN;
- Hold discussions with the fishing authorities and fishing associations to ensure that the channel remains open for shipping;
- Have a plan with the local authorities to help combat acts of vandalism;
- Include the maintenance of the AIS as this is an aide to navigation as well;
- Some system upgrades are in order such as using larger buoys and mooring systems in problem locations, and procuring lights with a longer lifespan and with built-in monitoring systems;
- A formal aids to navigation management program is established according to international norms including policy development, maintenance planning, long term financial planning and staff training;
- A well functioning marine aids to navigation system is an important component of a country's transport economy and should be maintained to a high standard using adequate technical and financial resources;
- Include procedures for responding to outages and notifying mariners regarding any deficiencies in the system;
- Planning also includes the inclusion of a proper quantity of spare buoys, lights and accessories so that the reliability of the system can be maintained at a high level;

- The 10 year plan needs to allow management to determine the budget and seek necessary funding to provide for the maintenance of the entire aids to navigation infrastructure including numbers and types of aids, personnel levels and training, and support equipment such as boats, vehicles, etc.;
- It is impossible to plan the maintenance of the aids to navigation system without a proper database. This does not need to be complicated. A simple Excel document keeping track of all the operational aids to navigation, their main component parts, serial numbers and the spares will do. A record keeping process needs to be installed whereby any maintenance activities are recorded and absolutely no changes to equipment occur without being noted on the database. A specific policy would need to be developed;
- A navigation storage facility should be reconfigured as an aids to navigation servicing depot with the added option to consider an office space for aids to navigation management and technicians;
- Clearing of debris:debris should be removed from the aids to navigation as soon as this is spotted, or at regular intervals. In many cases the debris will attach and amass around the chain below the surface, and is therefore not visible to the pilots. If more and more debris amasses, the weight will be so high that the buoy will start to sink, will not be traceable and will become an additional danger to navigation;
- Monitoring and reporting: every new light purchased should be required to have a GSM (mobile chip) inside which can allow all lit aids to be cheaply and efficiently monitored for their position and condition from one central control location. The small extra cost for this addition will quickly repay itself;
- Regular reporting should be done by the pilots on the status of the aids to navigation;
- The establishment of a database for aids to navigation, policies regarding all aspects of standards and maintenance, as well as the dissemination of safety information to mariners, is critical to a functioning aids to navigation system. It is recommended that all concerned parties work together to establish not only an aids to navigation information system, but also a marine safety information system (as part of RIS). It is recommended that the front line dissemination of marine safety information be done through a 24/7 Coordination Service. Operators managing ship movements could also receive and disseminate aids to navigation and marine safety information. This is common practice worldwide. The training and service should be to an IALA standard;
- Management: there must be an agency that is responsible for aids to navigation with proper management and technical staff. They must have a set of policies which meet IALA standards and serve the local user community. They must have enough resources to carry out the maintenance and there must be a proper database/schedule for routing maintenance. Other components of the maintenance/management system are also required to provide the quality and quantity of service for which it was designed;
- The first step in creating a maintenance plan is to establish the organization to properly implement such a plan;
- Proper management of the aids to navigation system is as important as the technical competencies to maintain the system. It is recommended that a formal structure of aids to navigation management, including the appropriate training regime and the provision of adequate management and physical resources, should be included in any proposal for an Aids to Navigation Coordinating Agency;
- Any proposal for development of an Aids to Navigation Coordinating Agency should include a complete financial proposal, including proposed long term capital and operations costs, and additionally a revenue proposal consisting of directing of all appropriate existing fees, possible new fees, donor and government general revenue contributions. In Cambodia this

should of course be phased-in over time.The recommendation is that PPAP continue (with support from other agencies such as the Waterways Department) to manage, install and maintain a 24-hour a day marine aids to navigation system in Area 1, Area 2 and Area 3 of the Mekong River.To enable and assist the PPAP, the parties involved should refer to the appropriate Sub-Decree whereby the Transport Department would continue to be the agency for laws and regulation, the Waterway Department would look after program management and policy (with help from donors such as the MRC), and the Phnom Penh Autonomous Port would continue to provide services on technical and operational matters concerning aids to navigation including procurement, installation and maintenance of aids to navigation;

- Institutional:in Cambodia, the specific duties of each of the organizations should be included as part of arrangements.The solution may be to develop official arrangements between all concerned parties which recognizes the responsibilities of each, yet in the end allows the financial and operational assistance of a Programme Delivery Manager.

Under Output 2 (actual monitoring and managing operations in Cambodia and in Viet Nam)

2.1 Based on all the considerations and recommendations mentioned in Output 1, and using the IALA Guidelines, start implementing the Monitoring and Management Plan in Cambodia and in Viet Nam.

Under Output 3 (institutional arrangements and training)

3.1 Separately in Cambodia and in Viet Nam, prepare the institutional arrangements according to the considerations and recommendations mentioned in Output 1. Especially in the case of Cambodia, a specific agency needs to be assigned.Start the 10-year Implementation. Revisit the implementation following the adjusted plans after 10 years.

3.2 Based on the Assessment Report, the Procurement Plan, and the Monitoring and Management Plan prepare a Training Needs Plan and start the 10-year implementation. Revisit the implementation following the adjusted plans after 10 years.

BUDGET

In Cambodia:

For Output 1: US$ 80,000

For Output 2: Estimated at US$ 800,000 but depending on the results of Output 1 and the full Procurement Plan – for 10 years

For Output 3: US$ 160,000 for 10 years

Total for Cambodia:US$ 1,040,000

In Viet Nam:

For Output 1: US$ 120,000 Is higher than Cambodia because of the longer stretch and because the size of buoys is bigger

For Output 2: Estimated at US$ 1,500,000 but depending on the results of Output 1 and the full Procurement Plan– for 10 years

For Output 3: US$ 260,000 for 10 years

Total for Viet Nam: US$ 1,880,000

Total for Cambodia and Viet Nam: US$ 2,920,000.

PROPOSED EXECUTING/IMPLEMENTING AGENCY

The Waterways Department and PPAP in Cambodia under the Ministry of Public Works and Transport.

The River Stations and VIWA for the stretch between the border and My Tho and VINAMARINE between My Tho and the sea. All are under the Ministry of Transportation (MoT) in Viet Nam.

TIME AND WORK SCHEDULE

The activities under Output 1 would take 4 months

The activities under Outputs 2 and 3 would take 2 X 10 years continuously

SOCIAL ISSUES

This project will not have any adverse social impacts.

ENVIRONMENTAL ISSUES

This project is not expected to have any significant negative impacts to the environment. Buoys that need replacing should be made of recyclable polyethylene and the use of virtual buoys should be considered. During the installation of the aids to navigation system the contractors should ensure a waste management plan is developed for the collection and treatment of solid wastes.

ECONOMIC ASSESSMENT

This action is likely to have safety improvement benefits, which are difficult to measure in economic terms.

PRIORITY OF ACTION (H/M/L)

High (2021-2040).

FINANCING PLAN (PUBLIC/PRIVATE)

Financial Responsibility and Funds Sourcing: Funds from channel fees and light dues that are paid by the cross-border vessels are not being used for their correct purpose.Money from tolls on a road is used to maintain and improve the road.This should be exactly the same with regards to waterways.

The funding process simplified is:PPAP collects fees for various shipping activities as partially listed in the report*'Financial and Economic Cost of Container Barge Operation, Ho Chi Minh City-Phnom Penh'*. These funds are then transferred to the Finance Department general revenue fund and allocations for necessary work to be performed by PPAP are then requested by the Waterway Department and, if provided, funds are transferred back to the port, but probably not in the correct manner.This process is extremely cumbersome and cannot be audited and does not work efficiently for line agencies like PPAP.

Sourcing the funds to buy, operate, and maintain the equipment, and accessing the funds to conduct/coordinate the non-physical requirements such as training and creating the awareness of the waterway users is priority number one.Luckily the funds may be made available as the navigational dues and fees that are being paid by the cross-bordering vessels can be used to fund the capital inputs, as well as operational and maintenance costs of the aids to navigation system.Steps should be taken to ensure this happens.

PRIOR ACTIONS REQUIRED

Legal arrangements and commitments for assigning the relevant agency in Cambodia are required before starting the project.

FOLLOW-UP ACTIONS REQUIRED

Continuous follow-up over 20 years.

5.13 LONG TERM AIDS TO NAVIGATION ACTION 6 (LAN6)

TITLE

Monitor and maintain the Aids to Navigation System along the Vam Nao Pass and the Bassac River between Phnom Penh and the entrance to the Quan Chanh Bo Canal between 2020 and 2040

BACKGROUND AND RATIONALE

In the years 2009, 2012, and 2014the Mekong River Commission assisted the Vietnamese Government to install aids to navigation along the Mekong, Vam Nao and Bassac Rivers. Similar to airline navigation services and road networks, regular maintenance and upgrades of the marine aids to navigation are necessary. A number of significant obstacles have conspired to prevent the original International Association of Lighthouse Authorities (IALA) standards from being maintained. The stretch, although well designed, is now beset with equipment failures and losses due to vandalism, lack of routine maintenance, ships striking buoys and other causes. Viet Nam has signed up to the SOLAS Convention, which automatically implies that the IALA standards should be followed. Much more should be done to maintain the aids to navigation system, and procure new parts when and where necessary.

Maintenance is required to ensure that Aids to Navigation (AtN) equipment and systems continue to perform at the levels required by mariners to safely navigate the waterways. A maintenance plan and system should be adopted to ensure that AtN assets deliver the desired performance while minimizing Total Ownership Cost. This performance is normally defined as the level of availability required. Depending on the criticality or category of the AtN, the same AtN type might require different maintenance approaches to deliver the required availability outcome in a given location.

AtN service providers are accountable to their stakeholders for the provision of a reliable AtNnetwork that meets international standards for a reasonable cost. Maintenance strategiesadopted by authorities should be sought to reduce the total cost of ownership of their AtN.

Authorities may be able to reduce their costs by:

- Introducing new technologies in AtN equipment and materials;
- Considering future maintenance requirements during the design phase;
- Selection of suitable equipment for the application and operating environment;
- Extending the intervals between visits for both floating and fixed AtN;
- Use of electronic AtN such as AIS to refine the mix of physical and virtual AtN;
- Optimizing the use of in-house and/or contract provision of maintenance services.

The majority of maintenance costs are determined by the design of the equipment itself.Maintenance costs are the most significant component of the total ownership cost of theequipment or system. Therefore, it is crucial to account for long-term maintenance and logisticssupport early on in the design process. The goal should be to reduce the need formaintenance, extend the time interval for required maintenance, enable maintenance upon theevidence of need (condition-based maintenance), facilitate the maintenance task by theservicing personnel, and reduce the "logistics footprint" required for maintenance and support.

Tools such as remote monitoring can assist in tracking AtN performance and are also a useful tool in providing early warning reports to maintainers on potential outages. This early warning offers maintainers an opportunity to respond to irregular equipment condition in a planned manner prior to it failing e.g. it may be a possible to attend an AtN that is reporting a problem and repair it prior to total failure as part of planned maintenance mobilization.

Minimize Impact on the Environment

Legislative obligations and community expectations require AtN authorities to ensure that theiractivities do not have an adverse impact on the environment. Cleaning up after pollutionincidents and the associated rehabilitation of the environment can be costly.

Authorities can reduce their impact on the environment through:

- Extending the intervals between site visits;
- Planning activities and site visits to take into account the breeding seasons;
- Reduction in the use and storage of hazardous materials;
- Increased use of environmental friendly products and materials;
- Reduction in the reliance on air and sea heavy lift operations;
- Disposal/recycling of materials during the entire lifecycle should be considered in the design/upgrade process of AtN hardware and systems.

As already stated, securing nautical accessibility is not a one-time operation. Once the navigational aids are installed it requires constant monitoring, operating, maintaining, repairing, and making new plans for capital investments, among others.

LOCATION

The Vam Nao Pass and the Bassac River betweenthe Vam Nao Pass and the entrance to the Quan Chanh Bo Canal in Viet Nam

OBJECTIVES

The **ultimate objective** of this project is to improve safety and quality of navigation along the shipping route of the Mekong River by monitoring and maintaining an internationally recognized system of Aids to Navigation and to increase the international trade opportunities between Cambodia and Viet Nam, and overseas partners.

The **immediate objectives** of the project are:

1) To prepare a monitoring and management plan for Viet Nam;
2) To implement the monitoring and management plan in Viet Nam;
3) To strengthen the capability of the related line agencies in monitoring and management.

OUTPUTS AND DELIVERABLES

Output 1: A well prepared and feasible monitoring and management plan for Viet Nam for the Vam Nao Pass and Bassac River

Expected deliverable:

- A plan for monitoring and maintaining the aids to navigation in Viet Nam for an initial period of 10 years, is in place.

Output 2: A well implemented monitoring and management plan for Viet Namfor the stretch between the Vam Nao Pass, Bassac River and the sea

Expected deliverable:

- The aids to navigation in Viet Nam are carefully monitored and well maintained throughout the initial period of 10 years. After 10 years, another plan is made.

Output 3: Establishment of an Aids to Navigation Coordinating Agency and training of the selected officials of the River Station and VIWA, VINAMRINE in monitoring and maintaining the navaids

Expected deliverable:

- An Aids to Navigation Coordinating Agency is established. An assigned number of staff can independently monitor and maintain the aids to navigation.

ACTIVITIES

Under Output 1 (monitoring and management plan for Viet Nam)

1.1 Prepare a detailed database of inventory of the navaids (location, type number, condition, spares, etc.), and an inventory of the available equipment for logistics and maintenance.

1.2 Based on the assessment report and the procurement plan, define which new navaids will be procured and which will be repaired.

1.3 Site visits to compare the results of 1.1 and 1.2 with the actual situation.

1.4 Prepare a 10-year feasible monitoring and management plan, including budget and including not only regular checking and maintenance of the system, but also policies and procedures that support the high performance standards set by IALA.

The Plan should bear in mind the **following Managerial, Operational and Maintenance considerations and recommendations:**

- The maintenance plan is a fairly complicated proposition which does not simply mean 'go and fix an aid';
- Incorporate an awareness campaign in the plan. In the future ships will become wider, longer and deeper and the old mentality and myths of "she will be alright" will not be valid anymore: accidents will happen, oil spills will occur and people will die if the channel is not properly marked, and maintained to remain operational;
- Allocate a higher budget for maintenance and repairs than what is expected will cost as there will always be unforeseen circumstances;
- Funds from channel fees and light dues that are paid by the cross-border vessels should be dedicated for maintenance and repairs;
- Set up a dedicated department consisting of an Aids to Navigation (AtN) Maintenance Unit, a Survey Unit and a Dredging Unit;
- Make facilities and equipment available for survey, maintenance of AtN and dredging including tugboat, pontoon, crane, and speed boat – if need be they can be hired;
- Make an annual plan for surveys, maintenance of AtN and the dredging of the navigation channel;
- Assign tasks to pilots to monitor daily, report and take notes on the status of aids to navigation;
- Organize a workshop at the Ministry with participation from stakeholders to inform about the role of the AtN system, and discuss ways to maintain and protect AtN;
- Hold discussions with the fishing authorities and fishing associations to ensure that the channel remains open for shipping;
- Have a plan with the local authorities to help combat acts of vandalism;
- Include the maintenance of the AIS as this is an aide to navigation as well;
- Some system upgrades are in order such as using larger buoys and mooring systems in problem locations, and procuring lights with a longer lifespan and with built-in monitoring systems;

- A formal aids to navigation management program be established according to international norms including policy development, maintenance planning, long term financial planning and staff training;
- A well functioning marine aids to navigation system is an important component of a country's transport economy and should be maintained to a high standard using adequate technical and financial resources;
- Include procedures for responding to outages and notifying mariners regarding any deficiencies in the system;
- Planning also includes the inclusion of a proper quantity of spare buoys, lights and accessories so that the reliability of the system can be maintained at a high level;
- The 10 year plan needs to allow management to determine the budget and seek funding necessary to provide for the maintenance of the entire aids to navigation infrastructure including numbers and types of aids, personnel levels and training, and support equipment such as boats, vehicles etc.
- It is impossible to plan the maintenance of the aids to navigation system without a proper database. This does not need to be complicated. A simple Excel document keeping track of all the operational aids to navigation, their main component parts, serial numbers and the spares will do. A record keeping process needs to be installed whereby any maintenance activities are recorded and absolutely no changes to equipment occur without being noted on the database. A specific policy would need to be developed;
- A navigation storage facility should be reconfigured as an aids to navigation servicing depot with the added option to consider an office space for aids to navigation management and technicians;
- **Clearing of debris:**debris should be removed from the aids to navigation as soon as this is spotted, or at regular intervals. In many cases the debris will attach and amass around the chain below the surface, and is therefore not visible to the pilots. If more and more debris amasses, the weight will be so high that the buoy will start to sink, it will notbe traceable, and it will become an additional danger to navigation;
- **Monitoring and reporting:** every new light purchased should be required to have a GSM (mobile chip) inside which can allow all lit aids to be cheaply and efficiently monitored for their position and condition from one central control location. The small extra cost for this addition will quickly repay itself;
- Regular reporting should be done by the pilots on the status of the AtN;
- The establishment of a database for aids to navigation, policies regarding all aspects of standards and maintenance, as well as the dissemination of safety information to mariners, is critical to a functioning aids to navigation system. It is recommended that all concerned parties work together to establish not only an aids to navigation information system, but also a marine safety information system (as part of RIS). It is recommended that the front line dissemination of marine safety information be done through a 24/7 Coordination Service. Operators managing ship movements could also receive and disseminate aids to navigation and marine safety information. This is common practice worldwide. The training and service should be to an IALA standard;
- **Management:** there must be an agency that is responsible for aids to navigation with proper management and technical staff. They must have a set of policies which meet IALA standards and serve the local user community. They must have enough resources to carry out the maintenance and there must be a proper database/schedule for routing maintenance. Other components of the maintenance/management system are also required to provide the quality and quantity of service for which it was designed;

- The first step in creating a maintenance plan is to establish the organization to properly implement such a plan;
- Proper management of the aids to navigation system is as important as the technical competencies to maintain the system. It is recommended that a formal structure of aids to navigation management, including the appropriate training regime and the provision of adequate management and physical resources, be included in any proposal for an Aids to Navigation Coordinating Agency;
- Any proposal for development of an Aids to Navigation Coordinating Agency should include a complete financial proposal, including proposed long term capital and operations costs, and additionally a revenue proposal consisting of directing of all appropriate existing fees, possible new fees, donor and government general revenue contributions.

Under Output 2 (actual monitoring and managing operations in Viet Nam)

2.1 Based on all the considerations and recommendations mentioned in Output 1, and using the IALA Guidelines, start implementing the Monitoring and Management Plan inViet Nam.

Under Output 3 (institutional arrangements and training)

3.1 Prepare the institutional arrangements according to the considerations and recommendations mentioned in **Output 1**. Start the 10 year implementation. Revisit the implementation following the adjusted plans after 10 years.

3.2 Based on the Assessment Report, the Procurement Plan, and the Monitoring and Management Plan prepare a Training Needs Plan and start the 10 year implementation. Revisit the implementation following the adjusted plans after 10 years.

BUDGET

In Viet Nam:

For **Output 1**: US$ 120,000

For **Output 2**: Estimated at US$ 1,300,000 but depending on the results of Output 1 and the full Procurement Plan – for 10 years

For **Output 3**: US$ 260,000 for 10 years

Total: US$ 1,680,000

PROPOSED EXECUTING/IMPLEMENTING AGENCY

By the River Stations and VIWA and for the stretch between the Vam Nao Pass and Can Tho, and VINAMARINE between CanTho and the sea. All are under the Ministry of Transportation (MoT) in Viet Nam.

TIME AND WORK SCHEDULE

The activities under Output 1 would take 4 months

The activities under Outputs 2 and 3 would take 2 X 10 years continuously.

SOCIAL ISSUES

This project will not have any adverse social impacts.

ENVIRONMENTAL ISSUES

This project is not expected to have any significant negative impacts to the environment. Buoys that need replacing should be made of recyclable polyethylene and the use of virtual buoys should be

considered. During the installation of the aids to navigation system the contractors should ensure a waste management plan is developed for the collection and treatment of solid wastes.

ECONOMIC ASSESSMENT

This action is likely to have safety improvement benefits, which are difficult to measure in economic terms.

PRIORITY OF ACTION (H/M/L)

Medium (2029-2040).

FINANCING PLAN (PUBLIC/PRIVATE)

Financial Responsibility and Funds Sourcing: Funds from channel fees and light dues that are paid by the cross-border vessels are not being used for their correct purpose. Money from tolls on a road is used to maintain and improve the road. This should be exactly the same with regards to waterways.

PRIOR ACTIONS REQUIRED

None.

FOLLOW-UP ACTIONS REQUIRED

Continuous follow-up over 20 years.

6 PORT DEVELOPMENT AND MANAGEMENT ACTIONS

6.1 SHORT TERM PORT DEVELOPMENT ACTION 1 (SPD1)

TITLE

Develop general arrangements concerning creation of landing sites, rehabilitation and maintenance systems both for cargo and passenger ports

BACKGROUND AND RATIONALE

LAO PDR

While the management of the rivers throughout the country is regulated by the Department of Waterways (DOW), the construction, rehabilitation and maintenance of river ports and landing sites resides under the Provincial Governments. With each of the provinces responsible for the ports and landing sites in their territory, there is no coherence to the development of landing sites both for cargo and passengers and even less for their maintenance. It is important to bring the responsibility of all landing sites of all rivers in Lao PDR under the central Government, particularly given that dams will change the flow of the river, which is the responsibility of the Waterway Department.

A central government policy should be applied to all sites on all rivers in the country.

Passenger landing sites:

- Based on the economic expert's report, the Master Plan shows that a bright future lies ahead for international tourism in the Lao PDR. However, all experts point out that the port and landing facilities are inadequate to accommodate that growth. Worse, if important improvements are not undertaken immediately, Lao PDR may lose out on this high profit industry. The rundown condition of the landing sites for passengers reflects badly on the overall image of the country. International tourists take this negative image home, which in turn reflects badly on future holiday bookings to Lao PDR.
- There is an urgent need for the Central Government to assume responsibility for the creation, refurbishing and maintenance of passenger landing sites. The importance has become such that neglecting this issue may have repercussions on the national economy.

Cargo landing sites:

- While passenger sites deserve topmost attention, the cargo aspect is of no less importance.
- Very few sites have a bare minimum of landing facilities;a lot have none. A safe and secure landing site for cargo vessels/barges will become even more important when the dams that are being built and planned are operational. At certain times, the dams and adjacent sluices may generate strong currents that could affect all vessels in that particular stretch. Provisions for safe moorings will have to be foreseen to avoid light craft being pushed away and ending up adrift midstream. This is a safety issue that should also be in the hands of the Central Government department within the Ministry of Public Works and Transport. Information on dams and their consequences on the river characteristics are only known at their level.

THAILAND

Thailand has a Marine Department that is responsible for all river ports and landing sites. The management of the international river ports and/or landing sites is given to the Port Authority of Thailand. Example: Chiang Saen was developed by the Marine Department but managed by PAT.

CAMBODIA

There is a bit of a dual arrangement with regards to maintenance of ports and landing sites in Cambodia. According to Sub Decree N°01 ANKrBK "On the Establishment of Phnom Penh Port Commercial Zone" dated 5 January 2009, PPAP is responsible for all ports and landing sites along the Mekong from Kompong Cham to Neak Luong and on the Tonle Sap from Sokimex Tanker Terminal at Km 6 to Chaktomuk. Kompong Chhnang and Chong Kneas on the Tonle Sap and Kratie and Strung Treng on the Mekong are under the responsibility of the provinces. Due to previous long term arrangements in Kompong Cham, Chong Kneas and Kompong Chhnang, not much has been done with regards to the development, refurbishing and maintenance of these ports, despite well-defined planning proposals for improvement described in the "2006 Master Plan for Waterborne Transport on the Mekong River System in Cambodia".

An extension of areas under the present PPAP's authority should be considered (in the short term), orthe creation of a central Port Department within the Ministry of Public Works and Transport, responsible for both public and private sea and river ports in Cambodia.

VIETNAM

Viet Nam has an Inland Waterway Administration (VIWA), a wellorganized administration that is based in Hanoi and is responsible for inland waterway ports, including the Mekong. Building and maintenance of ports falls under this central administration (except for Can Tho, considered as a seaport, which is under the responsibility of VINALINES). Operations of the public ports are managed by the Port Authorities number 3 and 4 under VIWA.

ALL MRC MEMBER COUNTRIES

In each country, the central authority should develop guidelines and standards for the creation, rehabilitation and maintenance of all river ports and landing sites that are applied to all sites on all rivers in the country.

LOCATION

Create or extend the responsibilities of a central Port Department: Vientiane, Lao PDR and Phnom Penh, Cambodia.

Develop guidelines and standards for the creation, rehabilitation and maintenance of all river ports and landing sites: all four MRC member countries.

OBJECTIVES

The main objective of this action is to develop a centrally led policy for the creation, rehabilitation and maintenance of all river ports and landing sites along the Mekong River and its tributaries.

The specific objectives are:

1) To centralize a port and landing site strategy and policy within the Ministry of Public Works and Transport in the Lao PDR and in Cambodia, where today the provinces are responsible for the development, rehabilitation and maintenance of these sites.

2) To develop guidelines and standards for the creation, rehabilitation and maintenance of all (public and private) river ports and landing sites, to be applied to all sites on all rivers in the country.

3) Within the planneddepartment, a section should be made responsible for administrative matters, regulations and financial matters such as leases and contracts that are now under provincial authority.

OUTPUTS AND DELIVERABLES

Output 1:A centralized authority within the Ministry of Public Works and Transport with extended responsibilities for the creation, funding, construction, rehabilitation and maintenance of ports and landing sites alongside the rivers (Lao PDR and Cambodia).

Output 2: Uniform regulations and standards for the construction, rehabilitation and maintenance of ports and landing sites, valid for all ports and landing sites in all the rivers in the country.

Output3: Uniform regulations on administrative and financial matters (management, contracts, tariffs, partnerships, etc.) applied to all ports and landing sites on all rivers in the country.

ACTIVITIES

1.1. In the Lao PDR and Cambodia a concise report is needed listing the current deplorable situation of ports and landing sites in each province and stating the need of a centrally led policy with regards to the creation, rehabilitation and maintenance of ports and landing sites along the rivers.

1.2. On the basis of that report, appoint an organizational consultant to guide the Ministry of Public Works and Transport in the creation of a separate central port division (Cambodia) or the identification of extended responsibilities for the existing central Port Office (Lao PDR) for all ports and landing sites in the country.

1.3. In all MRC Member countries, create a working group in order to develop regulations and standards for the construction, rehabilitation and maintenance of ports and landing sites, valid for all ports and landing sites in all rivers in the country.

1.4. Within the central departments, create a section, responsible for administrative matters, regulations and financial matters such as leases and contracts.

BUDGET

Creation of a Port Department under MPWT, Cambodia:		100,000 US$
Identification of extended responsibilities of the central Port Office under MPWT, Lao PDR		100,000 US$
(In both cases, preference for assistance should be given to an outside consulting company)		
Development of guidelines and standards:		
One international consultant 72,000 US$		
Four local experts 72,000 US$		
Administration and office costs24,000 US$		
Total/country	168,000 US$	652,000 US$
General Total		**852,000 US$**

HUMAN RESOURCES

In each country, the central unit should consist of some 20 people with a civil engineer, a marine/river specialist, a port/cargo handling specialist, an economistand a legal expert each with 2 assistants plus 2 IT knowledgeable agents and 3 administrative staff.

PROPOSED EXECUTING/IMPLEMENTING AGENCY

Lao PDR: Department of Waterways, MPWT.

Cambodia: General Department of Transport, MPWT.

Thailand: Marine Department, MoT.

Viet Nam: Inland Waterway Administration (VIWA), MoT.

TIME AND WORK SCHEDULE

This should be set in motion without further delay as the present situation of some ports and landing sites along the Mekong is harming the regional economy.

For the Lao PDR and Cambodia, the central units should be ready to operate and functional within one year (estimated preparatory work including consulting is 4 to 6 months, preparation of budgets 3 months, advising local authorities of new arrangements once in placeis 3 months).

For the development of guidelines and standards, 2 years should be necessary (forming of working group 3 months, draft guidelines and standards 12 months, approval and training of stakeholders 9 months).

SOCIAL ISSUES

This project is not expected to have any adverse social impacts.

ENVIRONMENTAL ISSUES

This action will improve environmental management and reduce the risks of pollution by improving arrangements for wastes, dangerous goods and re-fuelling activities.

ECONOMIC ASSESSMENT

No economic assessment of this action is necessary as it involves only administrative reorganization and development of guidelines and standards. While it may result in hiring extra staff within the organization, it does not involve investment. The funds for the rehabilitation of ports and landing sites come under a separate action.

PRIORITY OF ACTION (H/M/L)

High (2016-2018).

FINANCING PLAN (PUBLIC/PRIVATE)

Assistance in the creation of the new organization and set-up of the organization: national budgets. Development of guidelines and standards: regional grant.

PRIOR ACTIONS REQUIRED

None.

FOLLOW-UP ACTIONS REQUIRED

Evaluating progress at Ministerial level.

6.2 SHORT TERM PORT DEVELOPMENT ACTION 2 (SPD2)

TITLE

Develop general arrangements on a minimum port health, safety and environmental (HSE) management system for *all passenger and cargo ports* specific for the Mekong River ports

See "Regional Action Plan for Sustainable Transport of Dangerous Goods along the Mekong River 2015-2020 – Part I Implementation Strategy and Part II Portfolio of Projects for Cambodia, Lao PDR, Thailand and Viet Nam", MRCS NAP, December 2014 – Project 8

BACKGROUND AND RATIONALE

This action is in conjunction with the more important short term port development action 3. Background, rationale and objectives are similar to those describe there, although this action is valid for **all ports and terminals** while short term port development action 3 is only valid for ports and terminals, handling dangerous goods.

LAO PDR

As is clear, facilities are rather primitive and the handling of cargo or the assistance to passengers is done by occasional workers paid per piece or by the generosity of the tourists. There are general accepted minima for handling of cargo. Through a centuries old Chinese system, workers are given a token per piece carried on or off the boat that once the operation finished is exchanged for money. In the more functioning ports, laborers are more experienced and during the good season work daily. Local passengers also pay per piece for the help to load or unload their belongings or wares to sell. There is hardly any concern about health, safety or environmental issues with regard to these port operations,

While the HSE actions are mainly focused on cargo handling, the regulations on HSE for passengers require even more stringent application.

Passenger and cruise operations should be planned and executed in a way that minimizes risks to those involved in the operation, including direct employees, non-permanent employees (NPEs), ship's crew and passengers.

THAILAND

Both the Marine Department and the Port Authority of Thailand (PAT) have sections within departments are responsible for HSE and have trained officers who have followed courses on the subject and look after any issues that may arise.

CAMBODIA

A course on HSE would be welcomed by PPAP and provincial authorities responsible for the few river ports in their area.

VIETNAM

A proposed course on HSE for all authorities concerned would also be welcomed by Viet Nam who has participated in previous similar courses organized with the support of the MRC.

The purpose of this project is to prepare a Port Safety, Health and Environmental Management System (PSHEMS) specific to each port in order to build a culture that promotes safety, health and environmental protection as well as reducing accidents and operating costs, improving community relations and for the ports and terminals handling dangerous goods to be recognized as safe and efficient. In pursuing this objective, PEMSEA and its partners developed a **Port Safety, Health and Environmental Code** (PSHEM Code), for voluntary use by port authorities and companies operating in the ports, whose operations may have effects on the health and safety of people, the environment, port installations and/or cargo.

The PSHEM code specifies requirements for an effective port safety, health and environmental management system (PSHEMS) to enable a port or terminal to develop and implement policies and objectives. Such policies and objectives shall take into account legal requirements and information about hazards associated with port activities, which have or can have significant impact on safety, health and the environment. Furthermore, in order to provide guidance to parties who wish to develop a PSHEM System, PEMSEA has developed the **Port Safety, Health and Environmental Management System Development and Implementation Guidelines**. Both the PSHEM code and the Development and Implementation Guidelines are used as a baseline for this project.

LOCATION

The project is categorized as a "National Project" and will cover all public and private ports and terminals along the Mekong River. This means that it shall be implemented on a national basis by the appointed "Implementing Agency" in each of the MRC Member Countries.

OBJECTIVES

All ports and landing sites in the four MRC member countries should adhere to a minimum of safety, health and environmental regulations in accordance with the rules of the relevant international institutions. PEMSEA's should be developed, reviewed and adapted where necessary in order to have a common system for Mekong inland waterway ports and landing sites.

The sites where passengers embark and disembark need specific attention to conform to the guidelines of international agreements of HSE in ports. People involved in waterway tourism need to be made aware of these guidelines.

The final objective of this project is to develop and implement a Port Safety, Health and Environmental Management System (PSHEMS) for ports and terminals on the Mekong River.

This PSHEMS shall be based on the PSHEM Code developed by PEMSEA. The system (although not compulsory for inland ports and terminals) should be strongly recommended and promoted.

When developed and implemented in the ports/terminals along the Mekong river, the PSHEMS should:

- Provide safe practices in port operation and a safe working environment;
- Establish safeguards against all identified risks;
- Continuously improve safety management skills of personnel, including preparing for emergencies related to SHE protection;
- Prevent operational pollution of the port's environment; and

- Provide quality, safe and environmentally-responsible services with reduced damage to cargo, reduced operating costs through streamlined operations, better trained personnel and reduction of equipment down-time through improved maintenance.

OUTPUTS AND DELIVERABLES

Output 1 PEMSEA's Port, Safety, Health and Environmental Management System Development and Implementation Guidelines reviewed and adapted where necessary to a common system for Mekong inland waterway ports and terminals.

Output 2 Mekong PSHEMS development and implementation guidelines explained and distributed to other ports and terminals.

Output 3 Technical support and provisions for training to port personnel on the development of a PSHEMS prepared and carried out.

Output 4 Two ports/terminals selected for pilot projects for Mekong PSHEMS implementation.

The ports, port authorities or waterwaydepartments in the countries should be aware of the regulations, implement and supervise their application.

Technical support and provisions for training of port personnel on those sites needs to be organized.

It would be practical and cost saving to choose one site for all concerned countries. The courses would be basedon the principle of train the trainer. The knowledge acquired can then be used by participants to organize such courses in minor ports or landing sites in their home country.

ACTIVITIES

Activity 1.1 Establish a working group at the implementing authority to review the requirements of the PSHEMS Development and Implementation Guidelines. This shall be done together with the port authorities, operators of the ports and terminals handling dangerous goods and other stakeholders to determine where the development and implementation guidelines need to be adjusted or amended and to what extent to make the guidelines suitable for inland waterway ports.

Activity 1.2 Draft amended PSHEMS Development and Implementation Guidelines for inland waterway ports and terminals based on the review (Activity 1.1).

Activity 2.1 Distribute PSHEM code and corresponding PSHEMS Development and Implementation Guidelines to all ports and terminals handling dangerous goods.

Activity 2.2 Organize a workshop with all relevant stakeholders to explain the PSHEMS code and corresponding PSHEMS Development and Implementation Guidelines.

Activity 3.1 Prepare and carry out training for the implementing authority on how to develop a PSHEMS. The training shall include training-the-trainers.

Activity 3.2 Have the implementing authority provide technical support to port authorities, owners and operators of ports and terminals, and to other relevant stakeholders on how to develop a PSHEMS.

Activity 3.3 Organize training workshops for port authorities, and for owners and operators of ports and terminals on the set-up and implementation of the PSHEMS.

Activity 3.4 Organize training workshops for Internal Auditors (port staff) in port safety auditing.

Activity 4.1 Identify two pilot ports and/or terminals handling dangerous goods to participate in developing a PSHEMS.

Activity 4.2 Develop and implement a PSHEMS for the pilot ports/terminals in close cooperation with relevant stakeholders and test the internal auditing procedures.

BUDGET

The approximate budget for each country (technical assistance, training, capacity building and equipment is estimated at (cfr. MRCS NAP Regional Action Plan on Sustainable Transport of Dangerous Goods along the Mekong River):

Lao PDR:	**235,000 US$**	(2016, 2017)
Thailand:	**295,000 US$**	(2016, 2017)
Cambodia:	**300,000 US$**	(2016, 2017)
Viet Nam:	**335,000 US$**	(2016, 2017)
Total		**1,165,000 US$**

HUMAN RESOURCES

Training will have to be organized by external experts.

The target audience for the training can be restricted to a representative of the authority responsible (such as an assistant to the harbor master) or to the local/central administration.

PROPOSED EXECUTING/IMPLEMENTING AGENCY

Lao PDR: Department of Waterways under the Ministry of Public Works and Transport.

Thailand: Marine Department under the Ministry of Transport in close cooperation with the Port Authority of Thailand.

Cambodia: Private Port Management Committee under the Ministry of Public Works and Transport in cooperation with the Department of Occupational Safety and Health under the Ministry of Labor.

Viet Nam: Viet Nam Inland Waterway Administration under the Ministry of Transport.

MRC will coordinate the various projects and disseminate the results and lessons learned between the MRC countries. In order to operationalize this role, an Office for Coordination of Mekong Navigationwill be established at the Secretariat of MRC that will work closely with the implementing agencies and the Secretariats of the National Mekong Committees in each country, with the relevant line agencies, the private sector, and with other regional agencies.

TIME AND WORK SCHEDULE

This action is of very high priority in all countries concerned. It should start once the budget has been agreed and the funds are in place. This could be estimated at 1year for preparatory work,6 months to explain and distribute the guidelines and 6 months for implementation in two pilot project ports.

SOCIAL ISSUES

This project is not expected to have any adverse social impacts. It will have benefit the rural poor, because implementation of the PSHEMS will promote a culture of SHE protection, reduce accidents and operating costs, and improve community relations. The implementation of PHSEMS may create employment and opportunity for port workers to diversify skills.

ENVIRONMENTAL ISSUES

This project will not have any negative impact to the environment. This project will have positive impacts by improving the SHE management systems of passenger and cargo port in the Mekong Basin reducing pollution, accidents and collection and treatment of solid/liquid wastes.

ECONOMIC ASSESSMENT

This action does not involve infrastructure investments but rather organizational issues, which in the longer term will generate safety benefits, the value of which cannot be assessed here.

PRIORITY OF ACTION (H/M/L)

The "Risk Analysis of the Carriage, Handling and Storage of Dangerous Goods along the Mekong River", concluded that there is an urgent need to develop a PSHEMS. During the final regional workshop, the National Working Groups decided to designate this project as a "Very High" priority.

FINANCING PLAN (PUBLIC/PRIVATE)

Each of the individual countries according to their importance and involvement in the matter should contribute to at least part of the budgeted expenses.

Part of the project can be financed through national (or port) budget allocations. However, not all countries have this opportunity and need to seek external funding through donors.

Another source of funding is the private sector. Although it is not expected that it will participate in "basket funding", some specific activities can to some extent be funded by the private sector. Such co-financing shall be seen partly as compliance to new regulations and standards being implemented.

PRIOR ACTIONS REQUIRED

Selection of the ports that will serve as pilot cases.

FOLLOW-UP ACTIONS REQUIRED

The budget for the international expert should includea return visit to check on the correct execution of the implemented measures for each individual port.

The log kept from inspections as follow-up, to be controlled by the Harbor Master or the relevant central authority.

6.3 SHORT TERM PORT DEVELOPMENT ACTION 3 (SPD3)

TITLE

Implement the "Regional Action Plan for Sustainable Transport of Dangerous Goods along the Mekong River 2015-2020" for ports handling dangerous goods.

See "Regional Action Plan for Sustainable Transport of Dangerous Goods along the Mekong River 2015-2020 – Part I Implementation Strategy and Part II Portfolio of Projects for Cambodia, Lao PDR, Thailand and Viet Nam", MRCS NAP, December 2014.

BACKGROUND AND RATIONALE

In 2009, the Navigation Programme consulted with port authorities, vessel associations, petroleum companies, transport operators and relevant ministries in Cambodia, Lao PDR, Thailand and Viet Nam to assess growing transport of dangerous goods along the Mekong.

Awareness of dangerous goods, environmental protection, impacts of oils spills and safety requirements are currently limited in all of the Member Countries. Public information and awareness programmes will need to be developed to raise the awareness of all waterway users.

Taking all the shortcomings and risks into consideration, it was decided to prepare a Regional Action Plan which would act as the guiding document for Member Countries and the MRC on navigation safety and environmental protection.

The need for a Regional Action Plan (RAP) is underlined by the continuous increase in inland waterway transport, which increases the risks of accidents such as fires, explosions and oil spillages that require efficient emergency response. Increased transport also means increased waste generation on board vessels and in ports and terminals. If not handled properly, this will result in longterm negative environmental impacts and adversely affect the livelihoods of people living along the river.

The carriage, handling and storage of dangerous goods are significant in **Cambodia**. Gasoline, diesel, jet fuel and other petroleum products are imported on inland barges from Viet Nam and primarily stored at 12 large petroleum terminals on the Mekong and Tonle Sap Rivers.

In the **Lao PDR** most dangerous goods are transported by ferry crossings and include gasoline, diesel, asphalt and fertilizers. Tanker trucks containing dangerous goods load onto ferries and transport goods from Thailand to Lao PDR. Km 4 State Port Authority has fuel-storage capacity for refueling trucks, cranes and equipment onsite. There are a number of small refueling stations along the Mekong River for cargo, passenger and small fishing and other vessels. One of the main issues identified by the Risk Analysis was the management of solid and liquid wastes and limited awareness of the risks associated with transport and storage of dangerous goods.

The transport of dangerous goods is also increasing in **Thailand** through the export of petroleum products through Keawalee Terminal in Chiang Saen, a privately-owned terminal used to transfer diesel and gasoline from tanker trucks to inland barges from the People's Republic of China and Myanmar.

Inland waterborne transport is well advanced in **Viet Nam** where there are a number of inland and maritime ports helping to boost economic growth. The transport and storage of dangerous goods is extensive in Viet Nam. There are a number of petroleum terminals that use domestic tankers to supply refueling stations and industry for power generation.

An important aim of the RAP is to meet international requirements for inland navigation safety and environmental protection from ports, terminals and tankers/ships when they exist, and establish adapted standards in the region. Although individual countries are at different levels, they all have an interest in the compliance of neighboring countries with relevant conventions, regulations and other guidelines to ensure the highest level of safety and environmental protection.

The implementation of the RAP will be an important step towards more sustainable transport of dangerous goods. Member Countries will implement the plan at the national level in close coordination with the MRC with assistance from bilateral development partners and other agencies such as donors and development banks.

LOCATION

All MRC member countries.

OBJECTIVES

The implementation of the Regional Action Plan has as its**overall objective "**to ensure efficient, safe and secure carriage, handling and storage of dangerous goods on the Mekong River in a sustainable manner."

The **specific objectives** with regard to Cambodia, Lao PDR, Thailand and Viet Nam are to:

- Increase safety on board vessels with a special focus on tankers;
- Increase safety in ports and terminals;
- Minimize the environmental impact of navigation on the Mekong River with improved waste management;
- Secure safe navigation on the Mekong River;
- Increase human capacity of inland waterway and environmental authorities and the private sector.

The overall and specific objectives shall be achieved by implementing national projects, national projects with cross-border Impact and cross-border projects, of which six actions are related to ports and terminals handling dangerous goods:

National projects:

1) Standards for the Planning, Design and Construction of Ports and Terminals:

   To ensure that ports and terminals are planned, designed and constructed in a sustainable manner, in order to ensure the best achievable protection of public health, safety and the environment.

2) Maintenance, Inspection and Testing of Critical Equipment:

   To develop and implement a Maintenance, Inspection and Testing Program (MITP) for critical equipment in ports and terminals in order to ensure they function in a safe and efficient manner and reduce the downtime required for repair or replacement.

3) Port Safety Health and Environmental Management System (PSHEMS):

   To develop and implement a Port Safety, Health and Environmental Management System (PSHEMS) for ports and terminals.This project has to be applied in all cargo and passenger ports and terminals and is already described in Short Term Port Development Action 2.

4) National Vessel and PortWaste Management:

   To establish efficient vessel and port waste handling in ports and terminals on the Mekong River.

National project with cross-border impact:

5) Emergency and Oil Spill Response in Ports and Terminals.

   To reduce the impact on the marine environment of the Mekong River System, protect human lives and limit the damage to property by establishing and implementing an effective emergency and oil spill response plan at local, national and cross-border levels.

Cross-border project:

6) Cross-Border Vessel andPort Waste Management.

   To introduce cross border measures to incentivize vessel waste delivery, throughimplementation of economic incentives, harmonized uniform measures and a strengthening of cross-border inspection and communication.

The ultimate objective of this Master Plan action is to implement the port related projects of the Regional Action plan on the Sustainable Transport of Dangerous Goods along the Mekong River in order to actively prevent and mitigate the environmental and safety risks associated with the handling and storage of dangerous goods.

OUTPUTS AND DELIVERABLES

The following outputs are expected for the different projects:

Project 1:Standards for the planning, design and construction of ports and terminals

Output 1 Responsible agency(ies) identified for the development of ports and terminals handling dangerous goods along the Mekong River.

Output 2 Necessary rules, regulations and other legal instruments to support the agency(ies) responsible for the development of ports and terminals handling dangerous goods are prepared, reviewed or updated.

Output 3 Application and approval process for port and terminal planning and development including Environmental Impact Assessment of dangerous risks reviewed and updated if needed.

Output 4 Minimum technical standards for the design and construction of ports and terminals including standards for fire prevention, detection, and suppression are developed, reviewed and updated.

Output 5 A database of existing ports, terminals and landing stages that handle dangerous goods is prepared (this database should support the capacity needs assessment for the authorities in charge of auditing, inspections and evaluations).

Output 6 Training for relevant authorities regarding monitoring audits, inspections and evaluations (to verify compliance with technical standards) is prepared and carried out.

Project 2: Maintenance, inspection and testing of critical equipment.

Output 1 Critical equipment for handling dangerous goods for ports/terminals is identified (register of critical equipment is prepared). These should include characteristic descriptions and explanations on the functions.

Output 2 Maintenance, inspection and testing requirements and procedures for dangerous goods and critical equipment is revised and/or developed based on manufacturer recommendations, recognized international standards and generally accepted engineering best practices.

Output 3 Training programme for relevant authorities and port/terminal operators and personnel involved in the Maintenance, Inspection and Testing Programme (MITP).

Output 4 Two ports/terminals selected for pilot projects testing of the MITP.

Project 4:National vessel and port waste management.

Output 1 Relevant national legislation is reviewed, updated and developed regarding waste management in ports and from vessels in order to comply with national as well as international requirements.

Output 2 Country Waste Management Guidelines for most country ports, terminals and vessels are reviewed and applied (contractual framework for private waste operators will also beincluded).

Output 3 Technical study tour and training of relevant staff from inland waterway ports and authorities is arranged and carried out and best practice and international experience on vessel and port waste management is compiled and disseminated.

Output 4 Individual Port Waste Management Manuals developed for all inland waterway ports and terminals and three pilot projects are carried out in identified inland waterway ports and/or terminals regarding full implementation.

Project 5: Emergency and oil spill response in ports and terminals.

Output 1 Regulations and guidelines on emergency response and oil spill management are reviewed, drafted and approved by the competent authority(ies).

Output 2 Institutional arrangements for ports and terminals at national level for emergency and oil spill response management are analyzed and recommendations are provided.

Output 3 Recommendations on minimum equipment requirements for emergency response and oil spill equipment at local and national levels are provided.

Output 4 Two pilot projects regarding the preparation and implementation of contingency plans for dangerous goods management including training and exercises are prepared and implemented.

Output 5 Cross-border cooperation on emergency and oil spill response management is strengthened.

Project 6: Cross-border vessel and port waste management.

Output 1 Existing mechanisms for cross-border cooperation are reviewed, taking into account MRC's core functions, decentralization and implementation. Recommendations on regional cooperation are provided.

Output 2 Issues of regional interest and concern are identified for discussion and recommendations are made (e.g. cost recovery principle, waste registration procedures and forms, port waste management plans and requirements, inspection procedures, roles and responsibilities and waste characterization).

Output 3 Cross-border cooperation on vessel waste management in Europe and beyondis reviewed and adapted to the Mekong context.

ACTIVITIES

Project 1: Standards for the planning, design and construction of ports and terminals

Activity 1.1 Identify responsible agency(ies) involved in the development of ports and terminals along the Mekong River. This shall include the identification of all stakeholders involved, including e.g. IEIA and/or EIA approval, auditing, inspection and evaluation during and after the construction of the port or terminal and their roles and responsibilities. Based on this review, a number of recommendations and improvements shall be provided, discussed and agreed upon with the responsible agency(ies).

Activity 2.1 Identify and review existing rules, regulations and other legal instruments that support the relevant agency(ies) responsible for the development of ports and terminals. Provide, if necessary, recommendations for improvements.

Activity 2.2 Amend (update and/or improve) the existing legal framework ensuring that:

- Clear procedures and guidelines are available to port and terminal owners/operators regarding port or terminal development.
- Internal procedures regarding port and terminal development are available and agreed upon between all stakeholders.
- The responsible authority will be able to carry out audits, inspections and evaluations of both public and private ports without any restrictions.
- The responsible authority(ies) will be able to impose immediate remedial actions if major deficiencies have been observed prior to the continuance of normal operations at the port or terminal.
- The responsible authority(ies) will be able to require repairs and/or upgrade measures within a certain timeframe in order for the port or terminal to remain operational if deficiencies have been observed.
- The responsible authority will be able to impose penalties for non-compliance with the standards determined in Output 4. These penalties should be high enough to discourage any legal violations.
- The responsible authority is authorized to grant a license to ports and terminals that complies with all legal standards.

Activity 3.1 Consult with key stakeholders, e.g. relevant ministries at national, sub-national and local levels regarding the planning and development of ports and terminals to determine any existing discrepancies and or insufficiencies.

Activity 3.2 Identify insufficiencies in existing IEIA or EIA requirements related to Dangerous Goods.

Activity 3.3 Provide recommendations on how to include a Dangerous Goods risk assessment (and a format for a Dangerous Goods risk assessment) in the IEIA, EIA and EPC requirements. Discuss and agree with relevant stakeholders.

Activity 3.4 A Dangerous Goods risk assessment is incorporated into the existing IEIA and/or EIA requirements.

Activity 4.1 Review API Standard 2610, "Design, Construction, Operation, Maintenance and Inspection of Terminal and Tank Facilities, Second Edition, May 2005", and determine how and to what level this standard can be applied for the construction of new tank and terminal facilities in the country or used for the improvement of existing national standards. For existing facilities, where standards for new constructions are not applicable, prepare an analysis on how the responsible authority shall address the site-specific circumstances, e.g. the potential and tolerance for risk, existing conditions at the installation, and the overall benefit of applying the design and construction provisions.

Activity 4.2 On completion of the "Recommendations for the Design and Assessment of Marine Oil and Petrochemical Terminals" (intended to be completed in 2015) developed by PIANC, review the recommendations and determine the feasibility of implementing them.

Activity 4.3 Discuss with port and terminal operators (both private and public) the feasibility of the implementation of API Standard 2610 and the "Recommendations for the Design and Assessment of Marine Oil and Petrochemical Terminals" developed by PIANC.

Activity 4.4 Prepare minimum Technical Standards (or revise existing standards) for the design and construction of new as well as existing tank and terminal facilities based on existing

legislation, API Standard 2610 and the PIANC "Recommendations for the Design and Assessment of Marine Oil and Petrochemical Terminals".

Activity 5.1 Prepare a database with details of existing ports, terminals and landing stages handling Dangerous Goods. Besides contact details, the database shall include a brief assessment or score of the port, terminal or landing place´s ability to handle Dangerous Goods.

Activity 5.2 Based on the results of activity 5.1, prepare a plan for capacity building for both the authority in charge of auditing, inspection and evaluation and the individual ports, terminals and landing stages handling Dangerous Goods.

Activity 6.1 Appoint an appropriate number of inspectors to follow a recognized training course (e.g. API-U training) regarding the implementation of API Standard 2610 and (upon its completion) "Recommendations for the Design and Assessment of Marine Oil and Petrochemical Terminals" developed by PIANC.

Activity 6.2 Prepare and carry out a training course (including curriculum and training materials) for inspectors appointed by the responsible authority to carry out audits, inspections and evaluations in order to verify compliance with the minimum Technical Standards as determined in Output 4 and before a Dangerous Goods License is issued.

Activity 6.3 Prepare and carry out an awareness campaign and a training course (including curriculum and training materials) for existing port and terminal operators on how to comply with the new or updated regulations and minimum standards.

Project 2:Maintenance, inspection and testing of critical equipment

Activity 1.1 Prepare aregister of critical equipment for ports and terminals handling Dangerous Goods. The register should include equipment identification numbers, item descriptions, locations and required inspection intervals. The MPWT and MoT shall initiate a process and assist the ports and terminals to carry out this task themselves.

Activity 1.2 Prepare a "guidebook" attached to the register describing the characteristics and functions of critical equipment items.

Activity 2.1 Prepare minimum maintenance, inspection and testing requirements for Critical Equipment at ports and terminals handling Dangerous Goods based on recognized industry Standards/guidelines, Sound Engineering Practices and manufacturer recommendations. These minimum requirements shall be approved by the competent Government Authority and amended to existing relevant regulations.

Activity 2.2 Prepare procedures for maintenance, inspection and testing of critical equipment at ports and terminals handling Dangerous Goods based on recognized industry standards/guidelines, sound engineering practices and manufacturer recommendations.

Activity 2.3 Develop or review quality control procedures to ensure that maintenance materials and spare equipment and parts meet design specifications.

Activity 2.4 Develop a documentation system for completed testing and inspections for ports and terminals handling Dangerous Goods. This is to assist in determining necessary changes to the frequency of testing, inspections or preventative maintenance. Documentation should be retained for the entire life of the equipment.

Activity 3.1 Prepare and carry out a training program for port and terminal staff regarding the maintenance, inspection and testing requirements and procedures.

Activity 3.2 Prepare and carry out a training program on inspections for the competent government authority responsible for reviewing port/terminal compliance with the minimum maintenance, inspection and testing requirements and procedures for critical equipment.

Activity 4.1 Select two pilot ports or terminals among those identified in the course of undertaking activity 1.1 to participate in developing an MITP.

Activity 4.2 Review existing maintenance, inspection and testing procedures or standards and adjust to meet the minimum maintenance requirements recommended to ensure the mechanical functioning of critical equipment. This review shall include maintenance equipment, spare parts, spare equipment, procedures for correcting deficiencies or operations outside acceptable limits, and procedures for the authorization of changes in operations.

Activity 4.3 Provide specific training for port and terminal employees on how to implement the MITP and in its practical use.

Project 4: National vessel and port waste management

Activity 1.1 Review existing legislation and regulations in relation to waste handling from inland waterway vessels to determine any discrepancies and/or insufficiencies.

Activity 1.2 Prepare draft amendments to existing legislation or new draft regulations if required

Activity 2.1 Draft or review and utilize the "Waste Management Guidelines". Utilize the experience from European inland waterways i.e. Danube and Rhine rivers.

Activity 2.2 Prepare "Vessel Waste Management Guidelines" for handling waste on board vessels (how vessels should manage onboard waste).

Activity 2.3 Prepare a "Contractual Framework" for use by private waste operators in ports.

Activity 3.1 Arrange and conduct a technical study tour to European inland waterway ports. Learn best practices of vessel and port waste management.

Activity 3.2 Prepare and carry out training and awareness courses for port, vessel and authority staff regarding waste handling in ports, and disseminate information to ports and terminals on the new waste handling system.

Activity 4.1 Establish a number of "task force" teams (2 people in each) to assist inland waterway ports and terminals to establish waste handling systems and to draft Port Waste Management Manuals (PWMM). These task force teams shall primarily consist of staff from the MPWT, MoT and the MoE. The teams shall be trained extensively in Port Waste Management, enabling them to assist inland waterways ports and terminals to establish their own waste management system and prepare their PWMM. The task force teams shall identify all private and public ports and terminals and provideon site assistance to them.

Activity 4.2 Carry out an assessment of the three identified pilot ports regarding their existing waste handling systems (port and vessel waste) and provide recommendations for improvement.

Activity 4.3 Prepare a traffic and waste analysis for selected ports estimating the type (normal/non-toxic or hazardous waste and toxic waste/hazardous waste) and the volume of waste expected to be generated in ports and collected from vessels.

Activity 4.4 Discuss findings and recommendations with port or terminal managers. Clearly distinguish between waste generated by ports/vessels/barges (MARPOL 73/78) and imported waste (Basel Convention), as the legal implications are different.

- Owner/operation of waste handling facilities;
- Cost recovery principles and systems;
- Acceptance of waste (what the port should receive) in accordance with existing environmental legislations for a separation management;

- The port's role in waste handling, and in the case of changes to water quality and public health risks, and
- Waste registration procedures.

Activity 4.5 Prepare the Port Waste Management Manual for pilot ports according to the Waste Management Guidelines:

- Separation and storage procedures;
- Collection procedures;
- Treatment procedures;
- Final disposal procedures;
- Payment procedures and cost recovery;
- Waste registration procedures;
- Contact information, and
- Stakeholder roles and responsibilities in accordance with existing legislation.

Activity 4.6 Prepare an implementation plan for the new waste handling systems to be applied in three selected pilot ports and/or terminals.

Activity 4.7 Assist the pilot ports with implementation of the new waste handling systems, including identification and procurement of necessary equipment, and ensure that relevant information such as the port waste manual is made available on relevant websites and in hard copy.

Activity 4.8 Prepare a plan for disseminating results and experiences to other inland waterway ports and terminals in the country.

Project 5: Emergency and oil spill response in ports and terminals

In close cooperation with the competent authority:

Activity 1.1 Prepare minimum requirements regarding emergency response, oil spill response and safety procedures for ports and terminals handling Dangerous Goods.

Activity 1.2 Provide recommendations for ports and terminals handling Dangerous Goods on how to improve or revise their ERP and/or OSRP in case of non-compliance with existing regulations.

Activity 1.3 Determine minimum requirements regarding training for emergency response teams and for testing the emergency systems, equipment and procedures at ports and terminals handling Dangerous Goods and at the national level.

Activity 1.4 Develop emergency and oil spill reporting and notification requirements.

Activity 1.5 Establish requirements for Evidence of Financial Responsibility for owners/operators of ports and terminals handling Dangerous Goods, especially petroleum products.

Activity 1.6 Present and discuss the above requirements with relevant stakeholders at a national workshop.

Activity 2.1 Contact all ports and terminals handling Dangerous Goods and/or petroleum products regarding their level of preparedness regarding emergency and oil spill response and verify their compliance with applicable national regulations.

Activity 2.2 Establish a system at the implementing authority for receiving, reviewing and approving the ERPs and/or OSRPs prepared by all ports and terminals handling Dangerous Goods.

Activity 2.3 Prepare a standard training and exercise program for all facility staff involved in the emergency response or oil spill response procedures, which should be used at ports and terminals handling Dangerous Goods. Such program should include:

- Procedures for informing/warning/notifying a network focal point/coordinator in each of the member countries.
- Instructions for the correct use of available emergency equipment, including initial equipment familiarization, operating principles and techniques, and equipment deployment.
- Transfer of Dangerous Goods away from the site of an emergency.
- Fire isolation.
- Correct use of Personal Protective Equipment (PPE).
- Coordination of operations with outside services.
- Rescue training and procedures, including training for selected personnel in lifesaving from water.
- Spill containment and cleanup.
- Additional training to ensure that the level of knowledge is maintained and enhanced.

Activity 3.1 Determine minimum stockpile requirements for emergency and oil spill response equipment for ports and terminals handling Dangerous Goods (in conjunction with activities 1.1 and 2.1).

Activity 3.2 Assist the implementing authority to identify ports and terminals not complying with the equipment requirements and to prepare a plan for ports and terminals to comply.

Activity 3.3 Assist the implementing authority to make an inventory of all available emergency and oil spill equipment along the Mekong River and its tributaries and lakes that can be used in the event of major emergencies or spillages.

Activity 4.1 Identify two pilot ports or terminals to participate in developing an ERP and/or OSRP.

Activity 4.2 Develop and implement an ERP and/or OSRP for the selected pilot ports or terminals and identify inadequacies in response equipment.

Activity 4.3 Provide recommendations for minimum response equipment and assist in procurement.

Activity 4.4 Provide training for pilot port and terminal employees on how to implement the ERP and/or OSRP.

Activity 4.5 Arrange activities making use of the two pilot ports and/or terminals as demonstration sites.

Activity 5.1 Assist relevant line agencies in Cambodia and Viet Nam to develop a joint strategy on minimum emergency response/oil spill response. The strategy shall include recommendations on:

- Requirements for response planning;
- Communication procedures on a national as well as cross-border level (to be coordinated with activities under the "MRC Environmental Program");
- Type, quantity and location of emergency and oil spill response equipment, and
- A cross-border agreement on the use of national equipment in cross-border responses.

Activity 5.2 Arrange a cross-border exercise on emergency/oil spill response.

Project 6: Cross-border vessel and port waste management

Activity 1.1 Review existing cross-border cooperation within the MRC taking into account the MRC's core functions, decentralization, implementation and regional cooperation.

Activity 1.2 Recommend structure for regional cooperation.

Activity 1.3 Establish the Coordination Group at MRC to deal with cross-border issues related to waste reception facilities with participants from all involved countries (or other existing coordination committees).

Activity 1.4 Prepare a ToR for the Coordination Group.

Activity 1.5 Appoint members to the Coordination Group (preferably one per country). Experts can be called in when needed.

Activity 2.1 Identify roles and responsibilities of waste generators and Port Waste Management in accordance with existing national legislation and MRC-related procedures.

Activity 2.2 Identify issues of regional interest such as the cost recovery principles, waste registration procedures and forms, Port Waste Management Plan requirements and inspection procedures.

Activity 2.3 Agree on a regional approach to the identified issues and prepare recommendations for identified issues for Member States to implement.

Activity 3.1 Examine the WANDA project, where the success rate for compliance with waste management regulations is high.

Activity 3.2 Assist Member States with the implementation of the recommendations in their respective national ports and terminals.

BUDGET

Approximate budgets for each country (technical assistance, training and capacity building and equipment):

	Lao PDR	Thailand	Cambodia	Viet Nam	MRC	All countries
Project 1	400,000	411,000	404,000	399,000		1,614,000
Project 2	245,000	245,000	255,000	275,000		1,020,000
Project 4	387,000	454,000	357,000	596,000		1,794,000
Project 5	330,000	335,000	340,000	385,000		1,390,000
Project 6					155,000	155,000
Total	1,362,000	1,445,000	1,356,000	1,655,000	155,000	**5,973,000**

HUMAN RESOURCES

International, regional and local experts.

PROPOSED EXECUTING/IMPLEMENTING AGENCY

Project 1: Lao PDR: DOW-MPWT, Thailand: MD-MoT, Cambodia: Private Port Management Committee-MPWT + MoE, Viet Nam: VIWA-MoT.

Project 2: Lao PDR: DOW-MPWT, Thailand: MD-MoT, Cambodia: Private Port Management Committee-MPWT + MoE, Viet Nam: VIWA-MoT.

Project 4: Lao PDR: DOW-MPWT, Thailand: MD-MoT, Cambodia: WTD-MPWT, Viet Nam: VIWA-MoT.

Project 5: Lao PDR: DOW-MPWT, Thailand: MD-MoT, Cambodia: Private Port Management Committee-MPWT + MoE, Viet Nam: VIWA-MoT.

Project 6: Mekong River Commission (NAP hosting a Regional Navigation Coordination Unit RNCU).

TIME AND WORK SCHEDULE

All projects should start some 6 months after a Regional Navigation Coordination Unitis established under the MRC. The RNCU should use these 6 months to secure funding for the Regional Action Plan, concentrating on:

- Securing the financing of MRC activities (RNCU and cross-border activities);
- Exploring further the possibilities of funding for all projects identified in the RAP;
- Preparing a plan for how to approach and follow up with international donors;
- Coordinating with national authorities regarding funding, and
- Discussing new requirements for the private sector to invest in relevant improvements.

Implementation of the various projects is then proposed as follows:

Project 1: 3 years (2017, 2018, 2019)

Project 2: 2 years (2019, 2020)

Project 4: 2 years (2017, 2018)

Project 5: 2 years (2017, 2018)

Project 6: 2 years (2017, 2018)

SOCIAL ISSUES

This project is not expected to have any adverse social impacts. The project will have benefits for local communities. Increasing safety and environmental management will improve water quality and natural resources on which local communities rely for their livelihoods and significantly reduce the risks of fire and explosion. Local communities living in the vicinity of ports and terminal areas should be included in emergency response drills and identified as stakeholders in developing any exclusion zones or restricted areas.Furthermore, the implementation of these projects may create opportunities for employment.

ENVIRONMENTAL ISSUES

This projectwill not have any negative environmental impacts. This project will have positive impacts by improving environment protection, pollution control, waste management and developing systems for preventing and responding to oil spills and operational discharges.

ECONOMIC ASSESSMENT

This is effectively an administrative action without any investment, an economic assessment is not necessary. In the longer term, there may be safety benefits, but these cannot be measured here.

PRIORITY OF ACTION (H/M/L)

Project 1: Lao PDR and Cambodia: Very High – Thailand and Vietnam: High.

Project 2: Lao PDR and Cambodia: High – Thailand and Vietnam: Medium.

Project 4: Very High.

Project 5: Very High.

Project 6: Very High.

FINANCING PLAN (PUBLIC/PRIVATE)

National projects and national projects with cross-border impact can be financed through national budget allocations. However, not all countries have this opportunity and need to seek external funding through donors.

Another source of funding is the private sector. Although it is not expected that it will participate in "basket funding", some specific activities can to some extent be funded by the private sector. Such co-financing shall be seen partly as compliance to new regulations and standards being implemented.

PRIOR ACTIONS REQUIRED

None.

FOLLOW-UP ACTIONS REQUIRED

None.

6.4 SHORT TERM PORT DEVELOPMENT ACTION 4 (SPD4)

TITLE

Rehabilitate, extend and/or reconfigure the existing passenger ports and landing facilities in Chiang Saen Port, Haciang Commercial Port (passengers going to Ban Khouane) and Phnom Penh Passenger Port in order to increase the capacity of the passengers ports and to allow for more efficient and safe embarking and disembarking of the passengers

BACKGROUND AND RATIONALE

For the purpose of this Action, a port refers to any place on a waterway with loading, discharging, transfer or storage facilities for goods in bulk or packaged inside containers. Ferry sites, passenger landing sites (even for international tourists) and occasional small cargo landing sites are not considered as ports. This definition is important for other disciplines in the Master Plan where rules and regulations apply for ports under the above definition but are not necessarily applicable for landing sites.

THAILAND

Chiang Saen Port:

- This is the old cargo-handling site that apparently is not in use anymore. It has two pontoons and a ramp, both covered. It is therefore well suited for passengers to embark and disembark there, even with luggage, in rather good and safe conditions.
- Not much can be done without informing the government as Chiang Saen and its surroundings have been declared a UNESCO heritage site. Any changes have to be reported to see if they comply with the UNESCO Charter for the site.

Haciang Commercial Port:

- Haciang is a private port that is meant for the transfer of petroleum products from truck to barge. Passengers are supposed to board the boats at Chiang Saen port for the crossing to Ban Khouane, maybe a bit further on the river but safer. Haciang should not be used for passengers.

CAMBODIA

Phnom Penh Passenger Port:

- Phnom Penh passenger port is conveniently located, close to bus terminals and hotels. The pontoons offer decent embarking procedures with offices of immigration and customs at the site. It could be more attractive by following the recommendations of MRC's Master Plan 2006. The tourism aspect should be more accentuated.

LOCATION

Chiang Saen, Thailand.

Phnom Penh, Cambodia

OBJECTIVES

Capture the lucrative tourism industry by improving conditions along the Mekong where these tourists have to board boats to enjoy the beauty of the Mekong River in Lao PDR and Thailand or Cambodia where they come to admire the ruins of ancient Khmer temples of Angkor Wat.

Several substandard landing sites in these countries need to be rehabilitated to accommodate the growing number of tourists so that they can comfortably enjoy their holidays.

When excluding Haciang (private port) from the list, the two ports listed aboveare in acceptable condition to receive passengers even in growing numbers. A bit of a brush-up to highlight the Lanna heritage for Chiang Saen and Khmer tradition at the Phnom Penh site would give tourists a very nice welcome.

OUTPUTS AND DELIVERABLES

Discourage passengers of using Haciang as landing site for crossing to and from Ban Khouane.

For Chiang Saen and Phnom Penh, a brush-up of the site would be an asset to their business. For Chiang Saen this would be a welcome improvement if it were inline with the heritage status of the town. For Phnom Penh, plans have been made to give it a more touristic look in line with Khmer tradition.

ACTIVITIES

Remind the Chiang Saen township authorities of the positive effect a nice welcome in the Lana tradition would have on tourists.

The same goes for Phnom Penh where in the 2006 Master Plan some suggestions were made to make the landing site more welcoming.

BUDGET

There is hardly any budget needed. These small brush-ups could come from the working budget of the relevant authorities (2 x 10,000 US$).

HUMAN RESOURCES

Negligible.

PROPOSED EXECUTING/IMPLEMENTING AGENCY

Chiang Saen: PAT – Phnom Penh: PPAP.

TIME AND WORK SCHEDULE

Within the next 3 to 6 months.

SOCIAL ISSUES

The project is not expected to have any adverse social impacts. The reconfiguring of the passenger ports should consider customs and immigration procedures, migration and security of passengers. Increasing use of IWT passenger transport will create employment opportunities.

ENVIRONMENTAL ISSUES

The rehabilitation works would not be expected to have any significant impacts on the environment. In Chiang Saen any modification needs to be checked against the UNESCO Heritage charter. Prior to any works the project team would need to ensure compliance with the Thailand National Environmental Quality Act (NEQA) 1992 and the Cambodian Environment Protection Law 1996 and the Draft EIA Law 2015. An Environmental Management Plan (EMP) may need to be developed for the temporary works. Waste management facilities should be considered as part of the design.

ECONOMIC ASSESSMENT

Since this action involves minor modifications which can be financed from the working budgets of the relevant IWT authorities, an economic assessment is not relevant.

PRIORITY OF ACTION (H/M/L)

High.

FINANCING PLAN (PUBLIC/PRIVATE)

Not applicable.

PRIOR ACTIONS REQUIRED

None.

FOLLOW-UP ACTIONS REQUIRED

None.

6.5 SHORT TERM PORT DEVELOPMENT ACTION 5 (SPD5)

TITLE

Construct new passenger ports and landing facilities in Ban Sai Port, Muong Mom Port (Ban Mom) and Ban Khouane, Huay Xay, Pak Beng and Luang Prabang, Kratie, Kompong Cham, Kompong Chhnang and Chong Kneas suitable to handle the forecasted passenger volumes. These ports should be constructed for efficient and safe processing of the passengers.

BACKGROUND AND RATIONALE

Lao PDR has received complaints from international tourists about the deplorable conditions in which tourists have to embark and disembark at the basic landing sites where boats on the Mekong River stop at points of interest. Luang Prabang, the principal tourist site, is an example of a neglected tourism industry where passengers, visiting this attractive little town, walk on unpaved ground on a steep hill while their luggage is in the hands of hawkers pushing them to take tuk-tuks to the city center. If Lao PDR wants to capture the tourism industry and make it a profitable business for the country's economy, these situations need to be improved without further delay.

Of the landing sites in Lao PDR listed here, Ban Sai and Ban Khouane are secondary ports and are not considered as international tourist ports or landing sites. They do however represent a certain, not negligible, number of passengers. In most cases they are cross border passengers who buy and sell their goods in a limited cross border trade. In other instances local people use the boats to visit markets or family. Some use boats as short river outings. This does not mean that the facilities that are rather primitive to non-existent should not be upgraded to facilitate moorings of boats in a safe way and allow access to the crafts in all seasons. However, these sites are not a first priority in the overall modernization plan for river sites**. The JCCCN report lists Ban Sai, Muong Mom, Ban Khouane and Huay Xay as Phase II projects**. Apart from Muong Mom, all other sites use the natural bank slopes for access to the boats.

LOCATION

LAO PDR

Five ports have been upgraded by the Lao Government to the status of international tourist ports or landing sites: Xiengkok, Muong Mom (Ban Mom), Huay Xay, Pak Beng and Luang Prabang. Tourist boats start from Huay Xay to go to Luang Prabang via PakBeng where often international tourists spend the night.

1) **Ban Say**:is a provincial checkpoint for security, entry and exit inspection for border inhabitants and boats. It is considered a **secondary port** according to Lao PDR and is listed as **Phase II priority** in the JCCCN report.

2) **Muong Mom:** is a national checkpoint. It has been upgraded to international passenger port by Lao PDR and is now in the **Phase II list** of the JCCCN Report. There are relatively well-equipped facilities and a sound joint inspection organization inspecting people, vessels and cargo. For the moment no more investments are required.

3) **Ban Khouane:** Is located within the Bokeo Province SEZ. It is taken up in **Phase II** of the JCCCN report and is qualified as a **secondary port** by the Lao Government. There is a ferry provision but once on land there is no concrete road.

4) **Huay Xay:** is a national checkpoint where tourists board for the scenic water trip to Luang Prabang a distance of some 300km. The port has a 50 ft. crumbling concrete ramp way which is used for cargo purposes. To combine this site with tourist movement is not the best solution. The passenger site should therefore be relocated away from cargo operations. It is quoted as an**international landing site** by the Lao Government but placed in **Phase II list** in the JCCCN report.

5) **Pak Beng:** Has a concrete slope rampway that is used both for goods and passenger transport. Halfwayto Luang Prabang, tourists usually spend the night at a riverside hotel. Again a separation for passengers from cargo operations would be advisable. It is considered an **international landing site** for tourists by the Lao Government and is taken up in the **Phase I list** of investments in passenger ports in the JCCCN report.

6) **Luang Prabang:**is probably the best known and the most attractive stop on the Mekong. In the city center alongside the river there is a series of steps, not always in good condition. Private boats wait there trying to book passengers to visit the Tham Tin Buddha cave. This is all right in high water season but the steps are not always very safe in the low water season.During recent visits passengers were dropped at the cargo port where there is a part concrete rampway. Comments from passengers were not very favorable, the more so that the site is quite a bit away from the city center.

CAMBODIA

1) **Kratie:** There is a rampway to be used according to the water levels. The traffic is local and not of such importance that a passenger port needs to be constructed. Passengers are mainly local and use the boats to come and buy supplies in Kratie. With the building of the bridge in Stung Treng it is doubtful whether international tourists would use the rampway in such numbers that separate facilities would be necessary. Cruise companies from Viet Nam that rearrange their itinerary in the low season when the entrance to the Tonle Sap Lake at Chhnok Trou is not passable should be contacted to find out whether they let people disembark at Kratie.

2) In view of the projected dams up river from Kratie it would be unwise to already plan investments on improvements of landing sites for passengers that could be completely reversed once the hydropower dams are operational.

3) **Kompong Cham:**At this moment no special facilities have been foreseen for passengers disembarking at Kompong Cham: they are travelers from local villages and are able to disembark at the present landings on the town side of the river. There is also a 13-year concession (counted from 2008) from the Ministry of Economy and Finance to a private company to build a tourist port at the current port site.

4) Regarding passengers, local and international, it is remarkable that local passengers prefer land to waterway transport. Still some international tourists come to visit most of the provinces along the Mekong River in Cambodia including Kompong Cham by cruise vessels from Viet Nam. In the future, when all the navigational obstacles from SR to PP are removed, international tourists who come to visit Siem Reap will hopefully use boats as a means of transport to visit northeast provinces in Cambodia. As a consequence, international passenger traffic in Kompong Cham will surely increased. Thus it may be beneficial to upgrade the passenger terminal to be safe and secure to welcome the increased traffic.

5) However, in the low water season, when the passage to the Tonle Sap Lake is not passable, cruise ships from Viet Nam have chosen the Mekong side to pursue their river excursion. Whether they stay on board or are transported by road to the Khone Falls is unclear.

6) **Kompong Chhnang:** Long term concessions granted by the provincial authority to private operators have not resulted in any improvements to the port. These concessions seem to have come close to an end now.

7) Despite the province's touristic attractions they do not seem to encourage water. Cruise boats avoid stopping there because the existing infrastructure is not adequate to handle the luxurious cruise boats and their wealthy passengers. If the organization and control of operations is not improved to make passengers feel comfortable, secure and welcomed, there will never be a significant number of foreign tourists.

8) It can only be hoped that decisions will be taken by the central government to grant new concessions that will also benefit the quality of services and take tourism activities into account.

9) **Chong Kneas:** The proposed new site of the landing facility for passengers is on the NE shore of the Tonle Sap, about 12 km south of Siem Reap. The site is located within the seasonal flood plain of the lake, with a shoreline that migrates about 8 km at this location. The flood plain is very flat and slopes gently up from the dry season shoreline to Phnom Kraom at about 1 meter per kilometre:

   - The present landing at Chong Kneas moves with the water level in the Tonle Sap. During the low water period from mid-March to the end of May, goods and passengers are loaded and discharged at the lake edge just east of the existing channel mouth. Access is via the existing embankment to Kanthey Kaom where there is a bridge crossing the Stung Siem Reap to a dirt track down to the lake edge. As the water level rises, the landing is moved, first to Kanthey Kaom and then progressively up the embankment until at high water, it is located at the foot of Phnom Kraom. As the water level recedes, the landing moves progressively down towards the lake. During low water, the water depth at the entrance to the lake is only 0.5 m, and only very shallow draft passenger boats can cross the lake.

   - Passenger traffic was an important operation at Chong Kneas: in 2002, arrivals already numbered 100,000 plus, but with improved and air conditioned buses on the road between Phnom Penh and Siem Reap, this volume has fallen significantly. The decline in boat passengers is also attributable to the poor quality of the speedboats, lack of on-board service and the inadequate landing facilities at Chong Kneas. For the last few years there is only an average of one speedboat per day arriving at Chong Kneas. Unless improvements in the fleet of speedboats can reverse this trend, which is very unlikely, it is doubtful whether the investments in new port facilities for passengers at Chong Kneas are worth considering. On the other hand, the recent introduction of luxury tourist boats sailing from HCMC is seen as an important growth area. These boats can only pass the entrance to the lake at Chhnok Trou in the high water season. For all-year round cruises to Chong Kneas, a number of high risk improvements on the Tonle Sap need to be undertaken which will not be for this short term period.

   - Improvements to the passenger port at Chong Kneas will therefore be treated in the Long Term Port Development section of this report.

OBJECTIVES

Bring these landing sites to an acceptable level of efficiency and safety and decide on investments according to the needs and the number of passengers likely to use the site now and in the next 5 years.

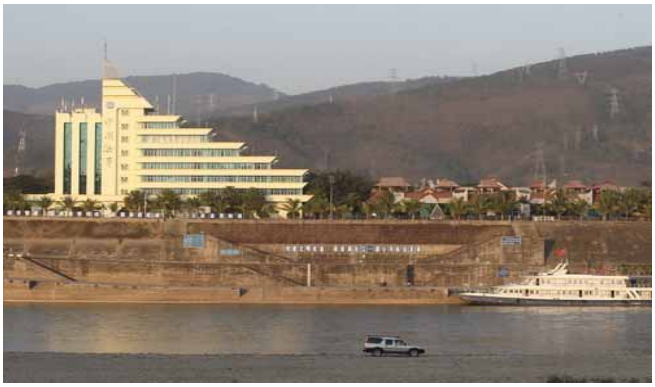
Make the distinction between Lao declared international landing sites and secondary sites.

Consider the Phase I and Phase II classification in the JCCCN report, as it will be important in the allocation of funds from the PR China.

Construction should preferably be donein a uniform way for each of these ports or landing sites. It would reduce the investment costs.

OUTPUTS AND DELIVERABLES

This can either be done by putting sizable pontoons at the landing sites so that tourist boats can easily moor alongside, or with a fixed concrete ramp that allows mooring according to the season, or a combination of the two. Even with pontoons, there still needs to be a concrete structure on land. These could either be steps, not the best for the elderly, or a ramp that will lead to the street level in different stages.



A flood season, a median water season, and a dry season facility could be envisaged with gradations of maximum 6% that would be manageable to overcome for passengers of all ages for the few selected sites: Simao and Jinghong port that handle respectively 200,000 and 400,000 passengers per year could serve as examples.

The effects on the river and its seasonal fluctuations by the dams should also be taken into account.

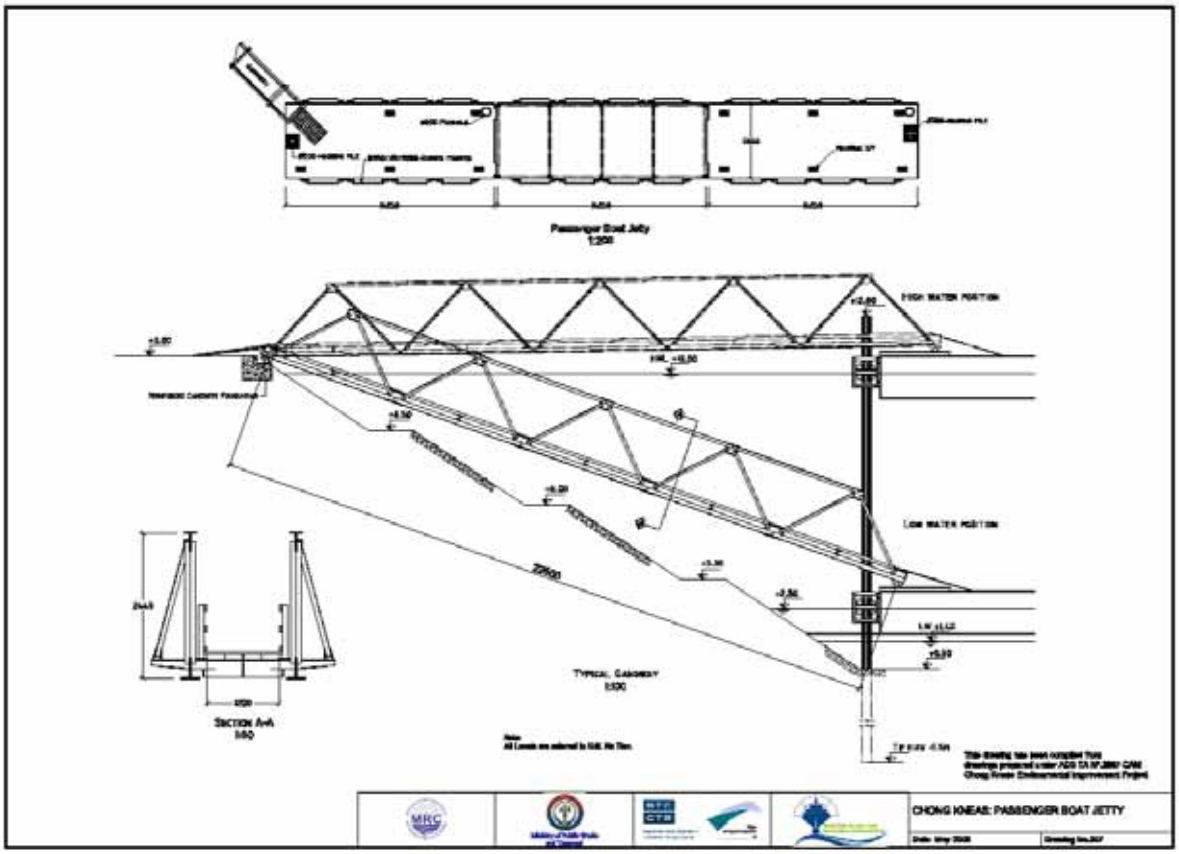
The picture in the left is of Simao passenger port and the one on the right is Jinghong. For the development of passenger ports in Lao PDR one should of course take into account the number of passengers expected to make use of the facilities.

ACTIVITIES

Identify the importance of the listed sites and state an order of priority for the creation of proper passenger landing sites, especially in those cases where international tourists pass through, as they generate foreign exchange.

Approval of the design and possible correction of the river flow to improve the approach and the safe mooring of the passenger boats.

Approve the minimal standards for the design and construction of these landing sites including housing for official agencies.



Example of pontoon and gangway for passenger boats (From Master Plan for Waterborne Transport on the Mekong River System in Cambodia, BTC-MPWT – Port Engineering Report, Bill Hawkins, 2006)

BUDGET

According to the JCCCN Development Plan, the construction of passenger landing sites in in the PR China and **Lao PDR** that allow comfortable embarking and disembarking of passengers will cost approximately**3.8 million US$ per berth**. That is the price for one berth in each (international) port selected in Phase I: Xiengkok, Huay Xay, Pak Beng and Luang Prabang. For Lao PDR the funds will most probably have to come from a government-to-government loan, although the report mentions that the one who benefits the most from these improvements should also have to contribute. These are private enterprises that have an interest in actively participating in this growing industry; the hotel industry will greatly benefit from the growth of tourism due to improved conditions.

One method would be to tax hotels with an overnight stay fine of a few dollars which would then be used for the maintenance of all tourist oriented facilities.

For Ban Sai, Muong Mom, Kratie and Kompong Chhnang, cheaper solutions could be applied, according to the site and the civil works needed to prepare the site. In these ports, a cost of **0.7 million US$ per port** is estimated.

In **Cambodia**, the cost for a passenger terminal in Kompong Cham was estimated in the Cambodian Master Plan 2006 at 0.5 million US$. Taking into account a devaluation of 40%, this would be in 2016 a cost **of 0.7 million US$.**

In the case of Chong Kneas, the budget estimated in the Cambodian Master Plan 2006 for total reconstruction (not only a passenger landing site but also provisions for general cargo, a fish market

and a petroleum transfer site) was as high as 15 million US$. With a devaluation of 40%, this would be now a cost of 20 million US$ (*see long term port development action 5*).

Total: 4 x 3.8 million US$ + 5 x 0.7 million US$ = **18.7 million US$**

HUMAN RESOURCES

In Lao PDR, one delegate from the Waterway Department. Monitoring by the Ministry of Finance where such a committee already exists and further consultation with the Ministry of Culture and Tourism who should delegate an officer to the preliminary meetings.

In Cambodia it is the Ministry of Public Works and Transport, Department of Inland Water Ways that is the higher authority. For Chong Kneas, Kratie and Kompong Chhnang the Provincial Authorities are responsible for the ports in their province. For Phnom Penh and Kompong Cham it is the Phnom Penh Port Authority (PPAP).

PROPOSED EXECUTING/IMPLEMENTING AGENCY

For LaoPDR the central government, specifically the Ministry of Public Works and Transport and the Ministry of Information, Culture & Tourism should be participating in initiating this project. The Waterway Department will be the executing office.

For Cambodia the Ministry of Public Works and Transport and the Ministry of Tourism will be the initiator while, in as far the authority of the Autonomous Port of Phnom Penh reaches, PPAP will be the executing office. For landing sites beyond the authority of PPAP it will be the local Provincial Government who will be the executing power.

TIME AND WORK SCHEDULE

Prioritizing the ports that need construction, the first works should start not later than mid-2016. Count one year per port and the prioritized ports (4) should all be ready for the 2018 tourist season. Further selection of ports for passengers, not necessarily international tourists, where basic infrastructure works to make the sites more accessible for local people can be executed concurrently.

SOCIAL ISSUES

The project is not expected to have any adverse social impacts. The passenger ports should consider customs and immigration procedures, migration and the safety and security of passengers. The Increasing use of IWT passenger transport will create employment and employment opportunities for rural people and improve safety.

ENVIRONMENTAL ISSUES

This project is not expected to have any adverse environmental impacts. The environmental impacts of constructing landing facilities and increased waterway use would need to be assessed in respect to environmental protection law in Lao PDR and Cambodia:

- The passenger landing facilities in Lao PDR may require an Initial Environmental Examination (IEE) under the Environmental Protection Law 2013 to determine whether an Environmental Impact Assessment (EIA) or Environmental Protection Commitment (EPC) is required.
- The construction of passenger landing facilities in Cambodia would require compliance with the Cambodian Environment Protection Law 1996 and the Draft EIA Law 2015.

ECONOMIC ASSESSMENT

Of the passenger landing sites encompassed by this action, Ban Khouane, Huay Xay, Pak Beng, Luang Prabang and Chong Kneas have been identified as having the potential for significant passenger traffic growth within the forecast timeline. In addition to improvement of onboard safety measures, realization of this growth will depend on the improvement of the landing facilities at these sites in order to make boarding and alighting easier, more convenient and safer for passengers. The economic impacts of these measures will include not only the valuation of enhanced safety for

existing passengers, but also the valuation of the increased passenger volume induced by the envisaged safety improvements.

The remaining five passenger landing sites (Ban Sai, Muong Mom, Kratie, Kompong Cham, and Kompong Chhnang) are not forecasted to generate significant passenger growth, but might be expected to benefit from safety improvements to passenger boarding/alighting facilities.

PRIORITY OF ACTION (H/M/L)

Medium to low according to the use of each of the ports.

FINANCING PLAN (PUBLIC/PRIVATE)

The bulk of the funds will have to come from government-to-government loans. As mentioned in the JCCCN, the PR China is prepared to consider such loans.

There is room for private investment in this modernization plan. Transport companies, boat owners and hotel owners will all benefit from the rehabilitation of the landing sites for tourists and should be approached to see how extra funds could be solicited that would contribute to the possibility of the timely execution of the project and quality of the details.

PRIOR ACTIONS REQUIRED

Identify the importance of the listed sites and state an order of priority for creation of passenger landing sites. Pak Beng and Luang Prabang feature on top of the list.

Approve the minimal standards for the design and construction of these landing sites, including housing for official agencies.

Approval of possible correction of the river flow to improve the approach and the safe mooring of the passenger boats.

First a list of substandard landing sites where international tourists embark or disembark will have to be drawn up. The list should prioritize the sites according to the number of international passengers that make use of them. For each landing site it should list the actual situation and propose the refurbishment, extension or dislocation that is to be considered. At all times, passenger sites should be separate from the cargo sites.

For each landing site a plan is to be proposed of the civil works needed so that international passengers can embark or disembark in all seasons in the most comfortable circumstances. Huay Xay, Pak Beng and Luang Prabang have been declared international tourist ports by the Lao Government. For Lao PDR they should be given priority for refurbishing.

A detailed construction plan to be drawn up by the Ministry of Public Works and Transport that will need to be presented to the Cabinet and that can be used to propose to financial institutions or governments of neighboring countries for request for funds.

A feasibility study report for each project and a report on EIA if channel improvement and maintenance is needed. This study will have to be approved by each of the four countries in accordance with Article 3 of the MOU on the Implementation Plan.

FOLLOW-UP ACTIONS REQUIRED

A constant follow up on progress and continuous contact with donors will be essential.

6.6 SHORT TERM PORT DEVELOPMENT ACTION 6 (SPD6)

TITLE

Establish standards on petrochemical transfer ports (both public and private) in Lao PDR, Thailand and Cambodia and organize an international audit for the existing petrochemical transfer ports in order to create safe processing and storage of fuel

BACKGROUND AND RATIONALE

From the "Risk Analysis of the Carriage, Handling and Storage of Dangerous Goods", it was determined that a number of inland ports and terminals have limited capacity in the areas of management of dangerous goods, waste management and environmental protection and revealed insufficient emergency response planning. Furthermore, awareness and understanding of the treatment of dangerous goods in port management and workers safety needed to be boosted. The recommendations called for ports to implement management systems for handling of dangerous goods, environmental protection, emergency and oil spill response and to develop training for management and workers.

LAO PDR: The Department of Waterways, MPWT prepared a Draft Rule on Safety of the Port, a Draft Rule on Dry Ports, a Draft Regulation on Handling and Storage of Dangerous Goods and a Draft Rule on Inland Waterway Transportation of Dangerous Goods. These documents are however only available in Lao at this stage.

THAILAND: Thailand has a Port Authority of Thailand Act, B.E. 2494 (1951), as amended, an Occupational Safety, Health and Environment Act, B.E. 2554 (2011) and Ministerial Regulations on Fuel Oil Storage Premises B.E.2551 (2008).

CAMBODIA: Cambodia has a Prakas on the Formation of Private Port Management Commission and a Circular N°070, December 2011 on Port Planning, Construction and Operation in the Kingdom of Cambodia with four Items: A: Port Establishment, B: Port Construction, C: Port Operation and D: Responsibilities Of Official Staff.

VIET NAM: Viet Nam has some 8 Decisions and Circulars on the organization and operation of ports, on rules for inland waterway port authorities, on the implementation of inland waterway ports and landing stages, on the operation of port state control systems, on the technical classification of inland waterway ports and landing stages, and so on.

Moreover, the standard system in Viet Nam consists of more than 7,000 standards of which many apply for ports, landing stages and terminals.

As a result of the 10th Navigation Advisory Body (NAB) meeting held in Thailand, it was decided to organize a pilot project at Chiang Saen Commercial Port to focus on the management of dangerous goods. Staff at the operational and management level at PAT received training on dangerous goods and risk assessment. Both national and international experts for ports presented a case of risk assessment, delivered training and prepared a manual on dangerous goods management.

LOCATION

Starting with a pilot action in one port in the Lao PDR, Thailand and Cambodia that will then serve as model, the training will further spread to all the ports and landing sites along the Mekong that handle Dangerous Goods not only on a regular basis but also on an occasional basis.

OBJECTIVES

Establish standardson petrochemical transfer ports (both public and private) in Lao PDR, Thailand and Cambodia and organize an international audit for the existing petrochemical transfer ports in order to create safe processing and storage of fuel.

OUTPUTS AND DELIVERABLES

A Dangerous Goods Management Manual (DGMM)has to be prepared in the national language of

each country. An international audit for the existing petrochemical transfer ports in order to create safe processing and storage of fuel. Training has to be provided in the handling of dangerous goods and the use of personal protective equipment.

ACTIVITIES

- Provide training in the handling of dangerous goods and the use of personal protective equipment (PPE);
- Complete the installation of fire protection measures at the port in general and especially in the dangerous goods area;
- Prepare an emergency response plan and provide the necessary response equipment;
- Prepare written procedures and checklists concerning the transfer of dangerous goods;
- Conduct an international audit for the existing petrochemical transfer ports in order to create safe processing and storage of fuel.

BUDGET

Development of standards:	
International Expert :3 months at 12,000 US$	36,000 US$
National Experts:3 countries x 12 months at 1,000 US$	36,000 US$
Translation of manuals and standards: 3 x 3,000 US$	9,000 US$
International auditThailand: 40,000 US$	40,000 US$
Lao PDR: 60,000 US$	60,000 US$
Cambodia: 100,000 US$	100,000 US$
Total	**281,000 US$**

HUMAN RESOURCES

One international expert who will manage the whole project. One middle management staff member for every country with a minimum of operational experience and who can in a second phase train local staff representing every port in the country that handles dangerous cargo.

An international consultancy company to execute the international audit.

PROPOSED EXECUTING/IMPLEMENTING AGENCY

For **Lao PDR:** Waterway Department.

For **Thailand:** Marine Department - Port Authority of Thailand.

For **Cambodia:** Inland Waterway Department, Phnom Penh Port Authority, Provincial Authorities.

Harbor Master of the concerned ports.

TIME AND WORK SCHEDULE

After having put the necessary funds in place, the audits and the drafting of the standards should start as soon as possible and take about one year.Then there will be a first training of staff responsible for Dangerous Goods in their ports. This should take one month. Then further training down the line should take another month. Monitoring the correct implementation should take one more month.

SOCIAL ISSUES

This project is not expected to have any adverse social impacts.

ENVIRONMENTAL ISSUES

This project could improve environmental protection and pollution control in the petroleum industry reducing impacts to the natural resources and the environment if the recommendations from the audit are implemented effectively.

ECONOMIC ASSESSMENT

These actions are intended to improve the safety of transfer handling and storage operations at petroleum landings along the river in Lao PDR, Thailand and Cambodia. Measurement of the resulting safety improvement benefits in economic terms is difficult.

PRIORITY OF ACTION (H/M/L)

High.

FINANCING PLAN (PUBLIC/PRIVATE)

Budgets from the concerned ports, government finances, international donors.

PRIOR ACTIONS REQUIRED

Prioritize ports and landing sites where urgent action is required.

List of personnel in each port in each country that is likely to follow the training with success.

FOLLOW-UP ACTIONS REQUIRED

Follow-up is built in the budget with one month of monitoring the ports where the project has been implemented.

6.7 SHORT TERM PORT DEVELOPMENT ACTION 7 (SPD7)

TITLE

Expand the existing container yard at the New Phnom Penh Container Terminal – NCT LM 17 in order to accommodate forecasted container traffic

BACKGROUND AND RATIONALE

PPAP is close to handling 150,000 TEUS per year, the maximum volume that the container terminal was originally built for in the first phase. The time has come to start the second phase. This phase consists of expansion of the yard, additional lifting equipment and truck/trailer combinations as distances will become greater.

Currently PPAP is operating as if it were a private enterprise. Its management is professional, the company is profitable and, therefore, any funds for the expansion should either come from its own profits, from the Ministry of Economic and Finance or from private investors for which the unit NCT at LM17 should go to a restructuring plan as explained hereunder.

LOCATION

PPAP's container terminal at LM17.

OBJECTIVES

To prepare PPAP for the growth in containers and additional logistic services for the next 5 years.

To continue to offer the best service to its customers and contribute in an important way to the national economy.

OUTPUTS AND DELIVERABLES

Especially on the ship's side of the operations, due consideration should be given to the lifting equipment. Notwithstanding three travelling heavy lift electric jib cranes, the port still uses the rather outdated floating derricks. Should the port consider one or two modest gantry cranes in the second phase or continue to load and discharge barges with jib cranes, this time fitted with automatic 20/40 ft. spreaders? At the volume PPAP is doing now and the volume it expects, the cost/benefit analysis is worth doing again within the organization.

ACTIVITIES

The container terminal is a state owned enterprise with PPAP as the operational entity. Due to the heavy investments that this enterprise will face in the continuous expansion and growth that it has proven capable of in the past, its structure may very well change in future years. A first move would be to set up a separate company for the container terminal and related logistic activities only. Such move is called corporatization where PPAP/Ministry of Finance would hold all of the shares to be issued. In a second move, part of these shares would be made available to private interests such as a strategic partner active in the transport/logistic industry, opening the possibility for valuable spin-offs. All these moves would lead to an Initial Public Offering (IPO), which would secure funds for future expansion.

BUDGET

Budget is to be estimated at 30 million US$ for the infrastructure works, plus 15 to 20 million US$ for equipment, depending on the quality of the equipment that will have to be ordered.

HUMAN RESOURCES

This is to be done within the PPAP organization, the way it was done for the first expansion. It would be advisable though to keep close contact with international experts, both in the operational and the financial side.

PROPOSED EXECUTING/IMPLEMENTING AGENCY

Phnom Penh Autonomous Port (PPAP) under the direct supervision of the Ministry of Public Works and Transport and the Ministry of Finance.

TIME AND WORK SCHEDULE

2015 to 2020.

SOCIAL ISSUES

Expanding the container yard may have social impacts on local communities living in the vicinity of the port container terminal. The project could increase the number of trucks using the access roads. Social and resettlement plans may need to be developed.

ENVIRONMENTAL ISSUES

The environmental impacts of expanding the container yard and increased waterway use at the new Phnom Penh Container Terminal would need to consider the Cambodian Environment Protection Law 1996 and the Draft EIA Law 2015.

ECONOMIC ASSESSMENT

Investment in the expansion of the New Phnom Penh International Container Terminal will be a matter for consideration by the Phnom Penh Autonomous Port which is an independent commercial (and profitable) organization. Given that the MRC or affiliated organizations will not be involved, an economic assessment of this action is not relevant.

PRIORITY OF ACTION (H/M/L)

High.

FINANCING PLAN (PUBLIC/PRIVATE)

International loan.

As explained above, in view of the important investments to be made and the need to maximize the efficiency and profits of the venture, it is important to consider a Public-Private Partnership (PPP) for the container operations at LM17.

PRIOR ACTIONS REQUIRED

None.

FOLLOW-UP ACTIONS REQUIRED

None.

6.8 SHORT TERM PORT DEVELOPMENT ACTION 8 (SPD8)

TITLE

Rehabilitate the existing petrochemical transfer ports in Viet Nam according to the Vietnamese Master Plans

BACKGROUND AND RATIONALE

Viet Nam has many fuel transfer ports, the conditions of these ports depends on the owner/operator. Substandard facilities should be identified and rehabilitated.

Reference: "Master Plan for Viet Nam Inland Waterway Sector to 2020 and Orientation to 2030".

Number	Name of Port	City/Province	Maximum GRT (Ton)	Capacity (Ton/year)
1	30/4 fuel port	Ho Chi Minh	650	300
2	Long Binh Tan fuel port	Dong Nai	300	700
3	Bien Hoa Number 18 fuel port	Dong Nai	700	300
4	Chanh My fuel port	Binh Duong	1,200	400
5	Phu Cuong fuel port	Binh Duong	500	300
6	LPG Tay Ninh fuel port	Tay Ninh	1,000	750
7	MT Gas	Long An	5,000	300
8	Long Hung Refinery&Petrochemical port	Long An	2,000	2,000
9	Ben Luc fuel port	Long An	300	250
10	Tan An-Petecland fuel port	Long An	2,000	700
11	K34-Tra Noc fuel port	Can Tho	1,000	250
12	99 Company fuel port	Can Tho	750	350
13	T18 fuel port	Can Tho	350	250
14	Tan Phu Thach fuel Port	Can Tho	1,000	400
15	Kien Giang fuel port	Kien Giang	300	250
16	Kien Giang fuel transfer port	Kien Giang	500	300
17	Mong Tho fuel port	Kien Giang	500	600
18	Phu Quoc fuel port	Kien Giang	400	250
19	Dang Hong Quang fuel port	Hau Giang	100	150
20	Phung Hoang fuel port	Hau Giang	300	250
21	Tan Hoa fuel port	Hau Giang	200	200
22	Vinh Tre fuel port	An Giang	300	250
23	Long Xuyen fuel port	An Giang	300	250
24	Lam Son fuel port	An Giang	100	150
25	My Thoi fuel port	An Giang	100	150
26	An Giang fuel port	An Giang	500	300
27	Binh Thanh fuel port	Dong Thap	300	250
28	Truong Xuan fuel port	Dong Thap	400	250
29	PetroMekong fuel port	Vinh Long	800	300
30	Vinh Long fuel port	Vinh Long	300	300
31	Vinh Thai fuel port	Vinh Long	500	1,100
32	Truong Son fuel port	Vinh Long	1,000	350
33	Soc Trang fuel port	Soc Trang	300	250
34	Soc Trang – PVOIL fuel port	Soc Trang	400	250
35	Soc Trang-Dong Thap fuel port	Soc Trang	400	250
36	Soc Trang-Soc Trang cie fuel port	Soc Trang	100	150
37	Tan Thanh fuel port	Soc Trang	100	150
38	Soc Trang – PetroMekong fuel port	Soc Trang	500	300

39	Rach Vong fuel port	Ben Tre	300	250
40	Hoi Yen fuel port	Ben Tre	200	250
41	Ba Tri fuel port	Ben Tre	1,000	400
42	Tac Van	Ca Mau	300	250

LOCATION

Fuel ports in the following provinces/locations: Ho Chi Minh city, Dong Nai, Binh Duong, Tay Ninh, Long An, Can Tho city, Kien Giang, Hau Giang, An Giang, Dong Thap, Vinh Long, Soc Trang, Ben Tre and Ca Mau.

OBJECTIVES

Objectives up to the year 2020.

Step by step modernization of port system, increasing ability and service quality in order to meet the requirements of connecting river transportation with other transportations such as road and sea transportation and the demands of logistic services.

Objectives up to 2030.

To continue rehabilitation and renovation of the fuel port system in the South. To improve management and operation of loading and unloading cargo, to increase the quality of logistic services, to have high quality, quick, safe, convenient and efficient fuel port operations.

OUTPUTS AND DELIVERABLES

Establish list of ports needingrehabilitation and innovation based on the following conditions:

1) Ports from class III, will be developed up to 2030;
2) Ports located in the center of a province or city or industrial zone;
3) Port having a convenient location that connects to national transportation routes;
4) Ports in remote areas that have river transportation must have at least one inland water port;
5) Priority for the ports that are already planned for in the Master Plan (QH13);
6) Adding central ports in order to make a connection, a judgment and movement of cargo between inland water transportation and other transportation.

ACTIVITIES

To update the detailed plan for all the fuel ports and to meet the demand of current loading and unloading of cargo andthe transit of cargo for South of Viet Nam, and to make the plan for connecting inland water transportation with other types of transportation.

Make the updated detailed plan for all the fuel ports in the above list.

BUDGET

Funding should be sought from national budgets, the private sector and international donors. If the action can be concentrated in one port that will serve as a pilot case, there could be a lot of cost savings. Nevertheless, estimates will be in the region of **2,500,000 to 3,000,000 US$** for all ports. There may be some expenses for follow up actions later. This sum consists of salaries for international consultants (part-time) and national experts during 5 years.

3 international consultants 24 months at 12,000 US$/month	864,000 US$
10 national experts 5 years at 1,200 US$/month	720,000 US$
Training and rehabilitation costs in 5 ports	1,000,000 US$
Total	**2,584,000 US$**

HUMAN RESOURCES

Three part time international consultants and ten national experts are required. The main activities of these experts are to revise and update the detailed design of the Master Plan for all fuel ports in the South of Viet Nam, consulting on the rehabilitation and innovation of the ports in the above objectives up to 2030.

PROPOSED EXECUTING/IMPLEMENTING AGENCY

A special regional unit to be created with MRC support and with the support of the Ministry of Transport and its departments responsible for inland waterway transport as well as the Marine Department and the Port Authority. This unit will be responsible for training and being involved in the updating and revision of the detailed plan for rehabilitation and innovation of all fuel ports in the South of Viet Nam.

TIME AND WORK SCHEDULE

Year 2016 to year 2020.

SOCIAL ISSUES

This project will have positive social impacts by improving the safety of petrochemical transfer ports used by local waterway users, reducing the risks of pollution, fire/explosion and accidents.

ENVIRONMENTAL ISSUES

The rehabilitation of the existing petrochemical transfer ports is not expected to have any significant impacts to the environment. The scope of the rehabilitation works would need to consider Viet Nam's Environmental Protection Law 2014. The environmental protection law would determine whether an EIA, EPC and/or Environmental Management Plan (EMP) and monitoring is required. The project would be expected to have positive environmental impacts by reducing water pollution from spills and operational discharges during fuel transfer.

ECONOMIC ASSESSMENT

These actions are intended to improve the safety and efficiency of transfer, handling and storage operations at petroleum landings in Viet Nam, and thereby enhancing the competitiveness of IWT against road transport for the haulage of petroleum products. The economic benefits of these actions will comprise the reduction in unit operating costs as compared with road transport and the greater IWT petroleum volume induced by efficiency improvements.

PRIORITY OF ACTION (H/M/L)

First update and revise the detailed plan for rehabilitation and innovation of five main ports and, afterwards, the other ports.

FINANCING PLAN (PUBLIC/PRIVATE)

Government subsidies, Marine Department, Port Authorities and private portcontributions as well as international donors through the MRC.

PRIOR ACTIONS REQUIRED

Listing of the concerned ports and/or landing sites. Prioritizing according to *Master Plan for Viet Nam Inland Waterway Sector to 2020 and Orientation to 2030*.

FOLLOW-UP ACTIONS REQUIRED

Continuously update and revise Master Plan and detailed plan corresponding with economic development up to year 2040.

6.9 SHORT TERM PORT DEVELOPMENT ACTION 9 (SPD9)

TITLE

Rehabilitate the existing cargo ports in Viet Nam according to the Vietnamese Master Plans

BACKGROUND AND RATIONALE

Viet Nam has many (often small) cargo ports, the conditions of these ports depends on the owner/operator. Substandard facilities should be identified and rehabilitated.

Reference:*"Master Plan for Viet Nam Inland Waterway Sector to 2020 and Orientation to 2030".*

Number	Name of Port	City/Province	Maximum GRT (Ton)	Capacity (Ton/year)
South West Area				
1	Long Duc port	Tra Vinh	2,000	600
2	An Phuoc port	Vinh Long	2,000	500
3	Sa Dec port	Dong Thap	1,000	400
4	Binh Long port	An Giang	3,000	600
5	Tac Cau port	Kien Giang	2,000	600
South East Area				
1	Phu Dinh port	Ho Chi Minh	3,000	2,500
2	Long Binh port	Ho Chi Minh	5,000	2,500
3	Truong Tho port	Ho Chi Minh	2,000	3,600
4	Nhon Duc port	Ho Chi Minh	3,000	1,500
5	Ben Suc port	Binh Duong	1,000	1,500
6	Ben Keo port	Tay Ninh	1,000	1,500
7	TRACOMECO port	Dong Nai	5,000	1,500
8	Nhon Trach port	Dong Nai	5,000	1,500
9	Tin Nghia port	Dong Nai	5,000	2,000
10	Ha Duc port	Dong Nai	5,000	1,500
11	Dong Nai port	Dong Nai	1,000	700
12	Rach Bap port	Binh Duong	1,000	800
13	An Son port	Binh Duong	1,000	1,500
14	Thach Phuoc port	Binh Duong	2,000	1,000
15	Cay Khe port	Vung Tau	2,000	1,000
16	C.Bourbon An Hoa port	Tay Ninh	2,000	1,000
17	Thanh Phuoc port	Tay Ninh	2,000	1,000
18	Bournbon Ben Luc Port	Long An	5,000	2,500
19	Thanh Tai port	Long An	5,000	800
20	BMT port	Long An	5,000	800
21	Kim Tin port	Long An	5,000	800
22	Thien Loc Thanh	Long An	5,000	800
23	Phuong Quan port	Long An	5,000	500
24	Phuoc Dong port	Long An	5,000	500
25	Can Giuoc port	Long An	2,000	500
26	Tan An port	Long An	1,000	1,000
27	Hoang Tuan port	Long An	1,000	600
28	Hoang Long port	Long An	1,000	600
29	Mechanic construction 2 port	Long An	1,000	400
30	Le Thach port	Tien Giang	3,000	500
31	Agriculture Tien Giang port	Tien Giang	3,000	1,200
32	My An port	Vinh Long	3,000	500
33	Quang Vinh port	Vinh Long	2,000	300

34	Toan Quoc port	Vinh Long	2,000	400
35	Bao Mai port	Dong Thap	5,000	500
36	Soc Trang port	Soc Trang	1,000	500
37	Long Hung port	Soc Trang	1,000	500
38	Nga Nam port	Soc Trang	1,000	500
39	Cai Con port	Soc Trang	1,000	500
40	Vi Thanh port	Hau Giang	1,000	700
41	Tan Chau port	An Giang	5,000	1,000
42	An Giang cargo port	An Giang	1,000	500
43	Song Hau food port	Can Tho	2,000	500
44	Huynh Lam port	Can Tho	5,000	800
45	Phuc Thanh port	Can Tho	2,000	500
46	Hau Giang material port	Can Tho	1,000	400
47	Thot Not industrial zone port	Can Tho	2,000	500
48	Ho Phong port	Bac Lieu	1,000	800
49	Bac Lieu port	Bac Lieu	1,000	500
50	Ong Doc port	Ca Mau	1,000	700
51	Ca Mau cargo port	Ca Mau	1,000	600

LOCATION

Cargo ports in the following locations/provinces: Binh Phuoc, Binh Duong, Dong Nai, Tay Ninh, Ba Ria-Vung Tau, Ho Chi Minh city, Long An, Dong Thap, Tien Giang, An Giang, Ben Tre, Vinh Long, Tra Vinh, Hau Giang, Kien Giang, Soc Trang, Bac Lieu, Ca Mau and Can Tho city.

OBJECTIVES

Objectives up to year 2020:

1) Construction of cargo port system meets the demand of throughput cargo volume for different periods; up to year 2020 is 32,6 million ton/year. Passenger ports meet the demand of 29 million passengers per year.
2) Some of the big cargo ports can be used for ships with 5,000DWT. Passenger port in Ho Chi Minh and Vung Tau city can be used for passenger ships with 250 passengers, other ports can be used for ships with 100 to 120 passengers.
3) Step by step modernization of port system, increasing ability and service quality in order to meet the requirements of connecting river transportation with other transportations such as road and sea transportation and the demands of logistic services.

Objectives up to 2030:

1) To continue rehabilitation and renovation of port system in the South. To improve management and operation of loading and unloading cargo, to increase the quality of logistic services, to have high quality, quick, safe, convenient and efficient port operations.
2) Volume of throughout ports up to 2030 as:
   - For the cargo ports: 52.5 million/year.
   - Passenger ports: 42.5 million passenger/year.

OUTPUTS AND DELIVERABLES

Establish list of ports needing rehabilitation and innovation based on the following conditions:

1) Ports from class III, will be developed up to 2030;
2) Ports located in center of province or city or industrial zone;
3) Port having a convenient location that connects to national transportation routes;

4) Ports in remote areas that have river transportation must have at least one inland water port;
5) Priority for the ports thatare already planned in the Master Plan (QH13);
6) Adding central ports in order to make connection, a judgment and movement of cargo between inland water transportation and other transportation.

Port system in inland water route have included 56 ports in South of Viet Nam. These ports meet the demand for ships from 500 ton to 5,000 ton. Throughput cargo volume up to year 2020 is 32.6 million ton/year.

ACTIVITIES

To make a detailed plan for all the cargo ports, to meet the demand of loading and unloading cargoes, transit of cargo for South of Viet Nam and make the plan for connecting inland water transportation with other type of cargo transportation.

Make the detailed plan for the eleven cargo ports: Long Binh port, Phu Dinh port, Nhon Duc port, Truong tho port, Ben Suc port, Ben Keo port, Long Duc port, An Phuoc port, Sa Dec port, Binh Long port and Tac Cau port.

Function of main ports: for economic activities in the local areas and surrounding areas.

Throughput cargo capacity up to 2020: 10.9 million ton/year.

Other ports include 45 ports.

Function of other ports: for economic activities in the local area.

Throughput cargo capacity up to 2020: 21.8 million ton/year.

BUDGET

Funding should be sought from national budgets, the private sector and international donors. If the action can be concentrated in one port that could serve as a pilot case there could be a lot of cost savings. Nevertheless, estimates will be in the region of **2,500,000 to 3,000,000 US$** for all ports. There may be some expenses for follow up actions later. This sum consists of salaries for international consultants (part time) and national experts during 5 years.

3 international consultants 24 months at 12,000 US$/month	864,000 US$
10 national experts 5 years at 1,200 US$/month	720,000 US$
Rehabilitation costs in 11 main ports	1,100,000 US$
Total	**2,684,000 US$**

HUMAN RESOURCES

Three international consultants and ten national experts are required. The main activities of these experts are revising and updating the detailed design of the Master Plan, consulting on the rehabilitation and innovation of the ports pointed in the above objectives up to 2030.

PROPOSED EXECUTING/IMPLEMENTING AGENCY

A special regional unit to be created with MRC support and with the support of the Ministry of Transport and its departments responsible for inland waterway transport as well as the Marine Department and Port Authority. This unit will be responsible for training and involvedin the detailed planning, rehabilitation and innovation of cargo ports in the South of Viet Nam (11 main ports and 45 other ports).

TIME AND WORK SCHEDULE

Year 2016 to year 2020.

SOCIAL ISSUES

The rehabilitation of ports may provide economic and employment opportunities for rural communities. The port authority would need to consider that rehabilitating the cargo ports could increase the boat traffic in local areas impacting local waterway users.

ENVIRONMENTAL ISSUES

The rehabilitation of the existing cargo ports is not expected to have any significant impacts to the environment. The scope of rehabilitation works would need to consider the Environmental Protection Law 2014 in Viet Nam to determine whether an EIA, EPC and/or EMP and monitoring are required. The project would be expected to have positive environmental impacts by improving environmental protection and waste management at cargo ports in Viet Nam.

ECONOMIC ASSESSMENT

These actions are intended to improve the safety and efficiency of transfer, handling and storage operations at cargo ports in Viet Nam, and thereby to enhance the competitiveness of IWT against road transport for cargo haulage. The economic benefits of these actions will comprise the reduction in unit operating costs as compared with road transport and the greater volume of IWT cargo induced by efficiency improvements.

PRIORITY OF ACTION (H/M/L)

First update and revise the detailed plan for rehabilitation and innovation of 11 main cargo ports and, afterwards, 45 cargo ports.

FINANCING PLAN (PUBLIC/PRIVATE)

Government subsidies, Marine Department, Port Authorities and private port contributions as well as international donors through the MRC.

PRIOR ACTIONS REQUIRED

Listing of the concerned ports and/or landing sites. Prioritizing according to the*Master Plan for Viet Nam Inland Waterway Sector to 2020 and Orientation to 2030*.

FOLLOW-UP ACTIONS REQUIRED

Continuously update Master Plan and revise detailed design corresponding with economic development up to 2030.

6.10 SHORT TERM PORT DEVELOPMENT ACTION 10 (SPD10)

TITLE

Update and amend the "Master Plan for Viet Nam Inland Waterway Sector to 2020 and Orientation to 2030"

BACKGROUND AND RATIONALE

Viet Nam has requested the assistance from MRC to update the "Master Plan for Viet Nam Inland Waterway Aector to 2020 and Orientation to 2030" for the ports that are under the agreement between Cambodia and Viet Nam (currently 40 Vietnamese ports are part of the agreement).

Reference:*"Master Plan for Viet Nam Inland Waterway Sector to 2020 and Orientation to 2030", "Master Plan for Viet Nam sea port system development till 2020 and Orientation to 2030"*

and "Decision No. 1071/QD-BGTVT dated 24/4/2013 of Ministry of Transport approved the amendment Inland Waterway Development Master Plan to 2020 and Vision to 2030".

No	Name of the ports/terminals	Ownership	Rivers	Type of cargo	River classific.	Specifications		
						L (m)	W (m)	D (m)
1	Thu Duc power plant port	Thu Duc power plant	Kenh Xang	Fuel	Class 3	120	15	3.0
2	Mien Nam logistics port	Mien Nam Logistics Company	Kenh Xang	Container, General Cargo	Class 3	120	15	3.0
3	Mien Nam steel plant port	Mien Nam steel company	Kenh Xang	Iron ore	Class 3	45	15	3.0
4	Tay Nam port	Tay Nam Trade company	Sai Gon river	Container, General Cargo	Class 2	130	25	4.5
5	Truong Tho port	Mechanical company	Sai Gon river	Container, General Cargo	Class 3	460	30	4.5
6	Trancimex port	Foreign trade company	Sai Gon river	Container, General Cargo	Class 3	100	30	4.5
7	Phuc Long port	Phuc Long Join stock company	Sai Gon river	Container, General Cargo	Class 3	80	30	4.5
8	Hoang Long port	Hoang Long Ltd. Company	Dong Nai river	General cargo	Class 4	50	15	3.0
9	Hoang Tuan port	Hoang Tuan Ltd. Company	Vam Co Dong Riv	General cargo	Class 3	50	15	3.0
10	Ton That Thuyet port	Southern Waterw. Transp. Corp.	Kenh Te	General cargo	Class 3	220	15	3.0
11	Tay Ninh port	Tay Ninh oil and gas company	Vam Co Dong Riv	Fuel and gas	Class 4	60	30	3.0
12	Sai Gon cement plant	Sai Gon cement plant	Dong Nai	Cement, Clinke	Class 3	80	30	3.0
13	Long Binh Tan Fuel port	Dong Nai fuel company	Dong Nai river	Fuel	Class 4	120	30	3.0
14	Tin Nghia port	Tin Nghia Ltd. Company	Dong Nai river	General Cargo	Class 3	124	30	4.0
15	Thanh Tai port	Thanh Tai Trade company	Vam Co Dong Riv	General cargo, fuel	Class 3	300	20	4.5
16	Buocbong port	Ben Luc Buocbong Ltd. Company	Vam Co Dong Riv	Gas	Class 3	200	20	4.5
17	MT gas port	MT Gas Ltd. Company	Vam Co Dong Riv	General Cargo, Gas	Class 3	140	16	4.5
18	Long Binh port	Southern Waterw. Transp. Corp.	Dong Nai river	General cargo	Class 2	560	30	4.5
19	Cement Ha Tien II plant	Ha Tien – Can Tho cement company	Bassac river	General cargo	Class 3	50	15	4.0

No	Name of the ports/terminals	Ownership	Rivers	Type of cargo	River classific.	Specifications		
						L (m)	W (m)	D (m)
20	Huynh Lam port	Huynh Lam enterprise	Bassac river	General cargo	Class 4	50	15	4.0
21	An Giang equipment port	An Giang equipm. Company	Rach Can Tho	General cargo	Class 4	-	-	2.6
22	Cai Rang fuel port	Nam Bo fuel company	Rach Can Tho	General cargo	Class 4	-	-	2.8
23	Duc Long port	Duc Long infrastructure	Co Chiem	General cargo	Class 3	-	-	2.5
24	Ha Tien – Kien Giang cement plant	Ha Tien cement company II	Kenh Ba Hon	General cargo	Class 3	-	-	2.4
25	Long Binh port	My Thoi – An Giang port group	Bassac river	General cargo	Class 3	-	-	2.5
26	Bao Mai port	Bao Mai enterprise	Bassac river	General cargo	Class 4	-	-	2.5
27	Chau Doc passenger port	An Giang Tourist management unit	Bassac river	Passenger port	Class 2	-	-	2.0
28	Viet Dan port	Dong Thap fish imp.-exp. Cie.	Co Chiem river	General cargo	Class 4	-	-	2.5
29	Sai Gon sea port group		Sai Gon river		Maritime channel			
30	Nha Be sea port group		Nha Be river		Maritime channel			
31	Cai Lat sea port group		Dong Nai river		Maritime channel			
32	Hiep Phuoc sea port group		Soai Rap river		Maritime channel			
33	Transship area		Thieng Lieng		Maritime channel			
34	Dong Nai industrial zone		Dong Nai river		Maritime channel			
35	Go Dau, Phuoc An, Phu My, Cai Mep port area		Thi Vai river		Maritime channel			
36	Vung Tau sea port group		Dinh river		Maritime channel			
37	Can Tho sea port group		Bassac river		Maritime channel			
38	Dong Thap sea port group		Mekong		Maritime channel			
39	My Tho sea port group		Mekong		Maritime channel			
40	Hon Chuong, Rach Gia port areas				Maritime channel			

LOCATION

These ports in the following rivers: Kenh Xang, Sai gon, Kenh Te, Dong Nai, Vam Co, Bassac, Co Chiem, Nha Be, Thi Vai, Soai Rap, Thieng Lieng and Mekong.

Relating to other provinces and cities that belong to border region near to Campuchia.

OBJECTIVES

Objectives up to year 2020.

Step by step modernization of port system, increasing ability and service quality in order to meet the requirements of connecting river transportation with other transportations such as road and sea transportation and the demand of logistic services.

Objectives up to 2030.

To continue rehabilitation and renovation of port system in these areas. To improve management and operation of loading and unloading cargo, to increase the quality of logistic services, to havehigh quality, quick, safe, convenient and efficient port operations.

OUTPUTS AND DELIVERABLES

The updated and revised Master Plan as well as a detailed plan for rehabilitation and innovation of 40 ports in the above list.

ACTIVITIES

To make an updated detailed plan for all the river and sea ports, to meet the demand of current loading and unloading cargoes, transportation of cargo from South of Viet Nam to Cambodia and make a plan for connecting inland water transportation with other types of transportation.

Make an updated detailed plan for all the ports in the above list.

BUDGET

Funding should be sought from national budgets, the private sector and international donors. If the action can be concentrated in one port that will serve as a pilot case there could be a lot of cost savings. Nevertheless, estimates will be in the region of **2,500,000 to 3,000,000 US$** for all ports.

There may be some expenses for follow up actions later. This sum consists of salaries for international consultants (part time) and national experts during 5 years.

3 international consultants, 24 months at 12,000 US$ / month	864,000 US$
10 national experts 5 years at 1,200 US$ / month	720,000 US$
Rehabilitation costs depending on the study results	1,000,000 US$
Total:	**2,584,000 US$**

HUMAN RESOURCES

Three international consultants (part time) and ten national experts are required. The main activities of these experts are revising and updating detailed design of theMaster Plan and consulting on the rehabilitation and innovation of the ports pointed in the above objectives up to 2030.

PROPOSED EXECUTING/IMPLEMENTING AGENCY

A special regional unit to be created with MRC support and with the support of the Ministry of Transport and their departments responsible for inland waterway transport as well as the Marine Department and Port Authority. This unit will responsible for training and involved in updating and revising the detailed plan for rehabilitation and innovation of all ports in the above list.

TIME AND WORK SCHEDULE

Year 2016 to year 2020.

SOCIAL ISSUES

Increasing importance of the agricultural, aquaculture, food technology and garment industry integrated into transport sector planning. IWT can provide economic and employment opportunities for rural communities and shifting cargo from road to IWT can improve traffic safety and congestion in urban areas.

ENVIRONMENTAL ISSUES

Environmental protection in the waterway sector should be strengthened to ensure coordination between the Ministry of Transport (MOT) and the Ministry of Natural Resources and Environment (MONRE).

ECONOMIC ASSESSMENT

As this is essentially an administrative action, an economic assessment is not relevant.

PRIORITY OF ACTION (H/M/L)

First update and revise detailed plan for rehabilitation and innovation of five main ports and, afterwards, 35 ports in the above list.

FINANCING PLAN (PUBLIC/PRIVATE)

Government subsidies, Marine Department, Port Authorities and private port contributions as well as international donors through the MRC.

PRIOR ACTIONS REQUIRED

Listing of the concerned ports and/or landing sites. Prioritizing according to *Master Plan for Viet Nam Inland Waterway Sector to 2020 and Orientation to 2030*.

FOLLOW-UP ACTIONS REQUIRED

Continuously update master plan and revise detailed design corresponding with economic development up to 2040.

6.11 LONG TERM PORT DEVELOPMENT ACTION 1 (LPD1)

TITLE

Develop a port strategy and policy and look where there would be an opportunity to create a Port Authority

BACKGROUND AND RATIONALE

The countries within the Greater Mekong Sub region, referred to in this Master Plan, not only have different political systems but, more important in as far as this plan is concerned, have distinctive institutional set ups with regard to the organization and management of the maritime sector and its assets within their ministriesresponsible for transport. Viet Nam, Cambodia, Myanmar and Thailand will soon be member states within the ASEAN Economic Union. With transport, by nature a transborder issue, in particular sea transport, the most important component is a need for extending the cross-border networks and integrate the specific transport systems more effectively within ASEAN.

Ports are of significant commercial importance to the national economy of these countries, which will constitute ASEAN. Substantial investments will be needed in transport operations and infrastructure both prior to and following integration.

Seaports and river ports are vital to the countries in the GMS, both in terms of trade and transport. Lao PDR, a landlocked country, is a prime example. Competitiveness in the global economy depends on an efficient and cost effective transport and port system. Ports are also important centers of regional, economic and social development and act as an essential interface between water borne and land-based modes of transport. Ports are the vital segment in the multi-modal transport chain. Government policies should help to increase port efficiency by improving port and maritime infrastructure and integrating this policy into the multimodal transborder network.

The ownership, organization and administration of ports vary among the GMS countries, thus leading to great diversity in the port sector. While accepting that it should be left to each country to decide upon the ownership and organization, a key issue from a competition point of view is the financial links between the public authorities, the port authorities, port operators and the users of the port facilities and services. Port services are to be seen as an integrated part of the maritime transport system as they are indispensable for the proper functioning of this mode of transport. Current practices, as described in this report, have given rise to complaints by users and potential suppliers.

There is a need to develop a more balanced transport policy by promoting more environmentally friendly transport solutions such as inter-modality. Expectations for waterway transport as a desired alternative to a consistently increasing road transport sector have not been fulfilled. Inter-modality is an essential component of today's transport chain. Its objective is to develop a framework for an optimal integration of the different modes and utilization of their capacities, so as to enable the most efficient use of the transport system through seamless, customer-oriented services. Ports are crucial connecting points in intermodal transport, transferring goods and passengers between maritime and land-based modes. Higher port efficiency thus contributes to the integration of modes in a single system, allowing better use of rail and inland waterways modes.

We are witnessing a vast movement toward the privatization or private management of public services throughout the world, in industrialized as well as in developing countries. This trend is especially marked in the port sector. Port reform requires public authorities to take on a new role, that of a regulatory authority. These changes permit the public authority to concentrate on its essential economic and infrastructural role of the various port and shipping entities.

With limited government money available for transportation infrastructure development, Public-Private Partnerships (PPPs) are increasingly being implemented to facilitate critical projects throughout the world. While the structure of such partnerships varies, PPPs typically are able to bring projects to completion faster, with more focus on utility, effectiveness and, last but not least,

more transparency. Privatization improves the efficiency of the port administration specifically its operations through the introduction of a business-like model.

To ease the transition to full privatisation, the corporatisation model is often considered. This means that the port authority's operational part, such as a container or general cargo terminals, is converted into a legally and financially independent entity with its own board of directors. The government or public port authority retains ownership in all shares of the venture. A corporatized port authority's operations may accommodate national and international interests. Corporatisation is usually the first step onto the road to privatisation.

In order to come to some uniform structure in the ports sector among the countries referred to in the Master Plan, it was necessary to sketch the present situation and its crucial role within the transport world in general and more so within the region. The issues raised bring us to a proposal of a common ground solution that, in view of past experience within the sector, has proven to be the most efficient and acceptable result for the management of ports.

UNCTAD defines a Port Authority as a "State, Municipal, public or private body, which is largely responsible for the tasks of construction, administration and sometimes the operation of port facilities and security."

Its statutory powers cover among others: investment, financial policy, tariff policy, labor policy and legal aspects. A Port Authority should have as a principal objective the full recovery of all port-related costs including capital costs plus an adequate return on capital, and it should attract outside investment and stimulate innovation.

The Ministrydevelops transport and port policies related to planning and development of the maritime infrastructure and of ports (location, function, type of management) but also the planning and development of the port's hinterland connections (roads, railways, waterways, pipelines).

The key role for a Port Authority is that of a landlord with the responsibility to manage the real estate within the port area. This management includes the economic exploitation, the long-term development of the land and the upkeep of basic port infrastructure such as fairways, berths and access roads. A Port Authority is the regulatorrelating to both shipping and port operations. It is responsible for applying conventions, laws, rules and regulations. It is responsible for observance of laws regarding public safety and security, environment, navigation and health care. Port Authorities issue port by-laws, comprising a multitude of rules and regulations with respect to the behavior of vessels in port, use of port areas, etc. Often, extensive police powers are also part of Port Authorities' powers.While the central government should establish a national port policythat supports national economic objectives, development of plans for specific port projects should remain in the hands of port operators. Oversight of nautical operations should be within a Port Authority's mandate and is often referred to as the Harbormaster's function.

LOCATION

Ministry of Public Works and Transport in the capitals of each of the countries concerned.

OBJECTIVES

LAO PDR

Set up a Port Authority within the Ministry of Public Works and Transport with broader responsibilities than the present Waterway Department. This Port Authority's mission is to implement the government's policy on transport development with the aim to link the water transport and commercial navigation system with other modes of transport for carrying both passengers and freight. The department attaches weight to the development and promotion of piers, ports, ship yards, as well as other related services with a view to offering fast, safe, convenient and extensive services to the public and strengthening Lao PDR's export sector by enhancing its potential and competitiveness in the global market.

This Port Authority shall be responsible for investment in and maintenance of separate landing sites for passengers, different from cargo facilities. The Ministry of Culture and Tourism needs to be involved in policy and practical matters with regards to the development and maintenance systems for passenger landing sites.

While the port itself, its infrastructure, administration, its bylaws and rules and regulations will be centrally initiated and controlled, the operational side is better served by private interests. In recent years the setup of public and private partnerships has resulted in a diminishing role for governments in the port industry but at the same time has attracted businesses that before could not absorb the investment in the infrastructure that a port or even a landing site requires. This report favors a Public/Private Partnership (PPP) in further out-building the multimodal transport sector. As a matter of fact,international donors, certainly financial institutions such as ADB, IMFand World Bank demand Public Private Partnerships for operations before sanctioning funds for infrastructural works in port projects.

CAMBODIA

In Cambodia, the mushrooming of ports, both seaports and river landing sites, has led to an uncontrollable situation, not only with regards to tariffs but also with regards to safety and security of the ports and the products that are being handled.

The principles explained in the above paragraphs need to be well considered. The developments presently going on in the maritime world in Cambodia, both with regards to river and sea transport, need to be centrally handled within the Ministry for which a new authority has to be created. While the Ministry's responsibility for transport policy is by no means being argued, there is a demand to create an Authority that will function as a regulatory body and for which various tasks have already been listed in the above paragraphs.

As a logical follow up of to these proposals, the private sector should be involved in the operational side of what is now still a governmental operation. It has been explained already that the Government may no longer want to immobilize funds to invest in pure operational matters that anywhere else in the world are being taken care of by private enterprises.

The funds that will be needed for the further expansion of both main ports (Phnom Penh and Sihanoukville) should be sought in the private sector, preferably strategic partners, thus avoiding a further debt burden with international donors in foreign denomination.

VIETNAM

The situation in Viet Nam is totally different from Lao and Cambodia. Most terminals in Viet Nam are operated by private companies. The management of the ports may differ according to the region. However, there is no central authority that manages all ports in Viet Nam. Most of the ports in Northern Europe are managed by the city (ex.: Rotterdam – Antwerp) but there is a consulting organization that will discuss issues like ratification and labor laws while ports have to follow the EC regulations on ports.

THAILAND

A Port Authority exists in Thailand. However, apart from Laem Chabang where private companies have invested in equipment and partly in infrastructure, all other ports including Bangkok and the river ports along the Mekong, are managed and have their operations handled by the Port Authority.

Privatizations efforts started at one time but were abandoned because of social issues.

OUTPUTS AND DELIVERABLES

1) Draft and approval of a "Port Act" in the Lao PDR and in Cambodia.

2) The creation of a Port Authority that, under the Ministry's policy, will be the regulator for all matters related to ports and shipping.

3) The drafting and approval of a long term port strategy and policy by this central authority.

ACTIVITIES

1) Explain to every Ministry concerned the benefits of a re-organization of the transport sector as explained in the paragraphs above.

2) In the Lao PDR form a working group to draft a "Port Act" and in the Lao PDR and Cambodia, explain to every Ministry the importance of the approval of such act.

3) Create a central port authority under the Ministry of (Public Works and) Transport as a regulator relating to both shipping and port operations, responsible for applying conventions, laws, rules and regulations regarding public safety and security, environment, navigation and health care.

4) Establish a working group to draft a long term port strategy and policy* concerning the application of the "landlord port" principle, the use of PPPs, BOTs, etc., in the port sector, the outsourcing of port operations to the private sector, the rights and duties of private ports, port labor, safety and security, among others.

* During the final workshop, it was mentioned that Cambodia already has a "port policy document", but this was never seen by the Master Plan team.

BUDGET

A symbolic budget for the start-up period but that can be reduced later on if income for its activities could be invoiced to the interests that would gain from those activities.

If an external international consulting company specialized in the re-engineering of public enterprises and the drafting of long term strategies and policies needs to be hired to assist in the re-organization and the drafting of long term strategies and policies, a budget of some 500,000 to 600,000 US$ needs to be considered in each country.

Total: 2 x 600,000 US$ (Lao PDR and Cambodia) + 2 x 500,000 US$ (Thailand and Viet Nam) = 2,200,000 US$

HUMAN RESOURCES

A department of some 20 people that would include specialists and administrative staff including a civil engineer, a marine (river) specialist, a port and/or cargo handling specialist, a transport economist, an accountant and a lawyer each with 2 or 3 assistants plus some IT knowledgeable agents and administrative staff (see short term port development action 1).

A working group with external international consultants and national experts to draft a long term port strategy and policy.

PROPOSED EXECUTING/IMPLEMENTING AGENCY

Ministry of (Public Works and) Transport in the four MRC member countries.

TIME AND WORK SCHEDULE

There is no reason to consider this as a long-term development. Benefits are obvious considering the present deplorable situation with regard to ports and landing sites. The future of the tourism industry, an important foreign exchange earner, is at stake. (2021-2024)

SOCIAL ISSUES

This action will not have any significant social impacts. The port strategy and policy should include poverty alleviation for rural communities and the employment and diversification of skills in the IWT sector.

ENVIRONMENTAL ISSUES

This action will not have any significant environmental impacts. The port strategy and policy should include environmental protection and commitment to reduce carbon and greenhouse gas (GHG) emissions.

ECONOMIC ASSESSMENT

Not relevant.

PRIORITY OF ACTION (H/M/L)

Very High.

FINANCING PLAN (PUBLIC/PRIVATE)

Assistance in the creation of the new organization and set-up of the organization: national budgets. Development of legislation, strategies and policies: regional grant.

PRIOR ACTIONS REQUIRED

Promote the principle of a centrally organized authority overseeing all activities related to the management of river transport, both for tourism and commerce.

FOLLOW-UP ACTIONS REQUIRED

Follow up actions for the implementation of the plan would involve presentations of the strategies and policies to all stakeholders.

6.12 LONG TERM PORT DEVELOPMENT ACTION 2 (LPD2)

TITLE

Construct new passenger ports and landing facilities in Pak Lay, Vientiane Capital City (Laksi Port), Nakhon Phanom, Savannakhet and Pakxe suitable to handle the forecasted passenger volumes. These ports should be constructed for efficient and safe processing of passengers

BACKGROUND AND RATIONALE

PAK LAY

Known for its caves and sacred Wat Sisavangvong temple, and steeped in history, culture and nature, Pak Lay acts as a gateway to the province's south and Sayabouly District. Several caves hide in Pak Lay's more remote areas, though three of the caverns and hot springs are huddled in a 3kilometers radius some 50 kilometers north of the district center.

Pak Lay can be reached by land from Vientiane by public buses. They take 5 hours for a 300 kilometers rough ride to Pak Lay. Not many tourists know of Pak Lay. Today backpackers are the main tourists. There are no hotels yet, but there is a choice of guest houses.

There is a ferry service for local cross border traffic. With help from the Australian government, the natural bank slope was improved making it easier for passengers to embark and disembark. Cargo boats of various sizes are loaded and discharged at the same pier.

With the bridge it will not take long before also the ferry service will stop.

Pak Lay is in the vicinity of the Xayaburi Dam, it would be wise to wait with plans for rehabilitation of the landing site until the impacts of the dam are known.

LAKSI PORT (Vientiane)

The Lao News Agency reported on August 24, 2015, that a modern pier for recreation purposes for both local and foreign visitors would be built in an area along the Mekong riverbank.

The port will be located in front of the Mekong Riverside Hotel in Sisattanak district of Vientiane. The developer is expected to sign a Memorandum of Understanding with relevant authorities to conduct a feasibility study into the cruising pier project. The port is to be equipped for cruising boats with seating for up to 300 passengers to provide recreation experiences for visitors who want to enjoy the natural views of the Mekong. The port will also provide immigration facilities.

The ports of Laksi and Thanaleng in Vientiane serve the major river cargo traffic. Laksi (4 km from Vientiane) currently serves domestic river traffic while Thanaleng serves cross-river traffic from Nong Kai in Thailand. Laksi has a single concrete-paved ramp to accommodate river fluctuations together with a mobile crane for cargo handling. Thanaleng has a concrete-paved ramp. Two ferries are shuttling mostly trucks and some passengers between the Lao and Thai sides of the Mekong River.

With a modern cruise terminal being built in Vientiane, there is no reason to further develop passenger facilities at Laksi.

NAKHON PHANOM

Nakhon Phanom is a city in central Thailand and capital of the Nakhon Pathom Province. Nakhon Pathom is where Buddhism first came to Thailand. At the center of the city is the Phra Pathom Chedi, the largest pagoda in Thailand and possibly in the world. It has been an important Buddhist center since the 6th century.

Nakhon Phanom has two daily cruise services, one run by the municipality and the other, which uses a much larger boat, by a private company named Mekong Paradise Cruise. The two vessels can be seen on the photos. There is a concrete ramp way that leads to the ferry that is mainly used by trucks. Cargo movements as such have mostly disappeared.

The newer type of tourist boats seem to cope well with the arrangements that are there now. Modest improvements by the Tourist Department would suffice to make disembarking more comfortable. Expenses could be shared with the tourist boat operators who would be the ones to gain most from such improvements. These are not to be considered as new passenger ports but simply as improvements on the natural river embankments.

SAVANNAKHET

There are luxury cruises to and from Savannakhet to Vientiane. There are no fixed schedules and the boats leave according to international tourist bookings. Most backpackers complain that there are no small boat operators anymore.

Touristboats seem to cope well with the present situation. Small improvementsfor disembarking funded by the Tourist Department would make it all more comfortable. Expenses could be shared with the boat operators.

PAKSE

With 88,000 inhabitants, Pakxe, the capital of Champassak, is the third largest city in Lao PDR.

Since 1975, Pakxe has gradually gained economic influence and is of some regional importance. The construction of a bridge over the Mekong, built with Japanese aid, allowing road traffic with Ubon Ratchathan in Thailand, has further integrated the city with neighboring countries. However, the river has been reduced to tourism and most of the cargo movements are now by road. There are no modern berthing facilities for tourist boats.Most of the tourist boats are very luxurious and take care of their passengers in embarking/disembarking at a site they feel is safe.

Boats take tourists down the river to Wat Phou, 4000 Islands and Khone Falls. Prices range from 80 to 250 US$ per person per night. Again these are luxury boats and not affordable for many tourists who complain that there are hardly any choices.

Tourist boats seem to cope with the present situation. If improvements were to be made to make disembarking more comfortable, funds could come out of the Provincial Tourist Department, further supported by the cruise boat companies.

LOCATION

Pak Lay, Vientiane, Nakhon Phanom, Savannakhet, and Pakxe.

OBJECTIVES

First of all,there is no rush to absolutely want to modernize these landings. They are part of the charm of this region. The luxury boats arrange for their own safe boarding and the few local passengers have no problem in taking the smaller fast boats to cross the river or be dropped at a site nearer to their destination.

OUTPUTS AND DELIVERABLES

A ‘wait and see’ attitude is most recommendable with regards to passenger traffic in the Southern part of the Mekong.

ACTIVITIES

- For the port of Pak Lay, hold rehabilitation plans of the landing site until the impacts of the Xayaburi dam are known.
- For the port of Vientiane, a MOU with a developer and a feasibility study are expected shortly.
- For the ports of Nakhon Phanom, Savannakhet and Pakxe, only some minor refurbishments are proposed.

BUDGET

The JCCCN report foresees 3.8 million US$ for restructuring a passenger port offering acceptable conditions for tourists to embark and disembark. Taking into account that such investment for

Vientiane should be done (partly?) by the private sector, for the four other ports only some refurbishing costs should be taken into account for an estimated amount of 700,000 US$ per port.

Total: 3.4 million + 4 x 0.7 million = **6.2 million US$.**

HUMAN RESOURCES

Not applicable.

PROPOSED EXECUTING/IMPLEMENTING AGENCY

Ministry of Public Works and Transport, Department of Waterways or any future department within the Ministry that will beresponsible for the development of landing sites in this region.

SCHEDULE

2025-2028.

SOCIAL ISSUES

The project is not expected to have any adverse social impacts. The passenger ports should consider customs and immigration procedures, migration and the safety and security of passengers. The Increasing use of IWT passenger transport will create employment opportunities for rural people, ecotourism and improve waterway safety.

ENVIRONMENTAL ISSUES

This project is not expected to have any adverse environmental impacts. The environmental impacts of constructing landing facilities and increased waterway use in Lao PDR would need to consider whether an Initial Environmental Examination (IEE), EIA or EPC is required under the Environmental Protection Law 2013. Waste management facilities would need to be developed to deal with increased passengers.

ECONOMIC ASSESSMENT

None of these ports were forecasted to generate significant volumes of regional passenger traffic within the Master Plan timeline. Given the likelihood that they would have only potential for the generation of limited local traffic, it would be difficult to justify (in economic terms) an investment in their improvement, amounting to more than US$ 6 million.

PRIORITY OF ACTION (H/M/L)

Low.

FINANCING PLAN (PUBLIC/PRIVATE)

Construction of a new passenger port in Vientiane and any rehabilitation of the other ports should be done under a Public Private Partnership system. Fund from the public sector should come from an international loan.

PRIOR ACTIONS REQUIRED

None.

FOLLOW-UP ACTIONS REQUIRED

None.

6.13 LONG TERM PORT DEVELOPMENT ACTION 3 (LPD3)

TITLE

Construct new port infrastructure for cargo ports with proper berthing and cargo handling facilities in Xiengkok, Muong Mom (Ban Mom), Ton Pheung, Haciang Commercial Port (private port), Huay Xay, Pak Beng, Luang Prabang, Pak Lay, Vientiane, Nakhom Phanom, Savannakhet, Pakxe* and Stung Treng*. The new cargo ports should be located in order to assure good hinterland connection (road and rail) - Two fully equipped vertical 500 DWT berths and one sloping ramp berth. (* scenario 2)

BACKGROUND AND RATIONALE

The Mekong River will not be the same after the completion of all the projected dams. If all goes to plan, larger barges than those that are being used now, with capacities varying from 150 to 500 tons will, in well-defined sections, change the method of commercial transport on the Mekong. Smaller, privately ownedboats, will gradually disappear, as they will not be able to compete.

If this is the case, the ports/landing sites will have to be improved in order to handle those barges in the safest and most efficient way.

These new landing sites and improvements will have to take in to account the steady increase in tonnage plying the river, the new dams' impacts on the river and possible other improvements on the river flow, better mooring facilities under the new situation when dams need to purge water or locks take water in or let water out for sluicing the barges and the building of concrete ramps that will allow the use of lifting equipment (in some case for containers).

This particular action will examine the situation for each port/landing site mentioned in the heading and, based on the limited data, propose the minimum investments required.

One background observation that could be made is: for Lao PDR one needs to assess the capacity of the smaller industries to amass a quantity of up to 500 tons from their rather less developed production lines on a weekly or bi-weekly basis.

LOCATION

XIENGKOK

These are pictures at Xiengkok. From left to right: the bend in the river where rocks have been blasted, the building of the bridge and the port with its natural slightly improved slope as access for trucks.

The port is located at the river crossing of the Mekong with the R3A road, halfway to Chiang Saen. The boat service between Guanlei and Chiang Saen does not stop at Xiengkok. Some boats come to Xiengkok to pick up cattle coming from the mountains as well as timber destined for PR China.

The port is an open port and still in its natural condition without any concrete berth. There is a joint inspection organization that inspects people, vessels and cargo passing the port from four countries (China, Myanmar, Lao PDR and Thailand). The port has a sloped berth but no cargo handling facilities.

Cross border ferries and river traffic may very well come to a halt once the bridge will be finished.

In view of its cross border role, the port needs to be constructed to meet the growing trade activities and passenger traffic, and should

be equipped with necessary handling equipment, immigration and customs offices, and warehouses.

Separating passengers from cargo will require one separate berth.

MUONG MOM (BAN MOM)

Ban Mom is a small village in Ton Pheuang District, Bokeo Province, located on the Mekong River. The port is 327 km away from Jinghong Port and 18 km from Chiang Saen Port (Thailand).

At the port there is almost no cargo handled, the port serves as a checkpoint. All vessels passing this port need to stop in order to sign the necessary documents. Ban Mom has a suitable place in which to build a river port. Under the Quadrilateral Agreement on the Commercial Navigation on Upper Mekong– Lancang River (PRChina–Lao PDR–Myanmar–Thailand), it is agreed that Ban Mom port will be a checkpoint

for upstream river traffic from Chiang Saen port in Thailand to the PRChina. This port needs to be constructed to meet the growing trade activities and passenger traffic, and should be equipped with necessary handling equipment, immigration and customs offices, and warehouses.

Separating passengers from cargo will require one separate berth.

A separate berth for two barges for cargo, plus a parking area for trucks and a covered space for cargo, as well as some basic equipment consisting of one mobile crane and one forklift, will be required.

TON PHEUNG

Ton Pheung has been reduced to a casino town, run by a reputed Chinese business boss who also happens to be president of the local Lao Chamber of Commerce.

A Special Economic Zone has been created in this border town. Whether it will revive the town's port activities is to be seen. Today it is mainly being used to bring tourists to the casino. Unless there is a clearer view of the real activities that this town is able to display, there is no need to play the hand of the casino boss in building out the present arrangements.

HACIANG

Since the port is a private undertaking there is hardly any need under this project to add further investments.

HUAY XAY

Huay Xay is the capital of the province of Bokeo. The port is a national level checkpoint that is 402 km away from Jinghong Port (PRChina) and 57 km from Chiang Saen port (Thailand). The port started commercial operations in 1990 and is used both as a passenger and a cargo port. The port has a concrete ramp way which is used for cargo purposes.

The port has been operating for 25 years and it is showing signs of lack of maintenance. Equipment is in a broken down state. In the JCCCN report, Huay Xay is taken up in Phase II for development. Nevertheless, two things need to be done. First, the passengers need to be separated from the cargo operations. The site for cargo operations has to be rehabilitated and made in such a way that lifting equipment can operate to load and discharge units.

There is no parking space for trucks or other equipment. To free the slope from waiting trucks an elementary parking space for trucks, pick-ups and cars need to be foreseen so that workers and equipment have free movement during operations. There is no need for bitumen or concrete pavement of that parking area as long as the top finishing allows an all season use.

PAK BENG

Pak Beng port is located at km marker 172 inOudomxay province. It is about halfway between Huay Xay and Luang Prabang and an overnight site for tourists on slow boats on theirtrip to Luang Prabang. The unfortunate thing is that it is also a reasonable busy cargo port and that passengers are all handled at the same concrete slope. Pak Beng has been classified as a Phase I port in the JCCCN report with regards to redevelopment.

The port has a 5 ton lifting truck but most cargo operations are done using manual labor. The maximum permissible draft at the port is 2.5 meters during the wet season and 0.4 meters during the dry season. These depths may change once the dams are built.

The port is equipped with a computer, printer, camera and a fax-scanner.

There is a need to separate the passenger-landing site from cargo operations. Passenger needs seem to be a more pressing issue but cargo operations would also benefit from any improvements.

Pak Beng needs to be upgraded for both passengers and cargo handling. This will have to include equipment such as a mobile crane and a medium capacity forklift, say 5 ton. Then one may wonder whether these investments weigh up to the very small volume that is being handled in Pak Beng: 2,000 tons import/export in 2014 or 5 tons per day. With the necessary improvements for the passenger site, the cargo handling may alsobecome more efficient.

LUANG PRABANG

Luang Prabang port is located at km marker 007, near Chiang Keo Village in the Luang Prabang District in Luang Prabang province. The port is located 702 km away from Jinghong port (PRChina) and 357 km away from Chiang Sean Port (Thailand). Luang Prabang is classified as a UNESCO World Heritage Site and is located in northern Lao PDR, about 400 km from Vientiane. It is considered one of Lao PDR's main tourist attractions.

Luang Prabang has two ports, one used for cargo and one for passengers. The port used for cargo is Chiang Keo port. This port has been in operationssince1973 and has no infrastructure and no concrete berth (only compacted soil). The port has no maintenance system in place.In fact, not much maintenance has been done since construction of the port. The main cargoes that are handled are construction material, wood, logging and consumer goods. Cement represents 70% of the goods transported.

Apart from the proper development of the cargo port, suitable equipment such as a mobile crane and a forklift of 5 tons may also be needed.

PAK LAY

Pak Lay used to have a busy ferry service crossing the Mekong. With the opening of the 370 meter long bridge that connects Nasak village in Park Lai district, to Khok Khaodor village, Sanakham district, Vientiane province, the bridge will facilitate the land communication and transport between Sayaboury and Vientiane and other provinces andreplace water travel (ADB report Regional Investment Framework Pipeline of Potential Projects 2013–2022).

With this in mind, except for tourism, Pak Lay does not seem to have much of a future as a river port. Further investments in developing a cargo port at Pak Lay are therefore not to be considered.
The construction of a Thai financed road to the border where a new customs and immigration crossing at PHU DU has been given international status to ease the trade with Thailand's Uttaradit, is another blow for river transport.

VIENTIANE – LAKSI – THANALENG – KENG KABAO

The ports of Laksi and Thanaleng in Vientiane serve the major river cargo traffic. Laksi (4 km from Vientiane) currently serves domestic river traffic while Thanaleng serves cross-river traffic from Nong Kai in Thailand. Laksi has a single concrete-paved ramp to accommodate river fluctuations together with a mobile crane for cargo handling. It can handle about 50,000 tons of cargo/year. Thanaleng is also a concrete-paved ramp operation with two ferries shuttling mostly trucks and some passengers between the Lao and Thai sides of the Mekong River. Thanaleng has the most extensive equipment,

space, and warehouses of any port in the country, and it can handle about 100,000 tons of cargo/year.

Keng Kabao was a river barge port, intended to serve as a transit point for imports from and exports to the port of Danang in Viet Nam. Construction started in 1979 and was completed in late 1986. Unfortunately, the river channel shifted to the other side and Keng Kabao completely silted up and could not be reached by barges anymore. The cranes that were built have been dismantled and sold.

NAKHOM PHANOM

Since the opening in November 2011 of the 3rd Thai – Lao Friendship bridge between Nakhom Phanom and Thakhek, the river crossing by ferry and other cargo river traffic by smaller boats has diminished significantly.

On the other hand, the bridge crossing has increased trade to and from Nakhom Phanom in an important way. The bridge connects Thailand and Lao PDR to seaports in Central Viet Nam via the road Nr 12. This direct connection among three Mekong river countries has proven to be important for trade from the standpoint of both public and private interests.

Nakhom Phanom province produces sand, gravel and other minerals that are not always commercialized on a larger scale such as magnetite, manganese, chromite and fluorite.

Under the present transport arrangements, and the change from river transport to road, it is not worthwhile to further invest in cargo ports at this particular site.

SAVANNAKHET

Since National Road 13S was improved, river freight traffic between Vientiane and Savannakhet has decreased. There is also the 2nd Thai – Lao bridge that opened in December 2006 between Mukdahan and Savannakhet, meaning there is not much future for river transport. In the coming decade roads will be further improved. From Savannakhet to the Cambodian border river traffic stops for longer periods due to the dry season and the limited draft. This of course will be remedied when the planned dams and the river improvements will allow barges of 500 DWT to ply the river all seasons and even cross the Khone Falls when the bypass is built. The question remains whether there will be enough traffic to develop a port in Savannakhet. The answer is likely to be no as there is no sufficient economic support to substantiate such investments.

PAKSE

Considering that Viet Nam has the highest share in investment in Champasak Province, one can expect that exports are mainly to Viet Nam. That means that the preferred transport mode will be road, specificallyNational Road 16 that leads from Pakxe to Danang, seaport in Central Viet Nam.

According to ADB, 69% of all traffic toand fromPakxe is by road. Air transport and river transport make up the remaining 30%, so some cargo is still takenby river.

STUNG TRENG

Since the Kong Bridge connecting the province and the border of Lao PDR was constructed with Chinese government assistance, National Road No. 7, the main provincial road, was integrated into ASEAN Highway No. 11. The province is expected to be a gateway to ASEAN international markets. Stung Treng province does not have any large manufacturing companies. Its economy is largely based on the agriculture sector. Stung Treng produces some 50,000 tons of cassava currently in demand as additive in the production of gasohol. With previous exports of cassava to PR China from Kompong

Cham, eager planners may want to see that operation repeated in Stung Treng. This is possible, but the initiative should start on land. A depot should be built alongside the Mekong at a proper mooring site where provisions for mooring can be at a dolphin to be anchored in the river.

OBJECTIVES

Bring the ports in line with the new possibilities offered by the implementation of the dams and the improvement of the waterway from the Chinese border to sea. This means that ports and landing sites that now serve small vessels of 75 to 150 tons will have to be built and expanded and even relocated to accommodate vessels of 500 tons.

Create supporting logistic facilities foe the new situation, after completion of the projected dams and the upgrading of the river, when barges with loading capacities of 500 tons will transport goods on the various stretches of the Mekong River.

OUTPUTS AND DELIVERABLES

A realistic set of proposals for ports/landing sites on the Mekong, considering the new load capacities allowed for barges after the completion of the projected dams.

ACTIVITIES

Activities for the sites listed will have to consider that the project stretches from 2020 to 2040. The activities already listed in the short term planning should therefore be considered as completed.

BUDGET

Xieng Kok, Muong Mom (Ban Mom), Huay Xay, Pak Beng and Luang Prabang:

Cargo berth for two barges	3,400,000 US$
Parking area	75,000 US$
Covered shed	60,000 US$
Mobile crane 20 tonnes	40,000 US$
Forklift 5 tonnes	25,000 US$
Total per port	3,600,000 US$
General total (5 ports)	18,000,000 US$

Vientiane – Laksi, Savannakhet, Pakxe, Stung Treng:

Upgrading the existing ramp way	1,000,000 US$
Parking area extension	75,000 US$
Covered shed	60,000 US$
New mobile crane	40,000 US$
Forklift 5 tonnes	25,000 US$
Total per port	1,200,000 US$
General total (4 ports)	4,800,000 US$

**Total: 22,800,000 US$**(20,400,000 in scenario 1 and 2,400,000 US$ in scenario 2).

HUMAN RESOURCES

Ministry of Public Works and Transport – Waterway Department.

PROPOSED EXECUTING/IMPLEMENTING AGENCY

Ministry of Public Works and Transport – Waterway Department.

TIME AND WORK SCHEDULE

Once all dams are built 2029-2032.

SOCIAL ISSUES

Resettlements plans for local communities living in the vicinity of proposed cargo ports may need to be considered in some locations. The rehabilitation of ports may provide economic and employment opportunities for rural communities. The port authority would need to consider that rehabilitating the cargo ports could increase the boat traffic in local areas impacting on local waterway users.

ENVIRONMENTAL ISSUES

This project could have some impacts on the environment during construction, from the operation of new port infrastructure and from increased waterway use.The size, type and extent of the impacts would need to be considered in relation to environmental protection laws:

- Conduct an Initial Environmental Examination (IEE) under the Environmental Protection Law 2013 in Lao PDR to determine whether an EIA or EPC is required.
- The construction of ports in Cambodia would require compliance with the Cambodian Environment Protection Law 1996 and the Draft EIA Law 2015.

ECONOMIC ASSESSMENT

An economic assessment of Long Term Waterway Design Action No.1 has established that an economic case can be made for the operation of 500 DWT cargo vessels (to replace the existing 100 DWT vessels) from the Green Triangle to Luang Prabang. This stretch effectively provides IWT cargo transport services, which compete with road transport services to/from China along Routes 3A and 13. However these services are disadvantaged by comparison with cargo haulage by road as a result of poor barge operating efficiency and high unit costs. An increase in average vessel capacity to 500 DWT will, by reducing barge unit operating costs, lead to an increased IWT modal share with larger cargo volumes. *The economic impact of these changes will be reduced IWT operating costs and a reduction in greenhouse gas emissions, as compared with those of road transport.*

The introduction of 500 DWT barges will require that certain cargo ports in Lao PDR be upgraded to accommodate such vessels. Demand forecasts prepared for this Master Plan have identified the following ports within Lao PDR as having the greatest potential for generating regional (cross border) cargo and therefore being prime candidates for upgrading to 500 DWT standard: Xiengkok, Muang Mom, Huay Xay, Pak Beng and Luang Prabang. Upgrading of the infrastructure and handling equipment at these ports would result in reduced unit handling costs per ton of cargo, which would then be offset against the estimated investment cost of this project ($US 18.0 million), to derive its Economic Rate of Return (EIRR).

PRIORITY OF ACTION (H/M/L)

Medium (2029-2040).

FINANCING PLAN (PUBLIC/PRIVATE)

Government-to-government loans of 19,2 million US$ for the Lao PDR (of which 18.0 million US$ in the JCCCN plan) and 3.6 million US$ for Cambodia.

PRIOR ACTIONS REQUIRED

An in depth study on the projections of cargo for each port proposed for development.

FOLLOW-UP ACTIONS REQUIRED

Within the Ministry's Waterway Department.

6.14 LONG TERM PORT DEVELOPMENT ACTION 4 (LPD4)

TITLE

Analyze/study which ports are suitable to handle containers in the Green Triangle to Savannakhet stretch and determine which ports need extra infrastructure to handle containers

BACKGROUND AND RATIONALE

LAO PDR

Presently, the use of containers on the North-South Economic Corridor (NSEC) is very scarce.

The logistic chain consists of a number of elements that rule this industry. Skippers, consignees and service providers on the one hand, and institutional framework and infrastructure on the other hand, tend to influence the routing and the method of transport.

With regards to Lao PDR, there are very few large shippers and buyers. There are a lot of small and medium size companies with low trading volumes. Usually the buyers determine the supply chain. These buyers' orders are too small for full container loads. That is another reason why containers in Lao PDR are rather the exception and it will take some time before that situation will change.

Lift on/Lift off (LO/LO) operations are expensive due to market conditions, meaning that very little lifting equipment is available and, when needed, is charged at very high prices.

Of the Mekong River ports, only Huay Xay and Mohan can handle LO/LO operations. Due to their quasi monopoly, a LO/LO move would cost 270 US$. This means that exchange of containers between Thailand and China is rather rare.

What could be done to improve the situation? First, introduce more LO/LO options, which would increase competition among operators. Consider trailer swap agreements between haulers. Build warehouses and foresee cool capabilities including three phase reefer slots.

One should also consider that it is not Laem Chabang, even less Bangkok Port, that are the major suppliers of Yunnan province. The ports of Hong Kong and Shenzen are roughly the same distance from many centers of Yunnan province, without having to cross land borders. For transport on the North-South Economic Corridor, two land/river borders have to be crossed.

How important is the traffic likely to be containerized? Based on 2012 statistics, 750 container trucks made it from Yunnan province via roads R3A and 13N to Vientiane.About two a day. To make the investment in a heavy lift crane and a reach stacker worthwhile on a multi modal transport link, 100 to 150 container moves per day are needed. However, it does not stop with the equipment. Also a vertical quay wall, a concrete area for handling and storing containers and a minimum administration are needed which would need some 50,000 containers per year.

By the time such numbers will be reached on the North-South Economic River Corridor, the national roads in Lao PDR will have been improved linking all commercial centers; bridges will have been built giving road transport a wider array of destinations, border crossings will have been facilitated offering haulers a smooth and well-timed operation.

While the Mekong and its landing sites/ports will certainly have developed into a more efficient navigation both in safety and size, it will not be able to compete with the road for container transport.

Considering that a trip from a Yunnan Mekong-Lancang port to Vientiane will take 6 days while the same trip by road is 1 ½ days, river transport of containers does not stand a chance, particularly when most of the cargo is made up of fruit and vegetables that would perish during the river journey.

Considering building out river ports/landing sites for container transport in the Green /Golden Triangle to Savannakhet is therefore a futile exercise.

THAILAND

The new Chiang Saen port that PAT is operating seems to be a good site for handling containers, both in and out. It can serve as a transit point for containers to and from Yunnan province. It is close to the Chiang Rai/Chiang Mai road which will, in years to come, offer a transfer point to the fast railway connection to Thailand's Eastern Seaboard, mainly Laem Chabang.

The port already has a vertical berth of some 200 meters, which can accommodate three 50 meters long ships simultaneously. Back up infrastructure is there with two 30 x 30 m warehouses and a marshalling yard with 20 plugs for reefer containers. The available equipment will have to be supplemented by heavy lift machines. A 10 ton mobile crane is not good enough for handling containers, neither will the 10 ton forklift be sufficient for handling containers on the yard. Until now, the port has not received any reefer containers (or normal containers) in transit.

Inland cargo transport by road is possible through three highways:

- Highway No. 1290 (Mae Sai – Chiang Saen);
- Highway No. 1 (Phaholyothin Road) turns into Highway No. 1016 at Mae Chan District 30 km from the port;
- Highway No. 1129 from Chiang Khong District with Highway No. 1290 (Chiang Saen – Chiang Khong).

Internationally, the port connects with the East-West Economic Corridor and the North-South Economic Corridor. The two Corridors intersect in Phisanulok Province.

The low container throughput is probably due to restrictions in container cross border trade.

However, this will no doubt be solved in the next few years.

LOCATION

Ports of Chiang Saen (Golden triangle) and Huay Xay.

OBJECTIVES

It is very difficult to compete with road transport, and the small initial river stretch from Chiang Saen/Chiang Khong to PR China is about the only possible waterway route that can be used in the container trade between the two countries.

There is a possibility for Lao PDR to develop Huay Xay, 30 miles from Chiang Saen, into a container facility port but it will demand heavy investments, both infrastructural and equipment. Such investments require at least an annual volume of some 50,000 containers. Most of the traffic consists of consumer goods and cheap household goods. It takes a lot of households to fill that many containers. The numbers in Lao PDR as well as their level of spending is not enough to consider such investments. As a multimodal transfer port Vientiane is too far away in travelling time to be considered while additional costs of handling will only add up to the adverse conditions for river transport that already exist incomparison with road transport.

OUTPUTS AND DELIVERABLES

A study report on the feasibility of waterborne container transport between the Green Triangle and Savannakhet, including an analysis of suitable container ports and eventual investments.

ACTIVITIES

- Study on the economic feasibility of the transport of containers by waterway between the Green Triangle and Savannakhet;
- Depending on the results of this study, if necessary, analyze what ports are suitable to handle containers;

- If necessary, determine which ports need extra infrastructure to handle containers and calculate the costs and benefits.

BUDGET

For the study, a budget of 100,000 US$ is estimated.

If any port needs a new container port facility, the following investments would have to be considered:

- 11.0 million US$ for a single 100 meter berth with a vertical quay wall in the river;
- 2.0 million US$ for paved storage area;
- 0.8 million US$ for a transit shed.

The reach stacker on the picture is specially made for handling barges but could also be used for yard operations.

Price: 740,000 US$

Small forklifts for handling general cargo 10,000 US$.

The study costs can be estimated at some 100,000 US$ (one international consultant 3 months at 12,000 US$ / month = 36,000 US$ and six national experts during six months at 1,000 US$ / month = 36,000 US$ + office, reporting and transport costs 28,000 US$).

HUMAN RESOURCES

One international consultant and six national experts.

PROPOSED EXECUTING/IMPLEMENTING AGENCY

Port Authority Thailand.

Laos PDR: Ministry of Public Works and Transport.

TIME AND WORK SCHEDULE

2031.

SOCIAL ISSUES

This project is not expected to have any adverse social impacts.

ENVIRONMENTAL ISSUES

This project is not expected to have any adverse environmental impacts.

ECONOMIC ASSESSMENT

It is presumed that the one of the objectives of the proposed study will be to establish whether the adaptation of certain ports in the Green Triangle to Savannakhet stretch to handle containers is *economically justified*. While it would be undesirable to pre-judge the result of such a study, it has to be acknowledged that only the stretch between Chiang Saen and the Green Triangle has the potential to generatesufficient volume and diversity of cargo traffic to justify an investment in container handling facilities. Other stretches are vulnerable to competition from high quality land transport links to Thailand – for example, both Vientiane and Savannakhet have high quality road connections to Thailand and, in addition, Vientiane has a recently built railway connection which is already linked to an Inland Container Depot at Tarnaleng.

PRIORITY OF ACTION (H/M/L)

Low.

FINANCING PLAN (PUBLIC/PRIVATE)

The study should be financed by the private sector. In a later stage, eventual infrastructure, equipment and operations would need a PPP approach.

PRIOR ACTIONS REQUIRED

Close follow up on evolution of container trade among the Mekong countries.

FOLLOW-UP ACTIONS REQUIRED

None.

6.15 LONG TERM PORT DEVELOPMENT ACTION 5 (LPD5)

TITLE

Expand the existing container yard at the New Container Terminal – NCT LM 17 in order to accommodate forecasted container traffic.

BACKGROUND AND RATIONALE

The Phnom Penh container terminal is managed by the PP Port Authority.

The second phase has already started. This involves the extension of the quay side and the container yard that will give the port a capacity of 300,000 TEUS, which should be good for the next 10 to 12 years. The third phase, another extension of the container yard that should then allow 500,000 TEUS to pass through the port, is planned to start in 2017. These extensions require big investments in infrastructure but also in equipment. With the present volume and a few improvements such as full use of the terminal management software, proper semi-automatic spreaders, discarding the use of the floating derrick for loading and discharging operations, the port is good for another 50,000 TEUS per year but eventually better cranes will need to be considered. That will require even higher investments. A Public Private Partnership to be achieved in stages needs to be considered. Only in this way can the enormous investments that a port requires be guaranteed. PPAP is wellmanaged and would gain from an Initial Public Offering (IPO).

Nevertheless, a few cautious suggestions need to be made to overcome some threats when they appear.

A recent hostile phenomenon is the growing container road traffic to Viet Nam now that trucks can use the new bridge at Neak Leuang. Some border difficulties that these trucks may face now will soon be abolished with the effective creation of the ASEAN Agreement on cross border transport.

The highway between Phnom Penh and Sihanoukville will be built and will make transfers of containers a lot faster and easier. There is of course the question of the toll and how much it will be and if it will be bearable for container transport up and down, often empty. Whatever the toll for a truck may be, it will bite into the volume of Phnom Penh Port.

Eventually the Northern railway line will be usable which will lead to the transfer of containers from Phnom Penh to Laem Chabang in Thailand. It is also a threat to Sihanoukville but could mean a significant loss of volume for Phnom Penh Port.

The justifiable growth of the new container terminal NCT LM 17lies in thegrowth in size of the vessels it will serve. The Cai Mep terminals have not proven the success that they were meant for. Singapore is still the preferred major hub port for all services, both to the United States and to the Mediterranean and Northern Europe. If NCT LM 17 could accommodate such vessels, both on the approach as well as in the handling, it could share Cambodia's economic growth on an equal basis with Sihanoukville.

To reach these objectives and avoid possible pitfalls, PPAP needs a strong and active marketing department that will keep in close contact with its customers, both shippers and shipping lines, securing their support in its future development.

LOCATION

Phnom Penh.

OBJECTIVES

To prepare PPAP for the growth in containers and additional logistic services for the coming 20 years.

To continue to offer the best service to its customers and contribute in an important way to the national economy.

OUTPUTS AND DELIVERABLES

Phase 3 of the Phnom Penh Port Container Terminal NCT LM 17 is operational.

ACTIVITIES

The container terminal is a state owned enterprise with PPAP as the operational entity. Because of the heavy investments that this enterprise will face in the continuous expansion and growth that it has proven capable of in the past, its structure may very well change in future years. A possible move would be to set up a separate company for the container terminal and related logistic activities only. Such move is called corporatization where PPAP/Ministry of Finance would hold all of the shares to be issued. In a second move, part of these shares would be made available to private interests, such as a strategic partner active in the transport/logistic industry, opening the possibility of valuable spin offs. All these moves would finally lead to an IPO (Initial Public Offering), which would secure funds for future expansion.

BUDGET

Budget is to be estimated at 30 million US$ for the infrastructure works plus 15 to 20 million US$ for equipment, depending on the quality of the equipment that will have to be ordered.

The numbers in the funds needed for this expansion only give more strength to the financial strategy explained above.

HUMAN RESOURCES

This is to be done within the PPAP organization, the way it was done for the first expansion. It would be advisable to keep in close contact with international experts, both in the operational and the financial side.

PROPOSED EXECUTING/IMPLEMENTING AGENCY

PhnomPenh Autonomous Port (PPAP) under direct supervision of the Ministry of Public Works and Transport and the Ministry of Finance.

TIME AND WORK SCHEDULE

2021 to 2024.

SOCIAL ISSUES

Expanding the container yard may have social impacts on local communities living in the vicinity of the port container terminal. The project could increase the number of trucks using the access roads. Social and resettlement plans may need to be developed.

ENVIRONMENTAL ISSUES

The environmental impacts of expanding the container yard and increased waterway use at the new Phnom Penh Container Terminal would need to consider the Cambodian Environment Protection Law 1996 and the Draft EIA Law 2015.

ECONOMIC ASSESSMENT

Since there is no need for intervention from the MRC or affiliated institutions, there is also no need to draw up a cost/benefit analysis for these investments. This will have to be done within the PPAP organization.

PRIORITY OF ACTION (H/M/L)

High.

FINANCING PLAN (PUBLIC/PRIVATE)

International loan.

As explained above, in view of the important investments to be made and the need to maximize the efficiency and profits of the venture, it is important to consider a Public/Private Partnership (PPP) for the container operations at LM17.

PRIOR ACTIONS REQUIRED

None.

FOLLOW-UP ACTIONS REQUIRED

None.

6.16 LONG TERM PORT DEVELOPMENT ACTION 6 (LPD6)

TITLE

Develop a cargo port in Kratie able to accommodate two seagoing barges up to 2,000 DWT suitable to handle the forecasted cargo volumes in an efficient and safe way

BACKGROUND AND RATIONALE

Kratie Province is mainly an agriculture region with 80% of the population employed in the sector. Main produces, apart from rice, are cassava and rubber. Annual quantities are impressive with 230,000 tons for cassava for the province and 75,000 tons of rubber. Viet Nam is the main buyer of cassava roots from Kratie. After processing they are exported to China. For the whole of Cambodia, China is by far the largest overall importer of cassava from Cambodia. From Kratie, trucks take the cassava via the Ratanakiri/O'Yadan border at a frequency of some 20 trucks per day. Could these quantities be exported directly from Kratie to Viet Nam by seagoing vessels? It would be worth a study. If it is done in Kompong Cham, it can be done in Kratie. Alternatively, could Kratie deliver their production of cassava for export to Kompong Cham where it could be stored until a seagoing vessel is ready to pick the cargo up? Such arrangements are not without commercial difficulties. Apparently some of Kratie's cassava production is sold to Viet Nam while Kompong Cham's production is sold to China. Still it would be arbitrary to invest in two ports that export the same products and that are just over 100 kilometers away from each other.

Not all cassava roots are exported in bulk. The high quality cassava that is grown in the province of Kompong Cham is used in various industries and needs special care. Lately cassava has been exported in big square bags, either in containers or in conventional vessels. These bagged and containerized quantities can either be picked up by truck or by barge for direct delivery alongside the seagoing vessels, Under these conditions, investment in a proper quay wall may have to be considered. The reasoning also is valid for Kompong Cham.

If Kratie wishes to follow the example of Kompong Cham and export cassava in bulk, some investments will have to be made. To load vessels with cassava in bulk at Kratie port, some basic infrastructure and equipment need to be put in place. On land a shed close to the waterfront. From pictures on some websites it appears that there is a shed. A conveyor belt to transport the pellets from the shed to the quayside, a pneumatic engine that takes the roots from a hopper and via another conveyor belt loads them in the vessel.

To avoid building vertical quay walls for the few vessels that will eventually come to Kratie to load cassava roots, anchorage buoys, also called dolphins could be anchored in the riverbed. The river is wide enough to accommodate the buoys and anchor the vessel somewhere midstream. Alternatively, the roots could first be loaded in barges and geared ocean vessels and fitted with grabs, and then the vessel could be loaded from the barges.

The waterway expert confirms that:

"Downstream Kratie to Kompong Cham, the river is wide, gentle flow, and relatively deep. Kratie port is at Km 560.7 on the left bank (steel floating pontoon port connected with concrete stairs up the slope). However, some sandy shallow areas are making navigation difficult during the dry season. The stretch Kratie-Kompong Cham, apart from these shallows, does not show any particular obstacle to the design of a commercial navigation channel."

Within this long term projection, accommodating sea going vessels of important tonnage (2,000 DWT) that would load dried cassava roots is feasible. Presently the arrangements in Kratie, with a concrete ramp and a pontoonthat needs maintenance, will have to do until a clearer picture of the influence of the dams on the river flow is better known.

LOCATION

Kratie, Cambodia.

OBJECTIVES

Find a cheaper way to export cassava to Viet Nam or China by seagoing vessels or alternatively via river transport to Phnom Penh port, either in big bags or containers.

OUTPUTS AND DELIVERABLES

Organize a team of experts that will check the various options, conduct a technical feasibility study and on the basis of the expenses and the gains that could be made in transport means, make a proposal on the most economical way to export cassava, one of the most important export products of Cambodia.

ACTIVITIES

- Check the market for technical solutions on how to reduce investments costs for the best operational way to load and export cassava roots.
- Analyze the feasibility of the construction of a 2,000 DWT port development.
- Plan and construct two 2,000 DWT berths in Kratie, according to the KOICA "Feasibility Study on Waterway Improvement for Port Logistics Development in Cambodia".

BUDGET

Study and analysis: **100,000 US$**

If Kratie will be exporting its cassava in containers to be barged to Phnom Penh, then a vertical quay wall will have to be built backed up by a paved yard allowing the free movement of containers. These are expensive investments and could well run up to **15,000,000 US$** for a single berth.

The reach stacker that can handle containers to and from barges could also be used here.

Therefore it is proposed to transport the cassava pellets from the shed to the vessel with a conveyor belt and to provide anchorage buoys, also called dolphins, anchored in the riverbed which would reduce the costs to **3,000,000 US$.**

HUMAN RESOURCES

A team of international consultants and national experts for economic analysis and feasibility study.

PROPOSED EXECUTING/IMPLEMENTING AGENCY

Cassava exporters.Kratie Provincial Government.

TIME AND WORK SCHEDULE

2025-2028.

SOCIAL ISSUES

This project could have significant impacts, both positive and negative. The social impacts during construction and operation of the cargo ports should be integrated into the IEIA and EIA under the Draft EIA Law 2015. Resettlement and social protection plans will need to be developed to reduce risks and enhance benefits of the project. The project has potential to increase economic and employment opportunities for rural communities.

ENVIRONMENTAL ISSUES

This project could have significant environmental impacts. The construction of this port would require an EIA to be conducted and approved prior to construction in line with the Environmental Protection Law 1996. The Draft EIA Law 2015 would require:

- Initial Environmental Impact Assessment (IEIA);
- Full EIA report;
- The approved environmental protection contract (EPC);

- EMP and monitoring.

Impacts during port construction, operations, associated dredging of the navigation channel and increased waterway use would be critical to include in the IEIA and EIA. Downstream of Kratie there is high biodiveristy, fishing conservation zones, fish migration routes, natural floodplains and important wetlands.

ECONOMIC COST-BENEFIT ANALYSIS

The construction of a cargo port to handle export consignments of agricultural products in 2,000 DWT barges would involve a large investment – at least of the order of US$ 5 million or more if container handling facilities are required.

The principal commodity to be exported from Kratie would be cassava. While a moderate tonnage of cassava is produced annually in Kratie Province, its share of the national cassava crop (of about 7.9 million tons in 2014) is less than 3%, and its share of total cassava exports would be even smaller. By comparison, the neighboring province of Kompong Cham produces the highest annual volume of cassava in Cambodia, about 1.0 million tons or 13% of the total crop, and accounts for a similar proportion of total cassava exports.

It is unlikely that Kratie could generate annual cassava export tonnages sufficient to justify the development of its own cargo port, either in financial or economic terms. Given that Kompong Cham and Kratie ports are only about 120 km apart, it would make sense to consolidate facilities for export loading from both provinces at Kompong Cham.

PRIORITY OF ACTION (H/M/L)

Medium.

FINANCING PLAN (PUBLIC/PRIVATE)

It is doubtful whether the provincial government, who manages the port, would have the funds to invest in such a venture. It is unlikely that even if farmers could ever attain such funds they would invest in these activities.

The difficulty in carrying out such a project would be in establishing the funds to even start a technical study or even a profitability exercise. International donors would be rightfully hesitant to invest important funds in what are, after all, very cheap products.

For the economic analysis and feasibility study: seek funding from international donors.

Eventual infrastructure, equipment and operations need a PPP approach.

PRIOR ACTIONS REQUIRED

Technical and profitability studies leading to the feasibility of the project.

FOLLOW-UP ACTIONS REQUIRED

Defend the project with interested parties if found to be feasible and profitable.

6.17 LONG TERM PORT DEVELOPMENT ACTION 7 (LPD7)

TITLE

Develop a cargo port in Kompong Cham (Tonle Bet) with vertical quays, able to accommodate two seagoing vessels up to 3,000 DWT (containers and general cargo), a domestic general cargo port for inland barges (ramp) and an oil distribution facility (jetty) suitable to handle the forecasted cargo volumes in an efficient and safe way

BACKGROUND AND RATIONALE

1) Seagoing vessels:

   - Because two vessels happened to load a few thousand tons of cassava roots does not mean that there should be a rush to construct a 300 meter vertical quay wall that would cost some 15 million US$. Less expensive solutions are available that would equally serve the agriculture trade that seems to flourish now from cassava root exports.
   - The depot at Tonle Bet has already successfully loaded cassava roots in bulk in two vessels that then sailed to China. What needs to be done is to look for solutions to guarantee the safe stay of the vessels in the strait at the Tonle Bet factory. Placement of a dolphin(s) can be considered and prices should be requested for implanting such an anchorage buoy(s) on the Mekong River bed. Such anchorage is quite common on the Chao Phraya in Bangkok, on the Mississippi in New Orleans and other rivers in the world.
   - Not all cassava roots are exported in bulk. The high quality cassava that is grown in the province of Kompong Cham is used in various industries and needs special care. Lately, cassava has been exported in big square bags, either in containers or in conventional vessels. These bagged and containerized quantities can either be picked up by truck or by barge for direct delivery alongside the seagoing vessels. If this tendency would lead to a regular transport of containers, investment in a proper quay wall may have to be considered, depending on the number of containers this would represent, the frequency of sailings and the equipment used for lifting containers in barge or eventually seagoing vessels.
   - The present method of transferring loaded containersfrom Kompong Cham to Phnom Penh involves the use of flat platform barges (15 to 20 containers every three months) equipped with a derrick and towed by a tug to place empty containers at Kompong Cham for loading. These are then transferred to Phnom Penh for customs clearance and re-loading onto large self-propelled river barges for the voyage through the Mekong Delta to Ho Chi Minh City. This is an expensive operation, tying up a tug, and a floating crane for about 3 days during movement to/from Kompong Cham, loading in Kompong Cham and transshipment in Phnom Penh.
   - The poor economics of the current IWT operation can be transformed by the provision of container loading facilities at Kompong Cham which would allow larger container-carrying barges (of up to 96 TEU capacity) or seagoing vessels to serve that port directly from Ho Chi Minh City.

2) Domestic transport:

   - During the last few years, after having a good road connection from Phnom Penh to Kompong Cham, many transporters have changed to use road transport instead of waterway which is slower and more expensive (small amount of cargo per each transport).
   - Some black spots have been noticed as usage barriers of waterway transport from Kompong Cham to upper and lower parts of the Mekong River. However, there are potentials to develop Kompong Cham as one of the main local ports in Cambodia. Urbanization and localization of business people make the capital city more and more congested. Since land prices and labor cost are higher, industrial and business centers will, in the future, move toward hinterlands attached to the city area. Therefore Kompong Cham can be the future hinterland of Phnom Penh. For other reasons, Kompong Cham is obviously seen as a distribution area for the north-east provinces such as Kratie, Steung Treng, Rattanakiri, Mondulkiri, and perhaps some provinces of Lao PDR.

3) Oil transport:

   - The last type of traffic which is currently still in operation at Kompong Cham is oil. Many oil companies still keep transporting their products by using waterway transport. But the amount of traffic has decreased year to year due to the competition from road transport. However it is not a smart choice to transport oil products by road (economies of scale), but oil companies have no other choice as long as the waterway cannot provide full year operation. If proper oil accommodated facilities are developed and navigational barriers on the river are removed, surely all oil traffic could be transported by waterway from Phnom Penh to Kompong Cham and all other areas within the perimeter of Kompong Cham port. Kompong Cham could then be an oil distribution center in Cambodia if oil vessels are allowed to come directly from Viet Nam.
   - At this moment, small oil tankers discharge their cargo at a concrete ramp on the town side of the river.

LOCATION

Kompong Cham, Cambodia.

OBJECTIVES

The objective of the project is to provide facilities for efficient general cargo, container and oil handling, in order to develop direct import and export traffic to and from Kompong Cham. Another objective is to provide efficient handling of domestic general cargo and well-organized, safe and attractive facilities and services for passengers including international tourists.

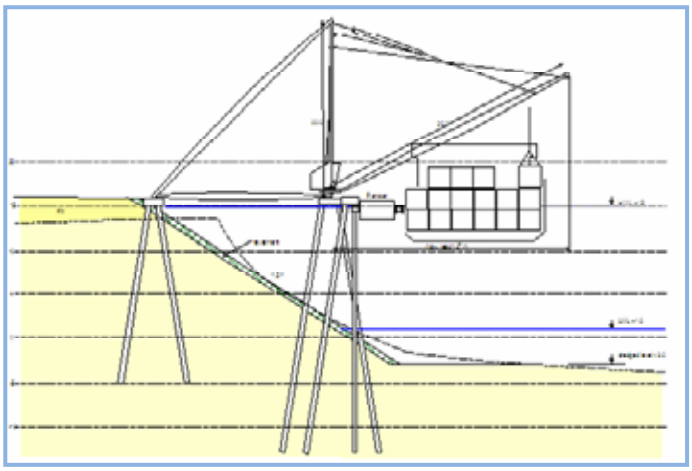
OUTPUTS AND DELIVERABLES

1) The KOICA "Feasibility Study on Waterway Improvement for Port Logistics Development in Cambodia" proposed to construct two vertical quays able to accommodate two seagoing vessels up to 3,000 DWT for containers and general cargo (mainly cassava roots).

Another possibility should be:

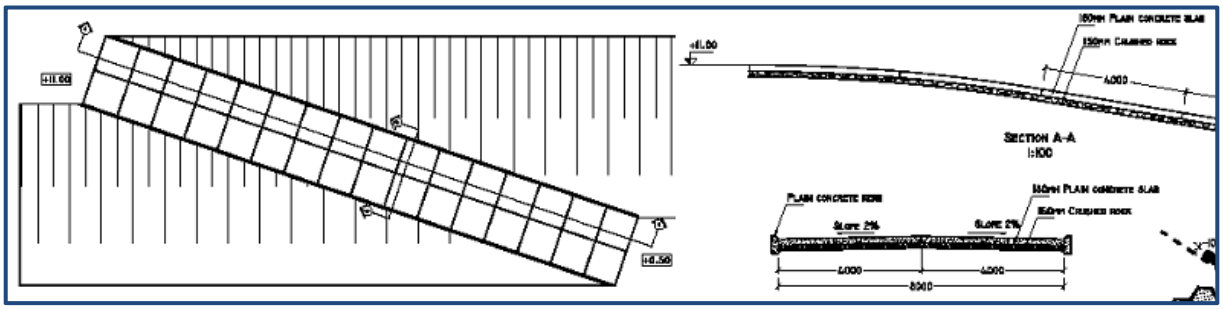
a) A conveyor belt to transport the pellets from the shed to the quayside, a pneumatic engine that takes the roots from a hopper and via another conveyor belt loads them in the vessel and to provide anchorage buoys, also called dolphins, that could be anchored in the riverbed to berth the vessels; and

b) The development of a site with good connection to the road at the left bank of the river, to construct a container jetty to accommodate barges/vessels, to install an operational derrick crane for handling operation and to create an operational stacking area with necessary equipment for stacking operation.



Container jetty with derrick crane (From Master Plan for Mekong River left bank at KompongChamWaterborne Transport on the Mekong River System in Cambodia, BTC-MPWT – Port Engineering Report, Bill Hawkins, 2006)

2) Domestic general cargo: New general cargo infrastructure (ramp) at the right bank of the river. A ramp should be provided for handling domestic general cargo with a width of 8 m and with a slope of 1:10. Three vessels can moor at the ramp bow on and there is room to back three trucks down the ramp to access the vessels. The primary commodities to be handled at the dry cargo berths are building materials such as bricks, steel, cement and sand which could also be handled by a crane at the container terminal, proposed at the east bank of the river.



3) Oil distribution facilities (also for regional cross-border waterway transport): small oil tankers presently discharge their cargo at a concrete ramp on the town side of the river. This arrangement is adequate for the present time.

4) In the future, when the tonnage of fuel and the size of vessels require a pontoon jetty, an oil jetty with new oil distribution center could be installed in Kompong Cham at the east bank of the river.

ACTIVITIES

Before starting construction works and installation of equipment and facilities, some prior activities need to be implemented in order to remove the barriers to full navigation along the Mekong River from Kompong Cham to its surroundings and Phnom Penh:

- Bank protection study;
- Environmental Impact Assessment(s);
- Cost-Benefit Analysis on the development plans of the new quay walls, container, passenger and oil terminals.

For the construction and installation works, the following activities should be conducted:

- Acquire site;
- Prepare ToR and bidding documents for, and recruit planning, design and supervision consultants;
- Site survey, planning, detailed design, and preparation of contract and procurement documents;
- Contracting of civil works;
- Procurement of equipment/define safety and security procedures;
- Site clearing, strengthening of embankment and slope protection, prepare plan for organization, operation and management of the terminal;
- Construction of wharf, erection of buildings,surfacing of stacking area, installation of derrick crane;
- Construction of ramp way for domestic general cargo;
- Construction of petroleum jetty and terminal for oil storage;
- Define safety and security procedures;
- Installation of utilities and construction of road connection;
- Train staff and introduce new organizational and administrative procedures.

BUDGET

For the KOICA project (two vertical berths for 3,000 DWT vessels) an infrastructure budget of 15 million US$ and an equipment budget of 5 million US$ is foreseen.

In case a conveyor belt with anchorage buoys for general cargo and a container terminal with a jetty and derrick crane, this budget can be reduced to	5,000,000 US$
A new berthing facility for domestic general cargo (ramp) can be estimated at	500,000 US$
Provide facilities for oil distribution center (land, superstructure to be provided by oil companies)	250,000 US$
Preliminary study costs and training of staff can be estimated at	100,000 US$
Total:	**5,850,000 US$**

HUMAN RESOURCES

It will be necessary to develop the capability of the Kompong Cham Port Authority to manage the construction and operation of several port facilities. A firm of engineering consultants should be contracted to plan, design and supervise construction of the facilities.

An investment of this type will require its own PMU team for planning and implementation, and the follow up of the services of the engineering consultants.

PROPOSED EXECUTING/IMPLEMENTING AGENCY

MPWT, PPAP, Kompong Cham Provincial Authority.

TIME AND WORK SCHEDULE

2025-2028.

SOCIAL ISSUES

This project could have significant impacts, both positive and negative. The social impacts during construction and operation of the cargo ports should be integrated into the IEIA and EIA under the Draft EIA Law 2015. Resettlement and social protection plans will need to be developed to reduce

risks and enhance benefits of the project. The project has the potential to increase economic and employment opportunities for rural communities.

ENVIRONMENTAL ISSUES

This project could have significant environmental impacts. The construction of this port would require an EIA to be conducted and approved prior to construction in line with the Environmental Protection Law 1996. The Draft EIA Law 2015 would require:

- Initial Environmental Impact Assessment (IEIA);
- Full EIA report;
- The approved environmental protection contract (EPC);
- EMP and monitoring.

Impacts during port construction, operation, associated dredging of the navigation channel and increased waterway use would be critical to include in the IEIA and EIA. The location of the activity means that it has an increased risk of impacting on the Tonle Sap Biosphere Reserve. The EMP and monitoring would need to consider the direct and indirect impacts on the natural resources of the Tonle Sap system, including fisheries, floodplains, water quality and hydro-morphology.

ECONOMIC ASSESSMENT

As observed in the case of Long Term Port Action No.6, there is merit in developing in Kompong Cham consolidated port facilities for the handling of agricultural exports (principally cassava) from both Kratie and Kompong Cham provinces. In line with the recommendations of KOICA, these facilities should incorporate infrastructure and equipment suitable for the handling of 3000 DWT (200 TEU) barges transporting both containers and general cargo. In order to avoid cargo transfer costs in Phnom Penh and to maximize operational efficiency, it would be desirable for these barges to operate directly to ports in Viet Nam.

The likely capital cost would be in the order of US$ 20 million (US$ 15 million infrastructure and US$ 5 million handling equipment). The economic benefits of the project, providing an offset against the capital cost, would comprise the reduction in unit cargo handling costs (per ton) of the new port facilities as compared with the unit handling costs of alternative ports (e.g. Phnom Penh), plus the avoided unit transfer cost by road to such alternative ports. All capital and operating costs should be converted to economic values through the exclusion of taxes and government charges from nominal (financial) values.

It is possible that an economic appraisal conducted on this basis would derive an acceptable economic rate of return (EIRR) for this project.

PRIORITY OF ACTION (H/M/L)

Medium.

FINANCING PLAN (PUBLIC/PRIVATE)

Preliminary studies and training: international grant.

Construction works: PPP and international loan for the public part.

Equipment and superstructure: private sector.

For a new oil terminal and oil distribution center it is up to the private sector to decide if they want to invest in new infrastructure in the port of Kompong Cham.

The estimated prices above are subject to be changed due to economic fluctuations (local and international).

PRIOR ACTIONS REQUIRED

Technical and profitability studies leading to the feasibility of the project.

Defend the project with interested parties if found to be feasible and profitable.

FOLLOW-UP ACTIONS REQUIRED

None.

6.18 LONG TERM PORT DEVELOPMENT ACTION 8 (LPD8)

TITLE

Develop a cargo port in Kompong Chhnang able to accommodate two vessels up to 500 DWT suitable to handle the forecasted cargo volumes in an efficient and safe way

BACKGROUND AND RATIONALE

Previous plans forecasted a substantial growth both in passengers and cargo for Kompong Chhnang. It is sad to say that, almost ten years later, these projections were not realized. Instead, long-term leases were granted to private companies. The income and gains from these leases were not, to say the least, used for the development of infrastructure, nor did they advance the cargo handling or passengers' comfort.

As for cargo, during all these years since the previous Mekong Master Plan in 2006, nothing much has been done nor has the cargo increased in the way it could have if proper measures for port operations had been taken.

Improved road conditions and a larger fleet of trucks and pick-ups have also meant tough competitionsince Phnom Penh is only 90 kilometersaway.

LOCATION

Kompong Chhnang.

OBJECTIVES

To provide efficient, well organized, safe and attractive facilities and services for efficient cargo transfer operations with a separate fish market.

OUTPUTS AND DELIVERABLES

The output will be efficient, safe and well organized cargo operations for up to 500 ton vessels with full revenue collection from the terminal.

ACTIVITIES

1) Prepare TOR for planning, design and supervision.
2) Site survey, planning, pre-design, EIA, detailed design and preparation of contract and procurement documents.
3) Contracting of civil works.
4) Define safety and security procedures.
5) Prepare plan for organization, operation and management of the cargo terminal.
6) Train staff and introduce new organizational and administrative procedures

BUDGET

Preliminary preparation costs:	100,000 US$
Two 500 DWT vertical berthing facilities, including terminal warehouses, parking, loading and unloading equipment, etc.:	3,400,000 US$
Staff training and organization:	50,000 US$
Total:	**3,550,000 US$**

HUMAN RESOURCES

It will be necessary to develop the capacity of Kompong Chhnang Port Authority to manage the construction and operation of several port facilities. A firm of engineering consultants shouldbe contracted to plan, design and supervise construction of the facilities.

An investment of this type will require its own PMU team for planning and implementation, and the follow up of the services of the engineering consultants.

PROPOSED EXECUTING/IMPLEMENTING AGENCY

Ministry of Public Works and Transport.Kompong Chhnang Provincial Authority.

TIME AND WORK SCHEDULE

2025-2028.

SOCIAL ISSUES

This project could have significant impacts, both positive and negative. The social impacts during construction and operation of the cargo ports should be integrated into the IEIA and EIA under the Draft EIA Law 2015. Resettlement and social protection plans will need to be developed to reduce risks and enhance benefits of the project.

This action will generate social benefits by providing safer, more hygienic and more comfortable facilities for an increasing number of passengers, mainly tourists, passing through Kompong Chhnang Port. Increased passenger transport can increase economic and employment opportunities for rural communities. The planning and design of the improved facilities should be done in a participatory process involving consultation with and incorporation of the expressed needs of passenger boat operators currently using the port, vendors and other service providers at the port and communities living in the area.

ENVIRONMENTAL ISSUES

This project could have significant environmental impacts. The construction of this port would require an EIA to be conducted and approved prior to construction in line with the Environmental Protection Law 1996. The Draft EIA Law 2015 would require:

- Initial Environmental Impact Assessment (IEIA);
- Full EIA report;
- The approved environmental protection contract (EPC);
- EMP and monitoring.

Impacts during port construction, operation, associated dredging of the navigation channel and increased waterway use would be critical to include in the IEIA and EIA. The location of the activity means that it has an increased risk of impacting on the Tonle Sap Biosphere Reserve. The EMP and monitoring would need to consider the direct and indirect impacts on the natural resources of the Tonle Sap system, including fisheries, floodplains, water quality and hydro-morphology.

ECONOMIC ASSESSMENT

Kompong Chhnang is only 95 km by road (NR 5) from Phnom Penh. Travelling at an average speed of 45 km per hour, a truck can complete this journey in 2 hours and 7 minutes. Allowing a 5 hour round trip cycle, a truck can complete 3 return trips in an operating day of 16 hours, hauling an average of 60 tons per day, direct to the ultimate point of delivery. By comparison, a barge will take about 10 hours to travel the 99 km by waterway from Phnom Penh to Kompong Chhnang Port, equivalent to only one single trip per day. While the project envisaged by this action would allow barges to haul up to 500 tons per trip, probably well in excess of requirements, additional costs would be incurred for cargo transfer to trucks and for haulage to the ultimate point of delivery.

IWT cargo traffic to/from Kompong Chhnang has not developed at the (over) optimistic rates of growth projected in the Cambodian Mekong Navigation Master Plan of 2006. Given the proximity of the port to Phnom Penh and the highly competitive nature of road freight services, this result is hardly surprising. It is therefore most unlikely that the proposed project to upgrade the port to handle 500 DWT cargo barges can be justified, either in financial or economic terms.

Instead, the port has a major function for domestic or local transport, both for passengers and goods, and its future development would be better directed towards improving levels of safety.

PRIORITY OF ACTION (H/M/L)

High.

FINANCING PLAN (PUBLIC/PRIVATE)

Preliminary studies and training: international grant.

Construction works: PPP and international loan for the public part.

Equipment and superstructure: private sector.

PRIOR ACTIONS REQUIRED

First, the planning and design of the improved facilities should be done in a participatory process involving consultation with and incorporation of the expressed needs of passenger boat operators currently using the port, vendors and other service providers at the port and communities living in the area.

Second, in designing the improved facilities, every effort should be made to avoid the acquisition of any additional land, and hence the need for relocation and compensation.

FOLLOW-UP ACTIONS REQUIRED

None.

6.19 LONG TERM PORT DEVELOPMENT ACTION 9 (LPD9)

TITLE

Construction of a new port in Chong Kneas. The port should consist of a new passenger terminal, cargo terminal, fish market and a bunkering jetty.

BACKGROUND AND RATIONALE

Chong Kneas, a fishing village and entry port to Cambodia's main tourist destination Siem Reap, is worth a study on its own. Investments required to guarantee year-round access by water are important. The government needs to take into account the high yielding tourist industry, which is the second largest earner in the national economy. If the government wants to uphold its tourist industry and encourage the use of its waterways, Chong Kneas should be modernized to accommodate all industries.

The objective of the present study, which is an updated version of the MRC 2006 Master Plan (of which the objectives were never realized), is to propose a new harbor at Chong Kneas at the most suitable location for the harbor users, fishermen, tourist boat operators and the cargo transport operators.

The new harbor is planned at the end of the existing embankment at Kantey Kaom. This location will give local fishermen and vessels transporting passengers and cargo from Phnom Penh easy access to the lake. As part of this plan, raising the height of the existing embankment to Kantey Kaom and widening it to allow sufficient space for traffic to pass freely to the new harbor, as well as allowing room for the construction of stilt houses along the embankment, is proposed.

Currently, the area does not have a physical port facility but a landing area that moves in response to lake water levels. There is also no effective organizational structure.

Chong Kneas is located 10 to 15 kilometres south of Siem Reap at the northern end of Tonle Sap Lake, the major tourist destination in Cambodia and the gateway to Angkor Wat and the many other temples in the nearby area. Angkor is the preeminent historical cultural monument in Asia.

Chong Kneas operates as the port for Siem Reap, serving both cross-border and domestic waterborne transport.Tourists traveling from Phnom Penh by cruise vessel or speed boat land there. It is estimated that about 10,000 tons of fish caught in the lake are currently landed annually at Chong Kneas, most of it sold there to traders**.** Small cargo vessels operate up to Chong Kneas between July and February when there is sufficient depth of water in the lake. Dry cargo consists largely of building materials – bricks manufactured near Chhnok Trou, cement and sand. Other dry cargoes include foodstuffs and beverages.

The existing landing facilities are rudimentary. For part of the year they rely on the use of the embankment and channel. For the remaining part of the year they use the beach by the low water lake edge. Cargoes and passengers are loaded and unloaded using unstable and unsafe gangplanks, through the mud or sand. There are no facilities for storage of cargo, necessitating direct discharge to trucks. There is a good road from Siem Reap as far as Phnom Kraom but the alignment along the embankment is very bumpy. During the low water season, trucks must cross the Stung Siem Reap on a small wooden bridge, then follow an earthen track across the dry lake bed. Overall, because of the lack of adequate facilities and road access, the discharge and loading of cargo at Chong Kneas Port is inefficient and unnecessarily costly. For international tourist passengers, the situation is totally unacceptable.

There is great potential to develop travel over the Tonle Sap from Phnom Penh to Siem Reap as a tourist attraction and to promote eco-friendly tourism on the Great Lake. But this potential will not be realized while the facilities for embarking and disembarking at Chong Kneas remain unsafe, and tourists have to wade through the mud next to where fish is being landed.

The town of Siem Reap is the center for visitors to the Angkor temple complex. Angkor Wat itself isabout six kilometers to the north of the town center. The Angkor complex is a cultural artifact of

worldwide historical importance and was declared a UNESCO World Heritage Site in 1993. With political stability in the country, tourist numbers to Siem Reap have substantially increased in recent years. Unfortunately, public sector investment has failed to match demand from the private sector. The principle public sector investment has been in the Siem Reap airport and road construction. It should therefore not come as a surprise that waterway transport of tourists has declined in favor of road and air transport. Of the fleet of speed boats that used to operate between Phnom Penh and Chong Kneas, only a few remain and their frequency has reduced to, on average, one boat a day. On the other hand, in the high water season international cruise boats now come regularly to Chong Kneas, land there, visit Siem Reap and return the next day.

The three main categories of traffic at Chong Kneas are fish, cargo and passengers. All three suffer from operational inefficiencies associated with the landing facilities currently available, and all would stand to gain significantly from the operational benefits that improved harbor facilities would provide.

As a result of these appalling conditions, waterway traffic of oil seems to have completely stopped. Gas transport via waterway had already been stopped before but now oil distributors prefer to use the road and deliver direct to gas stations in the Siem Reap area.

Passengers and cargo at the landing point will benefit from storage areas, shelters for passengers and suitable facilities for transfer to and from road vehicles. This will improve the quality of the experience for passengers and provide flexibility for cargo handlers.

Currently the loading and unloading of dry cargo vessels is performed manually via narrow planks from vessel to shore. This method is dictated partly by the lack of proper landing facilities and partly by the design of the vessels. Although the first constraint will be removed when the improved harbor facilities are in place, the second will not. The present fleet of double-decker cargo boats is likely to remain in operation for a number of years. Cargo-handling methods are not therefore expected to change a great deal in the short term.

LOCATION

Chong Kneas, Cambodia.

OBJECTIVES

To create a modern, efficient, environmentally-friendly, multi-purpose port serving the cross-border and domestic waterborne transport needs of Siem Reap and the surrounding areas in order to reduce the transportation and handling costs for imported and local products distributed to the area and for products exported from the area, and to promote the growth of international tourism in Siem Reap and the Tonle Sap Lake.

OUTPUTS AND DELIVERABLES

In the report "MP08 Port Engineering" of the Master Plan for Waterborne Transport on the Mekong River System in Cambodia 2006, a first design of a new Chong Kneas Port was made.

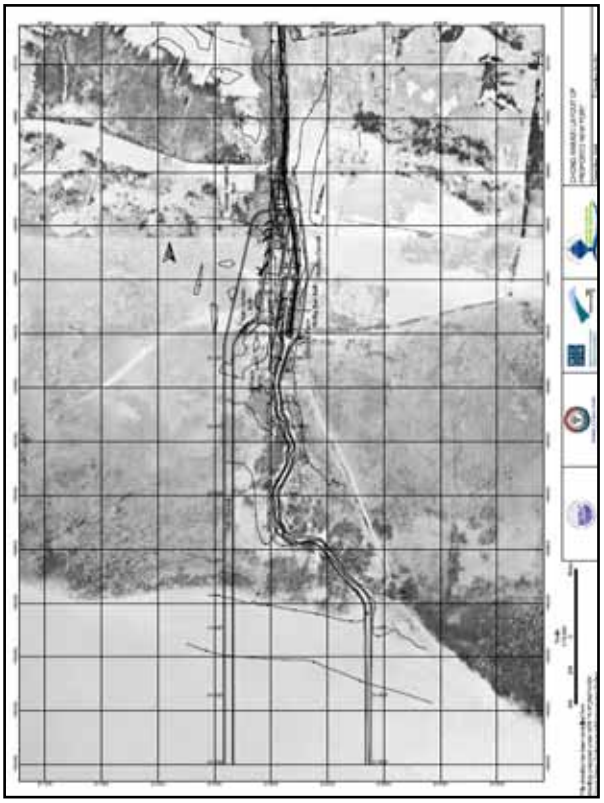
It included:

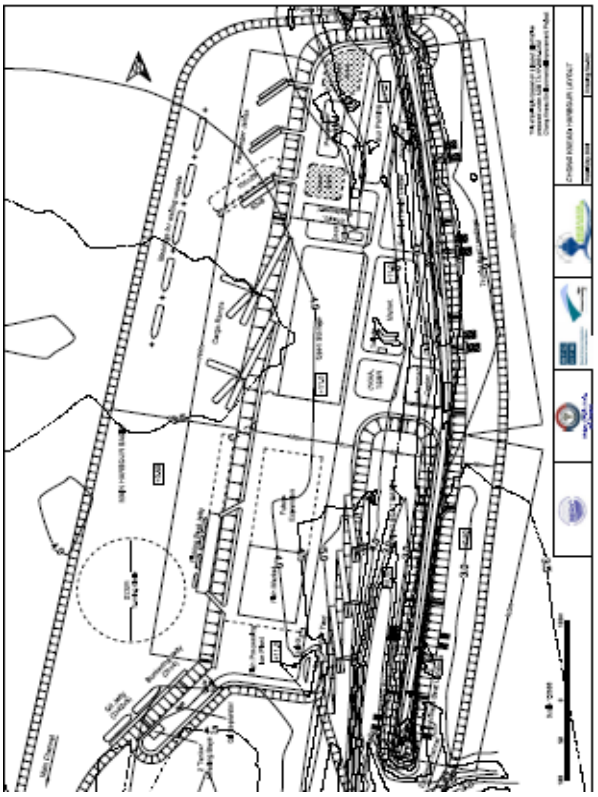
- Two navigation channels with navigation aids;
- Berths and ramps for fishing boats, general cargo barges, cruise vessels, speed boats and tourist boats, and petroleum tankers, plus a bunkering jetty;
- Earthworks, slopes and revetments;
- Shore facilities, cargo terminal, harbor administration building, fish market, passenger terminal building,firefighting system, boat repair yard and slipway, sewage treatment plant, land for essential civic activities;

- Equipment for: cargo handling, workboats, vehicles, workshops, power and lighting, and oil spills;
- Access roads and internal pavements.

ACTIVITIES

- Prepare ToR for studies and surveys;
- Create Project Management Unit (PMU);
- Prepare funding plan;
- Preparatory studies and surveys;
- Prepare ToR and bidding documents for, and recruit planning, design and supervision consultants;
- Detailed design of port facilities;
- Obtain environmental and archaeological clearances;
- Preparation of contract and procurement documents;
- Contracting and construction of civil works;
- Procurement and installation of equipment and utilities;
- Commissioning of the new port.





(From Master Plan for Waterborne Transport on the Mekong River System in Cambodia, BTC-MPWT – Port Engineering Report, Bill Hawkins, 2006).

BUDGET

Full project cost (estimations 2006 x 1.40):

Engineering design and supervision	1,465,000 US$
Earth works	8,380,000 US$
Surfacing	2,020,000 US$
Slopes	580,000 US$
Harbor facilities	1,740,000 US$
Buildings	1,480,000 US$
Utilities	840,000 US$
Miscellaneous	30,000 US$
Equipment – oil boom and skimmer	70,000 US$
Contingencies	2,300,000 US$
Price escalation 5 years at 3.5%	2,895,000 US$
Total	**21,800,000 US$**

HUMAN RESOURCES

It will be necessary to develop the capacity of Chong Kneas Port Authority to manage the construction and operation of the new port. A firm of engineering consultants should be contracted to carry out surveys, prepare the detailed design, and supervise construction of the new port.

Therefore, to plan and implement this kind of action plan, a Project Management Unit (PMU) should be created with a number of representatives from the Ministry of Public Works and Transport, Chong Kneas Authorities, the Ministry of Agriculture Forestry and Fisheries, the Ministry of Environment and also the international port planning experts and consultants. This PMU would help to ensurethe successful and sustainable development of the project.

PROPOSED EXECUTING/IMPLEMENTING AGENCY

Ministry of Public Works and Transport,Siem Reap Provincial Authority, Chong Kneas Port Authority.

TIME AND WORK SCHEDULE

A detailed topographic survey would be required for the final design phase to build an accurate terrain model. Additional bathymetric surveys need to be carried out in the lake and extended out beyond the entrance to the navigation channels. Soundings should also be made at intervals of no greater than 50 m.

Archaeological investigations would be required in the detailed design phase. These would focus on the proposed port and harbor areas and on the existing embankment down to Kantheay Kaom.

Detailed design, including the preparation of bidding documents, would precede the actual construction and would take about 12 months.

The time-frame for the actual construction works would be three years, to the schedule set out below:

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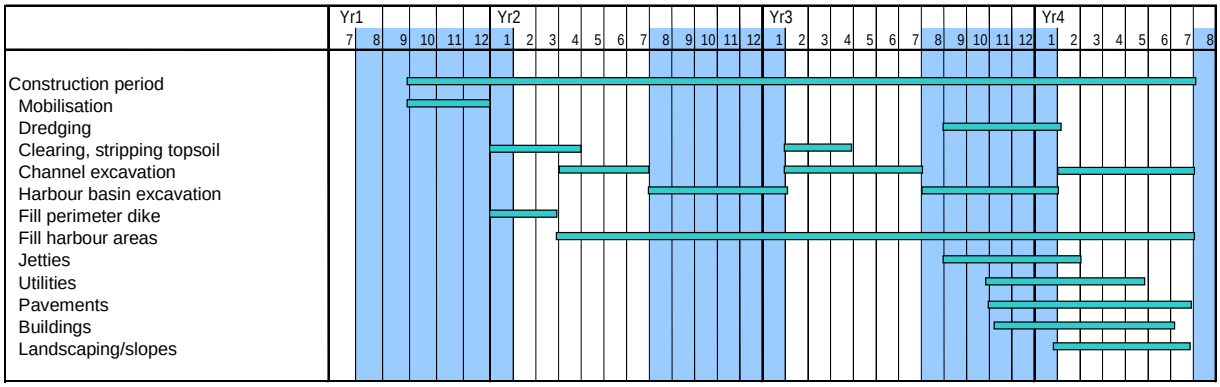


So, in total some 5 years are expected: starting in 2021, the port should be operational in 2026.

SOCIAL ISSUES

This project could have significant impacts, both positive and negative. The social impacts during construction and operation of the cargo ports should be integrated into the IEIA and EIA under the Draft EIA Law 2015. Resettlement and social protection plans will need to be developed to reduce risks and enhance benefits of the project.

Currently there will be no need for compulsory acquisition of additional land for the development of Chong Kneas Port. However, this will have to be confirmed at the detailed design stage. Should land acquisition prove to be necessary, adequate time must be allowed to identify all affected persons and the adverse impacts upon them, and to provide assistance in relocation and reestablishment of livelihoods activities, together with compensation for all losses of assets and incomes. This process should be completed prior to the start of construction works. It may be necessary to engage a suitable NGO to assist in this resettlement process. Resettlement and social protection plans will need to be developed to reduce risks and enhance benefits of the project.

The construction of the improved Port will provide employment opportunities. Opportunities for unskilled and artisan employment and provision of support services (e.g. transport of workers) should be offered first, on an equal opportunity basis, to local men and women. HIV/AIDS awareness activities should be conducted.

The proposed fish landing and trading facilities will have a direct impact upon poor fishers, men and women, operating on the Lake. There should be full consultation with, and attention to the needs expressed by, fishers in the detailed design, and in defining the arrangements for management of these facilities.

ENVIRONMENTAL ISSUES

This project could have significant environmental impacts. The construction of this port would require an EIA to be conducted and approved prior to construction in line with Environmental Protection Law 1996. The Draft EIA Law 2015 would require:

- Initial Environmental Impact Assessment (IEIA);
- Full EIA report;
- The approved environmental protection contract (EPC);
- EMP and monitoring.

Impacts during port construction, operation, associated dredging of the navigation channel and increased waterway use would be critical to include in the IEIA and EIA.

Due to the proposed location in the buffer zone of the Tonle Sap Biosphere Reserve, and the proximity of the core zones, this Action needs to be to be consistent with the protection and conservation plan of the core areas.The Tonle Sap Biosphere Reserve Secretariat must be asked for a ruling. Due to the location in the buffer zone of the Tonle Sap Biosphere Reserve, any clearing of

natural vegetation, i.e. flooded forest, is prohibited by the "Royal Decree on the Establishment and Management of the Tonle Sap Biosphere Reserve" and by the Fisheries Law.

Depending on the nature of the goods transported, the environmental risks in terms of interference with migration corridors and pollution/spills will increase compared to the current situation and a therefore a realistic, adequate and functional spill contingency plan is required in addition to effective spill prevention measures.

ECONOMIC ASSESSMENT

Despite elaborate development plans initially proposed in an ADB feasibility study and repeated in even greater detail in the Cambodian Mekong Navigation Master Plan of 2006, this project has remained dormant up until the present time. Only tour boat traffic has exceeded expectations, with passenger volumes growing at double-digit rates, despite operations being restricted to seven months of the year (high water) and rudimentary landing facilities being provided at Chong Kneas. IWT cargo traffic to/from Chong Kneas has continued to experience negative growth.

Demand forecasts prepared for this Master Plan indicate robust growth only for the tour boat traffic. The outlook for IWT cargo traffic remains poor owing to the proximity of Siem Reap to Phnom Penh, the on-going improvements to the highway connection (NR 6), and the existence of highly competitive road freight services between the two. Cargo can be put on a truck and delivered directly to Siem Reap in about one third of the time taken by IWT to deliver it to Chong Kneas, where it must again be transferred to road for the 15km trip to Siem Reap.18By using road transport, not only will transfer (barge to truck) costs be avoided, but cargo owners, especially the petroleum companies, will avoid the need to invest in additional storage facilities at Chong Kneas.

However, certainly there will be economic benefits for cargo haulage by IWT, in the form of lower operating costs and reduced greenhouse gas emissions, but these benefits will be limited as a result of the necessity to restrict barge size in the Tonle Sap to 500 DWT.19These benefits are likely to be insufficient to offset the large capital cost of the port development project (estimated at US$ 21.8 million) and provide an adequate rate of economic return.

PRIORITY OF ACTION (H/M/L)

High.

FINANCING PLAN (PUBLIC/PRIVATE)

International grant for planning and design: 1,465,000 US$

International loan for the transport department: 13,860,000 US$

International loan for the fisheries department: 6,470,000 US$

PRIOR ACTIONS REQUIRED

Approval of the respective national ministries concerned.

Inclusion of the project in the national development program, and mobilization of financing for the technical assistance needed to implement the Action.

[18]The road distance between Phnom Penh and Siem Reap is 310 km and trucks with an average speed of 45 km per hour (allowing for breaks) can cover this distance in less than 7 hours. By comparison, barges travelling at about 11 km per hour will require nearly 22 hours to cover the 251 waterway km between Phnom Penh and Chong Kneas.

[19] It has to be noted, for example, that 500 DWT would be too small to offer sufficient operating economics for the haulage of petroleum from Viet Nam. The current size of petroleum tanker barges operating between Viet Nam and Cambodia is already around 1,000 DWT, and this Master Plan makes provision to increase the size to 3,000 DWT.

FOLLOW-UP ACTIONS REQUIRED

Port management will be extremely important. The new navigation rules and regulations will need to be followed closely and enforced.

A detailed maintenance plan for the port and channel should be prepared and implemented.

7 REGULATORY ACTIONS

7.1 SHORT TERM REGULATORY ACTION 1 (SRE1)

TITLE

Implement the Cambodian-Vietnamese Agreement on Waterway Transportation

BACKGROUND AND RATIONALE

Actions to effectively implement the Agreement between Cambodia and Viet Nam on Waterway Transportation of 2009.

LOCATION

Cambodia and Viet Nam.

OBJECTIVES

The effective implementation of the Agreement will significantly facilitate international and cross-border waterborne transportation of cargo and passengers, increase the competitiveness of the Cambodian and Vietnamese economies and enhance safety and sustainability of navigation and port operations.

OUTPUTS AND DELIVERABLES

1) Operationalize the Mekong Navigation Facilitation Committee

   First of all, the Cambodian-Vietnamese Agreement on Waterway Transportation provides for the establishment of a new bilateral Mekong Navigation Facilitation Committee. The effective launch of this committee, including its secretariats, should be considered a priority. The committee should become the motor of integrated river management in the Lower Mekong Basin.

2) Issue documents and permits for inland waterway vessels

   The Cambodian-Vietnamese Agreement on Waterway Transportation provides for the issuance of documents and permits for inland waterway vessels. This is a prerequisite for the orderly organization of cross-border navigation and the effective implementation of the principle of freedom of navigation.

3) Implement the rules on formalities and dues and taxes

   The Agreement between Cambodia and Viet Nam on Waterway Transportation sets out rules for the simplification of formalities and the levying of dues and taxes which are essential to improve the competitiveness of international and cross-border waterborne transportation. These rules still await effective implementation. This is of key importance.

4) Harmonize, implement and enforce rules and regulations

   The Agreement between Cambodia and Viet Nam on Waterway Transportation entrusts the Mekong Navigation Facilitation Committee with the preparation of a number of harmonized rules and regulations. The following should be elaborated in the short term:

   a) Rules and regulations for safe navigation and the avoidance of collisions (including rules of the road);

   b) Pilotage regulations;

   c) Tariffs of fees, and related conditions;

   d) Rules and regulations on the transportation of dangerous goods;

e) Rules and regulations on coordinated cross-border pollution prevention, response and contingency plans;

f) Rules and regulations on the investigation of accidents;

g) Technical regulations on surveys of waterways and vessels.

h) These rules and regulations should be transposed into the national legal systems of the countries.

5) Elaborate a third party liability insurance system

The Agreement between Cambodia and Viet Nam on Waterway Transportation provides that vessel owners of either Contracting Party as well as foreign vessel owners shall have insurance cover or other financial security in order to cover their liabilities to third parties in conformity with applicable international conventions as well as national laws and regulations of the respective Contracting Parties.

6) Elaborate and adopt minimal technical and operational requirements for regulated waterways

The Agreement between Cambodia and Viet Nam on Waterway Transportation provides that the Contracting Parties, acting upon a proposal of the Mekong Navigation Facilitation Committee, shall adopt detailed technical and operational requirements for the regulated waterways. These requirements shall contain minimum standards for the maintenance and improvement of the navigable waterways and relate, inter alia, to the dimensions, the capacity and/or the draught of vessels as well as specify clearances, including air clearances under bridges. The adoption of these requirements is essential to ensure that freedom of navigation is not impeded by inadequate dimensions of new infrastructure and other constructions.

ACTIVITIES

1) Operationalize the Mekong Navigation Facilitation Committee

- Convene an inaugural meeting.
- Prepare and formally adopt internal rules of the committee.
- Establish the secretariats of the committee.
- Prepare and formally adopt a work plan indicating priorities.
- Establish one or more working groups.

2) Issue documents and permits for inland waterway vessels

- Produce documents and permits.
- Issue documents and permits to vessel operators.

3) Implement the rules on formalities and dues and taxes

- Instruct competent authorities to comply with the provisions of the Agreement.
- Rearrange port and border procedures.
- Review existing tariffs and practices in the light of the requirements of the Agreement.
- Prepare modified tariffs and instructions for competent authorities.
- Information campaign.

4) Harmonize, implement and enforce rules and regulations

- Collect, where needed translate, and analyze all existing rules and regulations in the light of the provisions of the Agreement, other treaty obligations of the States and international best practices.

- Prepare drafts of harmonized rules and regulations.
- Organize negotiations through one or more working groups set up within the Mekong Navigation Facilitation Committee.
- Formal adoption of rules and regulations by the Committee.
- Finalize rules and regulations including their transposition into national regulatory instruments.
- Instruct competent authorities to implement and enforce the new rules and regulations.
- Information campaign.

5) Elaborate a third party liability insurance system
   - A study of existing arrangements, the applicable international framework, best practices and the economic feasibility, including the preparation of recommendations and a discussion within a working group of the Mekong Navigation Facilitation Committee.
   - Prepare draft rules and regulations.
   - Organize negotiations through one or more working groups set up within the Mekong Navigation Facilitation Committee; formal adoption of rules and regulations by the Committee.
   - Finalize rules and regulations including their transposition into national regulatory instruments.
   - Instruct competent authorities to implement and enforce the new rules and regulations.
   - Information campaign.
6) Elaborate and adopt minimal technical and operational requirements for regulated waterways
   - Technical and legal study of possible requirements taking into account existing dimensions and other technical characteristics of waterways and ports, legal obligations and best practices, existing plans and projects, forecast economic needs, and comprising recommendations and/or alternative options.
   - Prepare a draft instrument.
   - Organize negotiations through one or more working groups set up within the Mekong Navigation Facilitation Committee; formal adoption of instrument by the Committee.
   - Finalize the instrument including its transposition into national regulatory instruments.
   - Instruct competent authorities to implement and enforce the new instruments.

BUDGET

Mekong Navigation Facilitation Committee	p.m.
3 international experts each four months at 12,000 US$/month	144,000 US$
4 local experts each 36 months at 1,000 US$/month	144,000 US$
Total:	**288,000 US$**

HUMAN RESOURCES

National experts (all activities).

International legal expert (all activities except 2).

International nautical expert (activities 4and 6).

International waterway and port engineering expert (activity 6).

PROPOSED EXECUTING/IMPLEMENTING AGENCY

MPWT Cambodia and MoT Viet Nam.

TIME AND WORK SCHEDULE

1) Operationalize the Mekong Navigation Facilitation Committee: First half 2016.
2) Issue documents and permits for inland waterway vessels: 2016.
3) Implement the rules on formalities and dues and taxes: 2016.
4) Harmonize, implement and enforce rules and regulationsrules and regulations for safe navigation and the avoidance of collisions (including rules of the road):2016-2017.
5) 5) Elaborate a third party liability insurance system:2017-2018.
6) 6)Elaborate and adopt minimal technical and operational requirements for regulated waterways:2016.

SOCIAL ISSUES

This action is not expected to have any adverse social impacts. Implementing the agreement will provide socio-economic benefits to Cambodia and Viet Nam.

ENVIRONMENTAL ISSUES

This action is not expected to have any adverse environmental impacts.

ECONOMIC ASSESSMENT

An economic assessment of this action is not considered to be relevant or necessary. However, its implementation may be expected to enhance the economic benefits of other actions by:

1) Ensuring the application of agreed tariffs for actual services performed, thereby improving the competitiveness and market acceptance of IWT as compared with road transport;
2) Improving the safety and ensuring the sustainability safety of cross border navigation and port operations.

PRIORITY OF ACTION (H/M/L)

Very High.

FINANCING PLAN (PUBLIC/PRIVATE)

National budgets of Cambodia and Viet Nam.

PRIOR ACTIONS REQUIRED

None.

FOLLOW-UP ACTIONS REQUIRED

None.

7.2 SHORT TERM REGULATORY ACTION 2 (SRE2)

TITLE

Transpose into national law and enforce existing harmonized rules and regulations made under the Quadripartite Agreement on Commercial Navigation on the Lancang-Mekong River.

BACKGROUND AND RATIONALE

Based on the Agreement on Commercial Navigation on the Lancang-Mekong River between China, the Lao PDR, Myanmar and Thailand, which was signed in 2000, a number of common regulations were adopted in the JCCCN which still need further implementation. First of all, these regulations should be transposed into domestic law. Next, they should be effectively implemented and enforced.

LOCATION

Lao PDR, Thailand, Myanmar and/or China.

OBJECTIVES

The effective implementation of the Agreement will significantly facilitate international and cross-border waterborne transportation of cargo and passengers, increase the competitiveness of the national economies and enhance safety and sustainability of navigation and port operations.

OUTPUTS AND DELIVERABLES

1) National legal instruments to implementthe Quadripartite Agreement and the subordinate instruments adopted under it;
2) Enforcement activities.

ACTIVITIES

3) National legal instruments to implementthe Quadripartite Agreement and the subordinate instruments adopted under it
   - Prepare the necessary national legal instruments including modification and/or abolition of incompatible existing instruments;
   - Formally adopt and promulgate the new instruments;
   - Information campaign.
4) Enforcement activities
   - Appointment of enforcement agencies;
   - Training of staff;
   - Information campaign.

BUDGET

International expert during three months at 12,000 US$/month	36,000 US$
4 National experts during 24 months at 1,000 US$/month	96,000 US$
Two enforcement agencies	p.m.
Total	**132,000 US$**

HUMAN RESOURCES

National experts (all activities).

International legal expert (all activities).

PROPOSED EXECUTING/IMPLEMENTING AGENCY

Marine Department Thailand and Waterway Department Lao PDR.

TIME AND WORK SCHEDULE

1) National legal instruments to implement the Quadripartite Agreement and the subordinate instruments adopted under it:2016-2017.
2) Enforcement activities:2017.

SOCIAL ISSUES

This action is not expected to have any adverse social impacts. Implementing the agreement will provide socio-economic benefits to countries in the Upper Mekong.

ENVIRONMENTAL ISSUES

This action is not expected to have any adverse environmental impacts.

ECONOMIC ASSESSMENT

An economic assessment of this action is not considered to be relevant or necessary. However, its implementation may be expected to enhance the economic benefits of other actionsby:

- Ensuring the application of agreed tariffs for actual services performed, thereby improving the competitiveness and market acceptance of IWT as compared with road transport;
- Improving the safety and ensuring the sustainability safety of cross border navigation and port operations.

PRIORITY OF ACTION (H/M/L)

High.

FINANCING PLAN (PUBLIC/PRIVATE)

National budgets.

PRIOR ACTIONS REQUIRED

None.

FOLLOW-UP ACTIONS REQUIRED

None.

7.3 SHORT TERM REGULATORY ACTION 3 (SRE3)

TITLE

Adopt, implement and enforce harmonized safety and anti-pollution rules for the Lao PDR and Thailand.

BACKGROUND AND RATIONALE

In order to address safety issues, the Lao PDR and Thailand should work towards the adoption of a set of common safety and anti-pollution rules for those stretches of the Mekong which are outside the scope of the Quadripartite Agreement (i.e. from Luang Prabang down to the Khone Falls). To the extent that no national rules are available, it is preferable to immediately draft a common instrument rather than first elaborate two national instruments which would subsequently be harmonized.

LOCATION

Lao PDR and Thailand.

OBJECTIVES

The adoption of safety and anti-pollution rules will enhance risk prevention and emergency and pollution response. It will make transportation and tourism services more attractive, protect workers and passengers and be beneficial to the protection of the environment.

OUTPUTS AND DELIVERABLES

1) Common rules on safety of vessels including on inspection of vessels.
2) Common rules on anti-pollution.

ACTIVITIES

1) Common rules on safety of vessels including on inspection of vessels
   - Collect, where needed translate, and analyze all existing rules and regulations in light of the provisions of the Quadripartite Agreement, treaty obligations of the States and international best practices.
   - Prepare drafts of rules and regulations.
   - Organize negotiations through one or more working groups set up by the countries; formal adoption of rules and regulations by the governments.
   - Finalize rules and regulations including their transposition into national regulatory instruments.
   - Instruct competent authorities to implement and enforce the new rules and regulations.
   - Information campaign.
2) Common rules on anti-pollution
   - Collect, where needed translate, and analyze all existing rules and regulations in light of the provisions of the Quadripartite Agreement, treaty obligations of the States and international best practices.
   - Prepare drafts of rules and regulations.
   - Organize negotiations through one or more working groups set up by the countries; formal adoption of rules and regulations by the governments.
   - Finalize rules and regulations including their transposition into national regulatory instruments.

- Instruct competent authorities to implement and enforce the new rules and regulations.
- Information campaign.

BUDGET

2 international experts each during three months at 12,000 US$/month	72,000 US$
4 local experts during 24 months at 1,000 US$/month	96,000 US$
Consultation meetings	12,000 US$
Total	**180,000 US$**

HUMAN RESOURCES

National experts (all activities).

International legal expert (all activities).

International nautical expert (all activities).

PROPOSED EXECUTING/IMPLEMENTING AGENCY

Marine Department and MONRE Thailand, Waterway Department and MONRE Lao PDR.

TIME AND WORK SCHEDULE

1) Common rules on safety of vessels including on inspection of vessels:2016-2017.
2) Common rules on anti-pollution:2016-2017.

SOCIAL ISSUES

This action is not expected to have any adverse social impacts. Preventing oil spill and water pollution will benefit local communities that depend on natural resources and fisheries for their livelihoods.

ENVIRONMENTAL ISSUES

This action could have a positive impact on the environment. Improving waterway safety, contingency planning and waste management can reduce the risks of oil spills and water pollution.

ECONOMIC ASSESSMENT

This action will have safety and environmental benefits, the economic impact of which cannot be measured here.

PRIORITY OF ACTION (H/M/L)

High.

FINANCING PLAN (PUBLIC/PRIVATE)

National budgets .

PRIOR ACTIONS REQUIRED

None.

FOLLOW-UP ACTIONS REQUIRED

None.

7.4 SHORT TERM REGULATORY ACTION 4 (SRE4)

TITLE

Adopt plans and procedures for port safety and emergency response

BACKGROUND AND RATIONALE

In every port, but particularlyin passenger ports,adequate safety and emergency response plans and procedures should be in place.

LOCATION

Cambodia, Lao PDR, Thailand and Viet Nam.

OBJECTIVES

The availability of adequate safety and emergency response standards, plans and procedures will be beneficial to the development of waterborne transportation of passengers and cargo, of ports activities and of tourism as well as for the protection of human life and health and the environment.

OUTPUTS AND DELIVERABLES

Standards, plans and procedures for port safety and emergency response.

ACTIVITIES

- Collection and analysis of existing standards, plans and procedures;
- Preparation of draft standards, plans and procedures;
- Discussion with relevant regional and/or national and/or local (port) authorities;
- Formal adoption of standards, plans and procedures;
- Training;
- Information campaign.

BUDGET

3 international experts during 3 months at 12,000 US$/month	108,000 US$
4 national experts during 12 months at 1,000 US$/month	48,000 US$
Total	**156,000 US$**

HUMAN RESOURCES

National experts.

International legal expert.

International nautical expert.

International port operations expert.

PROPOSED EXECUTING/IMPLEMENTING AGENCY

MRCS.

TIME AND WORK SCHEDULE

2016-2017.

SOCIAL ISSUES

This action is not expected to have any adverse social impacts. Improving port safety can protect workers from injury, illness and death.

ENVIRONMENTAL ISSUES

This action is not expected to have any adverse environmental impacts. Adopting rules for port safety and emergency response can be used to avoid, reduce or mitigate the impacts of oil spill pollution.

ECONOMIC ASSESSMENT

This action will have safety benefits, the economic impact of which cannot be measured here.

PRIORITY OF ACTION (H/M/L)

High.

FINANCING PLAN (PUBLIC/PRIVATE)

International grant.

PRIOR ACTIONS REQUIRED

None.

FOLLOW-UP ACTIONS REQUIRED

None.

7.5 SHORT TERM REGULATORY ACTION 5 (SRE5)

TITLE

Study inclusive policy and regulatory recommendations on measures to enhance legal protection of passengers.

BACKGROUND AND RATIONALE

Improvement of the legal framework for the protection of passengers in case of accidents or damage.

LOCATION

Cambodia, Lao PDR, Thailand and Viet Nam.

OBJECTIVES

Adequate legal protection of ship and boat passengers including cruise tourists will not only improve the position of the passengers but also enhance the overall attractiveness of waterborne passenger transportation.

OUTPUTS AND DELIVERABLES

1) Legal study on the improvement of passenger's protection.
2) Rules and regulations on the legal protection of passengers.

ACTIVITIES

1) A comprehensive legal study of current rules and mechanisms dealing with passenger protection, particularlyof applicable liability rules in case of death, personal injury and loss of or damage to luggage, rules on insurance, procedural rules, harmonization of rules across the borders, international benchmarks etc., comprising concrete measures to improve or complement current arrangements.
2) Rules and regulations on the legal protection of passengers: preparation of draft legal instruments if needed, discussion with relevant regional and/or national and/or local (port) authorities, formal adoption of instruments and information campaign.

BUDGET

International expert during 3 months at 12,000 US$/month	36,000 US$
4 national experts during 12 months at 1,000 US$/month	48,000 US$
Total	**84,000 US$**

HUMAN RESOURCES

National experts (all activities).

International legal expert (all activities).

PROPOSED EXECUTING/IMPLEMENTING AGENCY

MRC.

TIME AND WORK SCHEDULE

1) Legal study on the improvement of passenger's protection: 2016.
2) Rules and regulations on the legal protection of passengers: 2017.

SOCIAL ISSUES

This action is not expected to have any adverse social impacts.

ENVIRONMENTAL ISSUES

This action is not expected to have any adverse environmental impacts.

ECONOMIC ASSESSMENT

This action will have welfare benefits for passengers, the economic impact of which cannot be measured here.

PRIORITY OF ACTION (H/M/L)

High.

FINANCING PLAN (PUBLIC/PRIVATE)

International grant.

PRIOR ACTIONS REQUIRED

None.

FOLLOW-UP ACTIONS REQUIRED

None.

7.6 SHORT TERM REGULATORY ACTION 6 (SRE6)

TITLE

Ensure effective law enforcement

BACKGROUND AND RATIONALE

Generally, law enforcement levels remain insufficient. National line agencies have limited budgets, resources and technical capacity to conduct inspections and ensure compliance with applicable laws and regulations. The legal framework for enforcement activities shows serious gaps.

LOCATION

Cambodia, Lao PDR, Thailand and Viet Nam.

OBJECTIVES

Effective law enforcement will be conducive to higher levels of legal certainty, to transparency and non-discrimination and to economic development and the protection of human life and the environment.

OUTPUTS AND DELIVERABLES

1) Strengthening the enforcement agencies.
2) Awareness, capacity building and training campaign.

ACTIVITIES

1) Strengthening the enforcement agencies
   - Study on the legal framework for law enforcement (legal provisions on incentives and penalties, powers of enforcement agencies, appeal procedures, effectiveness of current enforcement system), comprising identification of gaps, the need for new regional and national arrangements and other recommendations;
   - Preparation of legal instrument if needed;
   - Adoption of legal instruments.

2) Awareness, capacity building and training campaigns
   - Awareness campaign directed towards competent agencies and the private sector;
   - Capacity building and training, including training on the legal aspects of the enforcement system.

BUDGET

Study of the legal framework:	
2 international consultants during 3 months at 12,000 US$/month	72,000 US$
4 local experts during 6 months at 1,000 US$/month	24,000 US$
Strengthening the enforcement agencies by capacity building and training activities:	
4 training sessions at 30,000 US$/session	120,000 US$
Total	**216,000 US$**

HUMAN RESOURCES

National experts (all activities).

International legal expert (all activities).

International law enforcement expert (all activities).

PROPOSED EXECUTING/IMPLEMENTING AGENCY

Coordination:MRC. Execution: MPWT in Lao PDR and Cambodia, MoT in Thailand and Viet Nam.

TIME AND WORK SCHEDULE

1) Strengthening the enforcement agencies:2016-2017.
2) Awareness, capacity building and training campaign: 2018.

SOCIAL ISSUES

This action is not expected to have any adverse social impacts. Sunset clauses should be implemented to allow time for local boat operators and waterway users to comply with new rules. Capacity building and awareness programs would be required at all levels.

ENVIRONMENTAL ISSUES

This action is not expected to have any adverse environmental impacts. Ensure coordination with Ministry/Departments responsible for water resources, environment and natural resources. Ensure coordination with laws relating to environmental protection, pollution control and waste management.

ECONOMIC ASSESSMENT

This action will have safety and environmental benefits, the economic impact of which cannot be measured here.

PRIORITY OF ACTION (H/M/L)

High.

FINANCING PLAN (PUBLIC/PRIVATE)

Study legal framework: international grant. Training sessions: national budgets.

PRIOR ACTIONS REQUIRED

None.

FOLLOW-UP ACTIONS REQUIRED

None.

7.7 LONG TERM REGULATORY ACTION 1 (LRE1)

TITLE

Further implement the Cambodian-Vietnamese Agreement on Waterway Transportation

BACKGROUND AND RATIONALE

Additional actions to effectively implement the Agreement between Cambodia and Viet Nam on Waterway Transportation, which was signed in 2009.

LOCATION

Cambodia and Viet Nam.

OBJECTIVES

Full implementation of the Agreement will significantly facilitate international and cross-border waterborne transportation of cargo and passengers, increase the competitiveness of the Cambodian and Vietnamese economies and enhance the safety and sustainability of navigation and port operations.

OUTPUTS AND DELIVERABLES

Harmonize, implement and enforce rules and regulations.

The Agreement between Cambodia and Viet Nam on Waterway Transportation entrusts the Mekong Navigation Facilitation Committee with the preparation of a number of harmonized rules and regulations. The following should be elaborated in the long term:

a) Rules and regulations on aids to navigation;

b) Rules and regulations on vessel traffic services;

c) Rules and regulations on search and rescue services and on the provision of adequate salvage capacity;

d) Rules and regulations laying down common training and certification standards;

e) Rules and regulations on the use and operation of floating structures.

ACTIVITIES

- Collect, where needed translate, and analyze all existing rules and regulations in light of the provisions of the Agreement, other treaty obligations of the States and international best practices.
- Prepare drafts of harmonized rules and regulations.
- Organize negotiations through one or more working groups set up within the Mekong Navigation Facilitation Committee; formal adoption of rules and regulations by the Committee.
- Finalize rules and regulations including their transposition into national regulatory instruments.
- Instruct competent authorities to implement and enforce the new rules and regulations.
- Information campaign.

BUDGET

3 international experts each three months at 12,000 US$/month	108,000 US$
4 local experts each 12 months at 1,000 US$/month	48,000 US$
Total	**156,000 US$**

HUMAN RESOURCES

National experts.

International legal expert.

International nautical expert.

International VTS expert.

PROPOSED EXECUTING/IMPLEMENTING AGENCY

MPWT – Waterway Transport Department Cambodia and MoT – VIWA Viet Nam.

TIME AND WORK SCHEDULE

2021-2024.

SOCIAL ISSUES

This action is not expected to have any adverse social impacts. Implementing the agreement would provide socio-economic benefits to Cambodia and Viet Nam. In the long-term, there should be a focus on benefit sharing mechanisms to ensure inclusive development in the IWT sector.

ENVIRONMENTAL ISSUES

This action is not expected to have any adverse environmental impacts. Ensure coordination with Ministry/Departments responsible for water resources, environment and natural resources. Ensure coordination with laws relating to environmental protection, pollution control and waste management.

ECONOMIC ASSESSMENT

This action will primarily have safety benefits, the economic impact of which cannot be measured here.

PRIORITY OF ACTION (H/M/L)

Very high.

FINANCING PLAN (PUBLIC/PRIVATE)

International grant.

PRIOR ACTIONS REQUIRED

None.

FOLLOW-UP ACTIONS REQUIRED

None.

7.8 LONG TERM REGULATORY ACTION 2 (LRE2)

TITLE

Further implement the Quadripartite Agreement on Commercial Navigation on the Lancang-Mekong River

BACKGROUND AND RATIONALE

In order to further elaborate and update the regulatory framework on navigation under the Quadripartite Agreement, a number of additional actions will be needed, focusing on the registration and safety of vessels, crew qualifications, training and certification, traffic safety and environmental protection.

LOCATION

Lao PDR, Thailand, Myanmar and/or China.

OBJECTIVES

The further implementation of the QuadripartiteAgreement will significantly facilitate international and cross-border waterborne transportation of cargo and passengers, increase the competitiveness of the national economies and enhance the safety and sustainability of navigation and port operations.

OUTPUTS AND DELIVERABLES

1) Comprehensive and updated regulatory framework for the registration of vessels;
2) Comprehensive and updated regulatory framework for the safety of vessels including construction standards and inspection system;
3) Comprehensive and updated regulatory framework for training, qualifications and certification of crews;
4) Comprehensive and updated regulatory framework for safety and aids to navigation including collision regulations;
5) Comprehensive and updated regulatory framework for environmental protection and management.

ACTIVITIES

1) Comprehensive and updated regulatory framework for the registration of vessels
   - Legal and technical study on gaps and updates of the regulatory framework.
   - Drafting of a proposal for new rules and regulations.
   - Formally adopt and promulgate the new instruments.
   - Appointment of enforcement agencies.
   - Training of staff.
   - Information campaign.
2) Comprehensive and updated regulatory framework for the safety of vessels including construction standards and inspection system
   - Legal and technical study on gaps and updates of the regulatory framework.
   - Drafting of a proposal for new rules and regulations.
   - Formally adopt and promulgate the new instruments.
   - Appointment of enforcement agencies.

- Training of staff.
- Information campaign.

3) Comprehensive and updated regulatory framework for training, qualifications and certification of crews
   - Legal and technical study on gaps and updates of the regulatory framework.
   - Drafting of a proposal for new rules and regulations.
   - Formally adopt and promulgate the new instruments.
   - Appointment of enforcement agencies.
   - Training of staff.
   - Information campaign.
4) Comprehensive and updated regulatory framework for safety and aids to navigation including collision regulations
   - Legal and technical study on gaps and updates of the regulatory framework.
   - Drafting of a proposal for new rules and regulations.
   - Formally adopt and promulgate the new instruments.
   - Appointment of enforcement agencies.
   - Training of staff.
   - Information campaign.
5) Comprehensive and updated regulatory framework for environmental protection and management
   - Legal and technical study on gaps and updates of the regulatory framework.
   - Drafting of a proposal for new rules and regulations.
   - Formally adopt and promulgate the new instruments.
   - Appointment of enforcement agencies.
   - Training of staff.
   - Information campaign.

BUDGET

3 International experts during three months at 12,000 US$/month	108,000 US$
8 National experts during 12 months at 1,000 US$/month	96,000 US$
Training Activities	100,000 US$
Total	**304,000 US$**

HUMAN RESOURCES

National experts.

International legal expert.

International nautical expert.

International environmental expert.

PROPOSED EXECUTING/IMPLEMENTING AGENCY

Marine Department Thailand and Waterway Department Lao PDR.

TIME AND WORK SCHEDULE

1) Comprehensive and updated regulatory framework for the registration of vessels: 2021-2040.
2) Comprehensive and updated regulatory framework for the safety of vessels including construction standards and inspection system: 2021-2040.
3) Comprehensive and updated regulatory framework for training, qualifications and certification of crews: 2021-2040.
4) Comprehensive and updated regulatory framework for safety and aids to navigation including collision regulations: 2021-2040.
5) Comprehensive and updated regulatory framework for environmental protection and management: 2021-2040.

SOCIAL ISSUES

This action is not expected to have any adverse social impacts. Implementing the agreement will provide socio-economic benefits to countries in the Upper Mekong. In the longterm, measure the direct and indirect benefits of IWT in the Upper Mekong to ensure inclusive development.

ENVIRONMENTAL ISSUES

This action is not expected to have any adverse environmental impacts. In the long term the agreement should focus on contingency planning, environmental protection and waste management.

ECONOMIC ASSESSMENT

This action will have safety and environmental benefits, the economic impact of which cannot be measured here.

PRIORITY OF ACTION (H/M/L)

High.

FINANCING PLAN (PUBLIC/PRIVATE)

National budgets.

PRIOR ACTIONS REQUIRED

None.

FOLLOW-UP ACTIONS REQUIRED

None.

7.9 LONG TERM REGULATORY ACTION 3 (LRE3)

TITLE

Further elaborate and harmonize the regulatory framework for waterborne transportation between Luang Prabang and the Khone Falls.

BACKGROUND AND RATIONALE

Gradual elaboration and harmonization of the regulatory framework for waterborne transportation between Luang Prabang and the Khone Falls.

LOCATION

Lao PDR and Thailand.

OBJECTIVES

The elaboration of a harmonized regulatory framework will facilitate international and cross-border waterborne transportation of cargo and passengers, increase the competitiveness of the Lao and Thai economies and enhance the safety and sustainability of navigation and port operations. The governments may also wish to consider extending the territorial scope of the Quadripartite Agreement and its annexes or agreeing on a specific bilateral navigation agreement.

OUTPUTS AND DELIVERABLES

1) Comprehensive and updated regulatory framework for the registration of vessels;
2) Comprehensive and updated regulatory framework for the safety of vessels including construction standards and inspection system;
3) Comprehensive and updated regulatory framework for training, qualifications and certification of crews;
4) Comprehensive and updated regulatory framework for safety and aids to navigation including collision regulations;
5) Comprehensive and updated regulatory framework for environmental protection and management.

ACTIVITIES

1) Comprehensive and updated regulatory framework for the registration of vessels
   - Legal and technical study on gaps and updates of the regulatory framework.
   - Drafting of a proposal for new rules and regulations.
   - Formally adopt and promulgate the new instruments.
   - Appointment of enforcement agencies.
   - Training of staff.
   - Information campaign.
2) Comprehensive and updated regulatory framework for the safety of vessels including construction standards and inspection system
   - Legal and technical study on gaps and updates of the regulatory framework.
   - Drafting of a proposal for new rules and regulations.
   - Formally adopt and promulgate the new instruments.
   - Appointment of enforcement agencies.
   - Training of staff.

- Information campaign.

3) Comprehensive and updated regulatory framework for training, qualifications and certification of crews
   - Legal and technical study on gaps and updates of the regulatory framework.
   - Drafting of a proposal for new rules and regulations.
   - Formally adopt and promulgate the new instruments.
   - Appointment of enforcement agencies.
   - Training of staff.
   - Information campaign.
4) Comprehensive and updated regulatory framework for safety and aids to navigation including collision regulations
   - Legal and technical study on gaps and updates of the regulatory framework.
   - Drafting of a proposal for new rules and regulations.
   - Formally adopt and promulgate the new instruments.
   - Appointment of enforcement agencies.
   - Training of staff.
   - Information campaign.
5) Comprehensive and updated regulatory framework for environmental protection and management
   - Legal and technical study on gaps and updates of the regulatory framework.
   - Drafting of a proposal for new rules and regulations.
   - Formally adopt and promulgate the new instruments.
   - Appointment of enforcement agencies.
   - Training of staff.
   - Information campaign.

BUDGET

3 International experts during three months at 12,000 US$/month	108,000 US$
8 National experts during 12 months at 1,000 US$/month	96,000 US$
Training Activities	100,000 US$
Total	**304,000 US$**

HUMAN RESOURCES

National experts.

International legal expert.

International nautical expert

International environmental expert.

PROPOSED EXECUTING/IMPLEMENTING AGENCY

Marine Department Thailand and Waterway Department Lao PDR.

TIME AND WORK SCHEDULE

1) Comprehensive and updated regulatory framework for the registration of vessels: 2020-2040.
2) Comprehensive and updated regulatory framework for the safety of vessels including construction standards and inspection system: 2020-2040.
3) Comprehensive and updated regulatory framework for training, qualifications and certification of crews: 2020-2040.
4) Comprehensive and updated regulatory framework for safety and aids to navigation including collision regulations: 2020-2040.
5) Comprehensive and updated regulatory framework for environmental protection and management: 2020-2040.

SOCIAL ISSUES

This action is not expected to have any adverse social impacts.

ENVIRONMENTAL ISSUES

This action is not expected to have any adverse environmental impacts.

ECONOMIC ASSESSMENT

The primary benefit of this action is likely to be the improved safety of navigation on this stretch, the economic impact of which cannot be measured here.

PRIORITY OF ACTION (H/M/L)

Medium.

FINANCING PLAN (PUBLIC/PRIVATE)

National budgets.

PRIOR ACTIONS REQUIRED

None.

FOLLOW-UP ACTIONS REQUIRED

None.

7.10 LONG TERM REGULATORY ACTION 4 (LRE4)

TITLE

Develop a regulatory framework for ports

BACKGROUND AND RATIONALE

The adoption of rules and regulations governing port planning, design, construction and maintenance, and an adequate legal framework for port management and state-of-the-art port regulations.

LOCATION

Lao PDR, Thailand, Cambodia, Viet Nam.

OBJECTIVES

Improve the efficiency of ports and the competiveness and sustainability of waterborne transportation on the Mekong.

OUTPUTS AND DELIVERABLES

1) Adopt, implement and enforce technical regulations and standards for port planning, design, construction and maintenance:
   - The purpose of this action is to establish uniform and enforceable technical minimum standards for all public and private ports handling passengers and/or cargo in order to ensure that they are properly planned, designed, constructed and maintained and that crews, passengers and port workers and the environment are protected.
2) Complement and further integrate the regulatory framework for port management
   - The management model of Mekong ports varies considerably. Separate or autonomous port authorities manage some ports, while others fall under the competence of a national ministry. Some but not all ports levy port dues and charges. Few ports apply a landlord model under which handling activities are carried out by the private sector. Comprehensive laws and regulations on port management are not in place everywhere. A comprehensive review of the management models and of the legal frameworks is likely to lead to an improvement of the relevant institutional and legal arrangements.
3) Adopt, implement and enforce port regulations
   - Port regulations (port bylaws) are usually issued by a governmental agency or a port authority and govern the conduct of vessels, safety and order in the port area, the protection of the environment, embarkation and disembarkation of passengers, loading and discharging of goods, crisis management and the powers of harbor masters, among others. Every Mekong port (big or small) should at least have an adequate form of theseregulations.

ACTIVITIES

1) Adopt, implement and enforce technical regulations and standards for port planning, design, construction and maintenance:
   - Technical and legal study on required regulations and standards including of best practices and recommendations.
   - Drafting of a proposal for regulations and standards.
   - Formally adopt and promulgate the new instruments.
   - Training of staff.
   - Information campaign.

2) Complement and further integrate the regulatory framework for port management
   - Legal and economic study on current port management arrangements including of international best practices, local needs and recommendations.
   - Drafting of a proposal for new laws and regulations.
   - Formally adopt and promulgate the new instruments.
   - Information campaign.
3) Adopt, implement and enforce port regulations
   - Legal and economic study on current port management arrangements including of international best practices, local needs and recommendations.
   - Drafting of a proposal for new laws and regulations.
   - Formally adopt and promulgate the new instruments.
   - Information campaign.

BUDGET

4 international experts during 3 months at 12,000 US$/month	144,000 US$
16 national experts during 6 months at 1,000 US$/month	96,000 US$
Total	**250,000 US$**

HUMAN RESOURCES

National experts.

International legal expert.

International waterway and port engineering expert.

International port management expert.

International nautical expert.

PROPOSED EXECUTING/IMPLEMENTING AGENCY

MRC.

TIME AND WORK SCHEDULE

1) Adopt, implement and enforce technical regulations and standards for port planning, design, construction and maintenance: 2021-2024.
2) Complement and further integrate the regulatory framework for port management: 2021-2024.
3) Adopt, implement and enforce port regulations: 2021-2024.

SOCIAL ISSUES

This action is not expected to have any adverse social impacts. Improving port safety can protect workers from injury, illness and death.

ENVIRONMENTAL ISSUES

This action is not expected to have any adverse environmental impacts. Adopting regulations for port safety and emergency response can be used to avoid, reduce or mitigate the impacts of oil spill pollution and improve environmental management.

ECONOMIC ASSESSMENT

Not relevant.

PRIORITY OF ACTION (H/M/L)

High.

FINANCING PLAN (PUBLIC/PRIVATE)

International grant.

PRIOR ACTIONS REQUIRED

None.

FOLLOW-UP ACTIONS REQUIRED

None.

7.11 LONG TERM REGULATORY ACTION 5 (LRE5)

TITLE

Ensure effective implementation and enforcement of rules and regulations

BACKGROUND AND RATIONALE

Ensuring sufficient levels of effective implementation and enforcement of regulatory instruments is likely to remain a concern and will therefore require a continuous effort.

LOCATION

Cambodia, Lao PDR, Thailand and Viet Nam.

OBJECTIVES

Effective law enforcement will be conducive to higher levels of legal certainty, to transparency and non-discrimination and to economic development and the protection of human life and the environment.

OUTPUTS AND DELIVERABLES

1) Strengthening the enforcement agencies;
2) Awareness, capacity building and training campaign.

ACTIVITIES

- Awareness campaign directed towards competent agencies and the private sector;
- Capacity building and training, including training on the legal aspects of the enforcement system.

BUDGET

4 awareness campaigns at 30,000 US$/campaign	120,000 US$
4 capacity building and training sessions at 30,000 US$/session	120,000 US$
Total	**240,000 US$**

HUMAN RESOURCES

National experts.

International law enforcement expert.

PROPOSED EXECUTING/IMPLEMENTING AGENCY

Coordination:MRC. Execution: MPWT in Lao PDR and Cambodia, MoT in Thailand and Viet Nam.

TIME AND WORK SCHEDULE

Awareness, capacity building and training campaign: 2020-2040.

SOCIAL ISSUES

This action is not expected to have any adverse social impacts. On-going capacity building and awareness programs will be required at all levels.

ENVIRONMENTAL ISSUES

This action is not expected to have any adverse environmental impacts. Ensure coordination with Ministry/Departments responsible for transport, water resources, environment and natural resources and coordination with laws and rules relating to environmental protection, pollution control and waste management.

ECONOMIC ASSESSMENT

Not relevant.

PRIORITY OF ACTION (H/M/L)

Medium.

FINANCING PLAN (PUBLIC/PRIVATE)

National budgets.

PRIOR ACTIONS REQUIRED

None.

FOLLOW-UP ACTIONS REQUIRED

None.

8 ENVIRONMENTAL ACTIONS

8.1 SHORT TERM ENVIRONMENTAL ACTION 1 (SEN1)

TITLE

Develop environmental assessment guidelines for IWT on the Mekong River

BACKGROUND AND RATIONALE

The environmental impacts of IWT must be effectively managed to ensure sustainable development. Potential impacts are derived from the following activities:

1) Construction of navigation infrastructure e.g. ports and landing facilities;
2) Operational e.g. water pollution from oil spills, solid and liquid wastes, navigation accidents; and
3) Maintenance of the navigation channel and waterway conditions (e.g. dredging) and commercial extraction of sediment (e.g. sand mining).

There is an appropriate legal framework in all of the Member Countries to ensure that environmental and social assessment, management and monitoring is undertaken for existing and future IWT projects. The type of environmental and social assessment needed is determined by the size and type of the project and activities specified under the environmental protection and EIA laws. However, the capacity and resources of line agencies to monitor and enforce law and regulations for environmental protection in the inland navigation sector is limited. There is noguidance available for assessing IWT projects and activities in the Mekong region.

LOCATION

Consultation and training in all MRC Member Countries. Consultation with MRCS and national line agencies.

OBJECTIVES

The objectives of the environmental assessment guidelines are to:

- Enhance understanding in the IWT sector to improve understanding of assessing and managing social and environmental impacts;
- Develop technical guidance and capacity building programs for environmental assessment and monitoring of future IWT planning and project/activities in the LMB; and
- Considering the type/scope, location and effect of proposed IWT projects to determine mechanisms for transboundary assessment and management.

OUTPUTS AND DELIVERABLES

The outputs of this action are:

- **Output 1:Environmental assessment guidelines for inland navigation in the LMB:including** SEA, EIA and EMP and monitoring and also consider the potential transboundary impacts for port, vessel and waterway improvements.
- **Output 2:Environmental assessment training:**IWT and environment assessment training program for national line agencies responsible for environment, water resources, inland waterways and transport planning.

ACTIVITIES

The environmental assessment guidelines can be applied to port developments, dredging, waterway improvements and increased waterway use. The development of the environmental assessment guidelines for the IWT sector will be an interactive process and incorporate the following activities:

- Gap analysis of the application of the existing environmental legal framework in the Member Countries in relation to EIA, EMP and monitoring, including specific technical guidance related to ports, dredging, sand mining and vessels;
- Rapid baseline assessment of the environmental and social impacts of IWT in the LMB;
- Interviews with national line agencies responsible for environment/water resources, transport and the private sector;
- Analyze international best practice on SEA/integrated planning, EIA, EMP and monitoring of IWT strategies, projects and activities;
- Evaluate the status of Transboundary EIA (TbEIA) guidance and determine the proposed and existing IWT projects that could have transboundary impacts;
- Develop indicators for environmental assessment and monitoring;
- Prepare draft environmental assessment guidelines for consultation with national line agencies and private sector;
- Finalize draft environmental assessment guidelines; and
- Develop and deliver environmental assessment training for national line agencies and the private sector.

BUDGET

125,000US$

HUMAN RESOURCES

A team with the following expertise would be required to effectively implement the RSEA:

1) Transport and Environmental Impact Assessment Specialist/Team Leader;
2) Navigation Safeguards Specialist; and
3) Waterway transport planner.

PROPOSED EXECUTING / IMPLEMENTING AGENCY

MRCS, independent environmental consultancy, research institute or development partners.

TIME AND WORK SCHEDULE

Month	Output
1-3	Prepare draft **Output 1- Environmental assessment guidelines for inland navigation in the Mekong Basin**
4	Consultation with national line agencies and private sector
5	Finalize **Output 1- Environmental assessment guidelines for inland navigation in the Mekong Basin**
6	Prepare training materials and guidance for **Output 2 Environmental assessment training**
7-8	Deliver training to national line agencies and private sector
9	Finalize **Output 2 Environmental assessment training**

SOCIAL ISSUES

The action is not expected to have any adverse social impacts.

ENVIRONMENTAL ISSUES

This action is not expected to have any adverse environmental impacts.

ECONOMIC ASSESSMENT

Not relevant.

PRIORITY OF ACTION (H/M/L)

Very high: start the action in 2016 as there is a number of IWT development projects in the planning and development stages in the LMB.

FINANCING PLAN (PUBLIC / PRIVATE)

Development partners and/or donors could fund this action.

PRIOR ACTIONS REQUIRED

Stakeholder analysis to identify the relevant national line agencies and private sector to include in consultations and training programs.

FOLLOW-UP ACTIONS REQUIRED

Identify an IWT project or activity that could be used to trial the application of the environmental assessment guidelines.

8.2 SHORT TERM ENVIRONMENTAL ACTION 2 (SEN2)

TITLE

Conduct a Strategic Environment Assessment (SEA) for the Lancang - Mekong Development Plan on International Navigation on the Lancang - Mekong River (2014-2025)

BACKGROUND AND RATIONALE

Phase 1 of the draft '*Development Plan of International Navigation on the Lancang-Mekong River (2015-2020)*' aims to improve the channel from the Golden Triangle to Luang Prabang. Projects include: development of three cargo ports at Xiengkok, Pak Beng and Luang Prabang in Lao PDR; the improvement and maintenance of 146 rapids and shoals to allow navigation for up to 500DWT vessels; and the construction of four emergency response and rescue ships and 1199 aids to navigation.

The development plan proposes '*Environmental Impact and Protective Measures*'. However, these measures fail to adequately consider:

- Impacts and costs of dredging, reef blasting and maintaining the waterway channel;
- Assessment of ecosystems and critical habitats including habitat requirements for endangered species of fish, reptiles, amphibians, aquatic plants, birds and mammals at different stages of their life-cycles and how these will be affected by the navigation improvement;
- Hydromorphological impacts from reef blasting, dredging and other activities on the Mekong River and its floodplains;
- Environmental and social impacts of construction of ports and landing facilities and increased shipping and waterway use (e.g. oil spills, water pollution, air emissions, solid and liquid wastes, sewage);
- Future volumes of cargo and passenger transport;
- Climate risk assessment of existing and planned infrastructure.

The development plan anticipates rapid and shoal improvement works and port constructionundertaken in different sections of the Mekong River with high biodiversity and unique environmental and socio-economic conditions. Targeted project EIAs will need to be undertaken for each of the port developments and rapid and shoal improvement projects and dredging. A RSEA will provide the framework of guidance for a program of site specific EIAs and monitoring to mitigate or avoid impacts.

LOCATION

The Upper Mekong between the Golden Triangle and Luang Prabang, including consultation with LNMC, TNMC and representatives of MRCS and the JCCCN.

OBJECTIVES

The objectives of the SEA are to:

1) Provide decision-makers with crucial knowledge of the social, environmental and economic impacts (positive and negative) prior to approving and implementing the Lancang Mekong Development Plan;
2) Determine how port construction and waterway improvement activities may be modified to avoid, offset or mitigate biodiversity and environmental impacts;
3) Establish environmental management and monitoring programs in line with national regulations and the MRC Water Quality Procedure (PWQ);

4) Enhance coordination between key actors at the regional and national level around environmental protection, transboundary cooperation and management.

OUTPUTS AND DELIVERABLES

The outputs of the SEA will be:

- **Output 1: Baseline report**- current status of the biophysical and socio-economic conditions between the Golden Triangle and Luang Prabang.
- **Output 2: Impact assessment report**- determine the significance of the cumulative impacts of the Lancang Mekong Development plan on biophysical and socio-economic conditions of the Upper Mekong.
- **Output 3: Environment and social safeguards**- management and monitoring plans to mitigate, avoid or reduce identified impacts and risks.

ACTIVITIES

An SEA of the Lancang-Mekong Development Plan is proposed to assess the impacts of rapid and shoal improvement, port construction and increased shipping on the biodiversity of the Mekong River. The SEA will incorporate environmental assessments for specific projects and activities, and integrate the following activities:

- Baseline assessment of water quality, environmental flow, sediment management, hydromorphology, biodiversity and climate change in relation to inland navigation;
- Evaluate the NAP hotspot and dangerous area surveys to determine the location of rapids, shoals and deep pools in relation to critical habitats for aquatic species;
- Google satellite image analysis to identify and map the in-stream wetlands and other critical habitats;
- Ecological assessment of fisheries, biodiversity, habitats, important wetlands and protected areas for specific stretches of the Mekong River;
- Modeling the hydromorphological impacts of waterway improvements (dredging and reef removal) between the Golden Triangle and Luang Prabang;
- Determine the water quality impacts of increased sedimentation and total suspended solids (TSS) on aquatic environments;
- Assess habitat requirements of endangered (Red-List) species of birds, mammals reptiles, amphibians, fish and aquatic plants at different stages of their life-cycles, and how these will be affected by the navigation improvement;
- Assess the implications of the navigation improvement on the national/regional/global conservation value of impacted endangered populations between the Golden Triangle and Luang Prabang;
- Support transboundary management for inland navigation (e.g. shared maintenance of waterways, oil spill response); and
- Develop environmental safeguards for the inland navigation sector.

BUDGET

350,000 US$

HUMAN RESOURCES

A team with the following expertise would be required to effectively implement the RSEA:

1) Ecologist and Environment Assessment Specialist/Team Leader;
2) Fish Specialist;

3) Bird Specialist;
4) Amphibians Specialist;
5) Navigation Safeguards Specialist;
6) Hydrographic Surveying Specialist;
7) Hydrologist and Sediment Specialist;
8) Transport and Environmental Impact Assessment Specialist;
9) Aquatic Biodiversity and Wetlands Specialist;
10) GIS Analyst; and
11) Climate Risk and Resilience Specialist.

PROPOSED EXECUTING / IMPLEMENTING AGENCY

MRCS, independent environmental consultancy, research institute or development partners.

TIME AND WORK SCHEDULE

Month	Output
1-3	Prepare **Output 1- Baseline report**
4	National/regional consultation on Baseline report
5-6	Prepare **Output 2- Impact Assessment Report**
7	National/regional consultation on Impact Assessment Report
8	Prepare **Output 3- Environment and Social Safeguards**
9	Capacity building and training for transport/environment line agencies, civil society and other stakeholders.

SOCIAL ISSUES

The action is not expected to have any adverse social impacts. A stakeholder analysis will be undertaken prior to consultations, training and capacity building activities to identify and involve key stakeholders.

ENVIRONMENTAL ISSUES

This action is not expected to have any adverse environmental impacts.

ECONOMIC ASSESSMENT

Not relevant.

PRIORITY OF ACTION (H/M/L)

Very high: start this action in 2016 as the Lancang Mekong Development Plan will commence implementation in 2016.

FINANCING PLAN (PUBLIC/PRIVATE)

Development partners and/or donors could fund the SEA.

PRIOR ACTIONS REQUIRED

Prepare detailed TOR for the SEA of the Lancang Mekong Development Plan.

FOLLOW-UP ACTIONS REQUIRED

Identify potential grants, development partners and donors to fund this action.

8.3 SHORT TERM ENVIRONMENTAL ACTION 3 (SEN3)

TITLE

Conduct an optimization study of dredging sand from the Mekong River at various places that are not creating a negative impact on the river behavior or ecological status.

BACKGROUND AND RATIONALE

A morphological feasibility study should indicate the places where sand dredging or excavation has limited or reduced impact on the river behavior or ecological status. Dredging includes impacts to aquatic ecosystems and habitat (especially fish spawning areas) from dredging operations, impacts to terrestrial flora/fauna and natural habitats, as sites of on-land disposal of dredged material poses a threat to the aquatic environment not only through the disposal of dredged material, but also the dispersal of pollutants into surface waters during dredging.

It is important that new dredging projects are assessed with consideration for the main natural functions of river systems, including:

1) Morphological processes (e.g. erosion, sediment transport and sedimentation);
2) Maintenance of the hydrological balance (e.g. flood pulse);
3) Maintenance of the sediment balance;
4) Provision of habitat (ecosystem connectivity); and
5) Maintenance of biological and chemical processes (nutrient cycles).

Modifying or maintaining the navigation channel can have significant hydromorphological impacts on the Mekong River. Hydromorphological changes can have far-reaching impacts upstream and downstream from dredging activities, significantly affecting river system dynamics and interfering with the exchange of water and sediments between the mainstream and its tributaries and flood plains (ECMT 2006). Dredging may induce changes in water levels, discharge regimes and riverbed geomorphology, affecting the dynamic characteristics of channel systems, sedimentation and erosion. Maintaining or modifying the waterway can result in a stabilized uniform channel, lacking both natural in-stream structures and connectivity with floodplains, leading to ecosystem degradation and loss of species (ICDPR 2010). In-stream structures include shoals, deep pools, reefs, rocks, rapids and sandbars. These provide critical habitats for fish and other aquatic organisms. River systems depend on unimpeded flow and the maintenance and connectivity among a variety of ecosystems (WWF 2013).

LOCATION

This study will be primarily home-based with field trips to major dredging sites in the Mekong Basin.

OBJECTIVES

The objectives of this study are to determine areas in the Mekong River that can be dredged to improve the navigation channel and where the impact is negligible or appropriate controls can significantly reduce the risks.

OUTPUTS AND DELIVERABLES

Output 1: Sustainable waterway maintenance in the Mekong Basin.

Output 2: Regional workshop.

ACTIVITIES

- Review the hydrographic atlas, waterway channel and dangerous conditions survey to determine areas that require dredging.
- Legal and institutional analysis of the environmental and operational requirements for dredging and/or sand mining in the Mekong Basin.

- Review existing studies on the impacts of dredging and sand mining i.e. reduced sediment load to the Mekong Delta.
- Analyze the ecological status of stretches along the Mekong River using WWF eco-regions, water quality data, bio-monitoring and State of Basin (SOB) reports.
- Prepare a survey on the extent of waterway dredging to be conducted with national line agencies, dredging companies, environmental monitoring and management agencies, environmental NGOs and research institutes.
- Field trip to areas of dredging and sand mining to interview operators and determine volumes of sand and gravel extracted.
- Using GIS software overlay dredging hotspots with WWF eco-regions and locations of high biodiversity, wetlands, community fishing zones and other environmental areas of significance.
- Determine the significance of dredging impacts for certain stretches along the Mekong River.
- Estimate the cumulative impacts of dredging and sand mining by calculating the total volume and type of sand and gravel extracted for a one-year period.
- Prepare draft impact and risk assessment and recommendations for a Dredging Environmental Management Plan (DEMP).
- Regional workshop to review the findings of the impacts of dredging and the DEMP.
- Prepare final report'Sustainable Waterway Maintenance in the Mekong Basin'.

BUDGET

200,000 US$

HUMAN RESOURCES

1) Waterway expert.
2) Environment expert.
3) GIS expert.
4) National expert for waterways and environment (Lao PDR).
5) National expert for waterways and environment (Thailand).
6) National expert for waterways and environment (Cambodia).
7) National expert for waterways and environment (Viet Nam).

PROPOSED EXECUTING/IMPLEMENTING AGENCY

This project should be implemented by MRCS.

TIME AND WORK SCHEDULE

Month	Output/activity
0-2	**Output 1:** Sustainable waterway maintenance in the LMB • Review the hydrographic atlas, waterway channel and dangerous conditions survey to determine areas that require dredging. • Legal and institutional analysis of the environmental and operational requirements for dredging and/or sand mining in the LMB. • Review existing studies on the impacts of dredging and sand mining i.e. reduced sediment load to the Mekong Delta. • Analyze the ecological status of stretches along the Mekong River using WWF

	eco-regions, water quality data, bio-monitoring and State of Basin (SOB) reports.
3-4	**Output 1**: Sustainable waterway maintenance in the LMB • Analyze the ecological status of stretches along the Mekong River using WWF eco-regions, water quality data, bio-monitoring and State of Basin (SOB) reports. • Prepare a survey on the extent of waterway dredging to be conducted with national line agencies, dredging companies, environmental monitoring and management agencies, environmental NGOs and research institutes. • Field trips to areas of dredging and sand mining to interview operators and determine volumes of sand and gravel extracted in Lao PDR/Thailand and Cambodia/Viet Nam.
5-6	**Output 1**: Sustainable waterway maintenance in the LMB • Using GIS software overlay dredging hotspots with WWF eco-regions and locations of high biodiversity, wetlands, community fishing zones and other environmental areas of significance. • Determine the significance of dredging impacts for certain stretches along the Mekong River. • Estimate the cumulative impacts of dredging and sand mining by calculating the total volume and type of sand and gravel extracted for a one-year period. • Prepare draft impact and risk assessment and recommendations for a Dredging Environmental Management Plan (DEMP).
7	**Output 2:** Regional Workshop • Regional workshop to review findings on the impacts of dredging and DEMP. • Compile comments and suggestions to incorporate into final draft.
8-9	**Output 1:** Sustainable waterway maintenance in the LMB • Regional. • Prepare final report of 'Sustainable Waterway Maintenance in the LMB'.

SOCIAL ISSUES

The action is not expected to have any adverse social impacts.

ENVIRONMENTAL ISSUES

This action is not expected to have any adverse environmental impacts.

ECONOMIC ASSESSMENT

Not relevant.

PRIORITY OF ACTION (H/M/L)

High: Start of the short-term action in 2017.

FINANCING PLAN (PUBLIC/PRIVATE)

Development partners and/or donors could fund this action.

PRIOR ACTIONS REQUIRED

Review hydrographic atlas and dangerous conditions surveys.

FOLLOW-UP ACTIONS REQUIRED

Identify potential grants, development partners and donors to fund this action.

8.4 SHORT TERM ENVIRONMENTAL ACTION 4 (SEN4)

TITLE

Determine the extent of oil spill pollution from existing ports, petroleum terminals and vessel operations to determine regional and national contingency planning and develop specific water quality parameters to monitor IWT operations

BACKGROUND AND RATIONALE

Water quality pollution is increasing in the Mekong Basin. High levels of phenol, oil and grease and heavy metals (lead and mercury) were detected by MMAP and WQMN.Elevated values of phenol indicate possible leakage of petroleum products close to cities and navigation routes (MRC 2014a). The Elevated levels of O&G were detected in Luang Prabang, Vientiane and Phnom Penh port. These could be from navigation/port activities and/or rubbish from the high-density communities living in these areas.

The concentration of heavy metals in bottom sediment along the Mekong River may increase the significance of the environmental impacts of dredging. High levels of heavy metals including copper, zinc, mercury and cadmium have been reported in the Mekong Delta, Viet Nam. Further water quality monitoring is required to ensure the operational impacts of IWT are effectively monitored and effective pollution control plans implemented.

There is no single analytical method to characterize oil pollution due to its complex nature, or alterations in the environment. Fluorescence spectroscopy is an appropriate analytical technique for determining organic micro pollutants having aromatic rings in their molecules. Therefore, fluorescence properties of petroleum hydrocarbons can be used in oil pollution monitoring and research. Fluorescence fingerprints have been successfully used for characterizing petroleum-related contamination in the Danube River[3]. Further investigation is required to determine an effective water quality monitoring in the Mekong Basin.Currently the impacts of IWT are not being effectively monitored.

LOCATION

The project will cover the Mekong Basin. The activities will be home based and oil spill modeling and scenarios will be tested at the MRC OSP, Cambodia.

OBJECTIVES

The objectives of this action are to:

- Review and analyze the relevant MRC data and information from MRCS and MRC member countries to develop some relevant scenarios of oil spill and or water quality incident in the Mekong Basin;
- Review and analyze the advantages and disadvantages of oil spill and water quality incident modeling applied worldwide;
- Recommend suitable model(s) to simulate the developed scenarios of oil spill and water quality incidents in the Mekong Basin;
- Provide a conceptual framework and methodology and plan to preparefor each oil spill or water quality incident model simulation;
- Develop water quality parameters to monitor the impact of ports, terminals and vessel operations on surface water and sediments.

OUTPUTS AND DELIVERABLES

The outputs of this action will be:

Output 1: Oil spill and water quality incident scenarios and models

Output 2: Final report, a comprehensive report including:

- The overall potential oil spill and water quality incident of some target substances in the Mekong Basin;
- The oil spill and water quality incident scenarios and sub-scenarios developed supporting model simulation to predict the severity and extent of oil and or substance(s) caused by oil spill or water quality incidents;
- The environment condition of the Mekong River and its basin, and the advantages and disadvantages of existing MRC data regarding oil spill and/or water quality model simulation;
- Relevant water quality parameters developed for monitoring the impacts of IWT in line with the MRC Procedure for Water Quality;
- The conceptual framework and methodology and plan supporting the model simulation for each scenario and sub-scenario.

ACTIVITIES

The key objectives for **Output 1** are to identify oil spill and water quality incident scenarios and models suitable for the Mekong Basin, key activities include:

- Identifying the potential oil spill and water quality incidents and their severity in the Mekong Basin;
- Outlining the cause-effect relationships between navigation activities in the Mekong Basin (the drivers of pollution), the pollution load (the pressures on the environment) and the water quality issues;
- Determine the impacts of oil spill pollution on fisheries, aquatic species and key habitats;
- Identifying the environmental conditions/driving factors which contribute to the probability and extent of an oil spill and/or substance(s) in case of a water quality incident;
- Evaluating bio-physical features in terms of hydrology and hydraulic conditions and, in particular, rainfall, run-off, rainfall, flow, evaporation, river length, width and morphology would help determing the parameters affecting model simulations and their results;
- Develop a series of oil spill and water quality incident scenarios;
- The scenarios and model development should based on the groups of criteria to make sure the results of model simulation would achieve the expectations as decribed below.

Types and scopes of scenarios:

- **On land runoff/sub-basin model**: applied for cases with oil spill or substance from any gasoline or chemical storage stations and/or any on-land vehicles.
- **Tributary ending point and accumulation into mainstream sub-basin model**: applied for any case which oil is spilled from any navigation activities or chemical substance transportation in that tributary.
- **Mainstream/Upstream-downstream based model**: applied for water quality incidents in the mainstream of Mekong River, potentially being a transboundary issue.

Model Assumptions:

- Mono-pollutant (for oils spill focus on lighter oil incident in Mekong Basin).
- Chemical and biological processes related to water of a given substance needs to be taken into account.

- Oil spill simulation model may not fully include all aspects of biological and chemical processes, but should try as much as possible:
  - <10 tonnes- Tier 1
  - >150 tonnes- Tier 2
  - >1,000 tonnes- Tier 3

Environmental conditions:

- **Flow/velocity condition:** slow, medium, and fast.
- **Discharge:** large, medium, and small.
- **Tidal regime:** applied for the Mekong Delta and or lower reaches of Mekong River.
- **Wind condition:** no or slight wind, medium wind speed, and strong wind.
- **Rainfall:** no or slight rain, medium rain, heavy rain.
- **River width:** is the actual measurement at a specific river reach according to the scenario of that river reach.
- **River morphology:** is the actual measurement at a specific river reach according to the scenario of that river reach.
- **Sediment concentrations/turbidity:** high, medium, low.

Model expected results:

- The maximum concentration of oil reached at certain points downstream of the spill.
- The time for concentration of oil to reach [WQ limit/maximum/normal level] at certain points downstream of the spill.
- How big the water surface and/or wetland ecosystem is covered by spilled oil.
- Dataset/library of water quality incidents to support early warning and incident notification for emergency response and management.

The objective of this Output 2: Final report is to identify the most relevant model(s) and software(s) used for oil spill and or water quality incident simulation that would be applied for the scenarios deloped in the Mekong Basin, the actions should also:

- Determine the data requirments of each model, and how the relevant available data of the MRCS would be maximally used in order to support the simulation processes of the designed scenarios;
- Prepare a conceptual framework and methodology and plan to support the model simulation that includes the list of developed scenarios for oil spills and water quality incidents;
- Outline the water quality parameters and monitoring that could be adopted in the Mekong Basin to continually measure the impacts of inland navigation activities.

BUDGET

80,000 US$

HUMAN RESOURCES

The following experts would be required for this action:

1) Team leader/water quality expert;

2) Oil spill/water quality modeling expert.

PROPOSED EXECUTING/IMPLEMENTING AGENCY

This project could be carried out by at MRCS as one of its core functions. The expert team could utilize the existing models at IKMP and consult with the EP and national line agencies responsible for the Technical Guidelines for Water Quality.

TIME AND WORK SCHEDULE

Month	Output/activity
0-2	**Output 1: Oil spill and water quality incident scenarios-** and sub-scenarios by river reach, environment condition, and severity of potential oil spill or substance(s) of water quality in the LMB are developed.
3	Relevant oil spill and or water quality incident model(s) are suggested, applying in the simulation the oil spill and water quality incident scenarios and sub-scenarios developed in the LMB. Water quality parameters monitoring inland navigation in the LMB isproposed.
4	Conceptual framework and methodology and plan preparing for model simulation to predict the probability and extent and severity of a given oil and or substance probably caused by oil spill or water quality incident.
5	**Output 2: Final report**
6	Regional technical workshop organized and final overall report of the assignment is submitted

SOCIAL ISSUES

This action is not expected to have any adverse social impacts.

ENVIRONMENTAL ISSUES

This action is not expected to have any adverse environmental impacts.

ECONOMIC ASSESSMENT

This action can be expected to have environmental benefits, the economic impact of which cannot be measured here.

PRIORITY OF ACTION (H/M/L)

High: start this action in 2017 as the information will guide the development of oil spill contingency planning and water quality monitoring for the IWT sector.

FINANCING PLAN (PUBLIC/PRIVATE)

Funded by MRCS donors and development partners to maintain water quality and transboundary management of water quality incidents.

PRIOR ACTIONS REQUIRED

Liaise with MRCS to determine the existing model/scenarios and data inputs required for modeling oil spill pollution and water quality incidents.

FOLLOW-UP ACTIONS REQUIRED

Consult with EP on the progress of the Technical Guidelines for Water Quality, especially in relation to water quality emergency response.

8.5 SHORT TERM ENVIRONMENTAL ACTION 5 (SEN5)

TITLE

Start awareness and education campaigns to reduce pollution from vessels and ports

BACKGROUND AND RATIONALE

Lack of awareness contributes significantly to the increased risks of fire, explosion, injury, loss of life and pollution. This is considered a high priority area in all of the Member Countries. Public information campaigns should be delivered to key stakeholders including port authorities, shipping operators, petroleum companies and waterway users to improve their understanding and awareness of dangerous goods, environmental protection and correct disposal of solid and liquid wastes. Increased awareness of decision-makers and key stakeholders on environmental issues associated with navigation is important in order to balance the socio-economic developments in the navigation sector with environmental protection.

Currently, the MRC capacity building and awareness on the Dangerous Good Management Manual (DGMM), Mekong Vessel Inspection Scheme (MVIS) and Waste Management Plan (WMP) has been delivered to port authorities, waterway departments and national line agencies in the Mekong countries. This approach needs to be extended to inform crewmembers and port workers of the consequences of waste disposal in the river and the dangers of pollution for the environment. The crew and port workers should be trained in dealing with different kinds of waste generated on board, its segregation and the use of the waste management plans, including solid and liquid wastes from port and vessels activities.

LOCATION

The information booklet and posters will be translated to Lao, Khmer, Thai and Vietnamese. Information sessions will be delivered at three locations in each of the MRC member countries.

OBJECTIVES

The objectives of this action are to raise awareness of waterway users, port workers and crewmembers of the impacts of pollution from inland navigation on the Mekong River and Great Lake.

OUTPUTS AND DELIVERABLES

The outputs of this action will be:

- **Output 1:** Information booklet and awareness posters translated to Lao, Khmer, Thai and Vietnamese.
- **Output 2:** information session delivered to three local boat association and/or port authorities and attended by local waterway users.

ACTIVITIES

The following activities will be undertaken to complete this action:

- Analyze existing information from MRC Risk Analysis, Regional Action Plan (RAP) and international literature on pollution prevention at the local level;
- Prepare draft information booklet for environmental awareness;
- Review content with national consultants prior to translating;
- Determine the three locations in each of the Member Countries to deliver the information sessions;
- Develop reporting mechanisms for local communities and passengers to report pollution from shipping and port activities;
- Print and distribute the awareness booklets and posters;

- Deliver the information and awareness training at the three sites in each of the Member Countries.

BUDGET

150,000 US$

HUMAN RESOURCES

1) Navigation safeguards or dangerous goods expert.
2) Training and capacity building expert.
3) National consultant (Cambodia).
4) National consultant (Lao PDR).
5) National consultant (Thailand).
6) National consultant (Viet Nam).

The national consultants will provide translation and deliver the training in the Member Countries.

PROPOSED EXECUTING/IMPLEMENTING AGENCY

The MRCS Integrated Capacity Building Program (ICBP) could implement this action.

TIME AND WORK SCHEDULE

Month	Output/activity
0-1	**Output 1:** Information booklet and awareness posters translated to Lao, Khmer, Thai and Vietnamese • Prepare draft information booklet and awareness posters.
1-3	**Output 1:** Information booklet and awareness posters translated to Lao, Khmer, Thai and Vietnamese • Develop reporting mechanism for local communities and passengers to report pollution from shipping and port activities. • Consultation with national experts to review materials and determine sites for the information sessions. • Finalize information booklets and awareness posters.
3-4	Translating, printing and distributing the awareness booklets.
5-6	**Output 2:** information session to three local boat association and/or port authorities with local waterway users • Deliver the information and awareness training at the three sites in Lao PDR. • Deliver the information and awareness training at the three sites in Thailand. • Deliver the information and awareness training at the three sites in Cambodia. • Deliver the information and awareness training at the three sites in Viet Nam.

SOCIAL ISSUES

This action is not expected to have any adverse social impacts.

ENVIRONMENTAL ISSUES

This action expected to have only limited environmental impact. The information booklets will be printed on recycled paper.

ECONOMIC ASSESSMENT

This action can be expected to have environmental benefits, the economic impact of which cannot be measured here.

PRIORITY OF ACTION (H/M/L)

High: Start this short-term action in 2017.

FINANCING PLAN (PUBLIC/PRIVATE)

This should be funded by MRCS and development partners.

PRIOR ACTIONS REQUIRED

Review the NAP studies on dangerous goods, waste management plan and environmental pollution.

FOLLOW-UP ACTIONS REQUIRED

Prepare the materials into a 'training of trainers' package so that the training can be provided continuously.

8.6 SHORT TERM ENVIRONMENTAL ACTION 6 (SEN6)

TITLE

Prepare an inventory of air emissions from key inland cargo ports in the Mekong Basin

BACKGROUND AND RATIONALE

An inventory of air emissions at key ports and reviewing the energy efficiency of existing vessels is required to determine approaches for reducing CO_2, SO_x, NO_x GHG emissions from the IWT sector.An emission inventory is a quantification of all emissions of criteria and other pollutants (including toxics and greenhouse gases (GHG)) that occur within a designated area by their source. Emissions sources are categorized broadly as mobile sources and point sources (i.e. port or terminals). Mobile sources are further classified as:

- **On-road sources:** i.e. automobiles, trucks, buses;
- **Non-road sources:** i.e. construction equipment, cranes, yard trucks, locomotives, marine and inland vessels.

Mobile source port emissions are generated by maritime and inland vessels and by land-based sources at ports and terminal operations. Vessels emissions come primarily from diesel engines operating on oceangoing and inland vessels, tugs and tows, dredges, and other vessels operating within a port area. Land-based emission sources include cargo-handling equipment (CHE) such as terminal tractors, cranes, container handlers and forklifts, as well as heavy-duty trucks and locomotives operating within a port area. These land-based sources also are likely to have diesel engines. Diesel emissions of concern include nitrogen oxides (NOx), sulfur oxides (SOx), particulate matter (PM) and toxics. An air emissions inventory to determine an approach for reducing air emissions from the IWT sector, to contribute to climate change and atmospheric pollution mitigation and to promote IWT as a sustainable transport option, is needed.

LOCATION

The mid-tier inventory will be conducted at one major inland port in Lao PDR, Cambodia, Thailand and Viet Nam. The ports will be decided based on consultation with national line agencies.

OBJECTIVES

The objectives of this action are to undertake an inventory of air emissions at one major inland port in Lao PDR, Thailand, Cambodia and Viet Nam to determine emission reduction options for the IWT sector.

OUTPUTS AND DELIVERABLES

The outputs of this action will be:

- **Output 1:** Mid-tier inventory of air emissions of one major in-land port in each of the Member Countries, including recommendations for reducing CO2 and GHG emissions from the IWT ports and terminals; and
- **Output 2:** Regional training workshop for completing air emissions inventories at inland ports.

ACTIVITIES

- Determine the methodology for conducting a mid-tier inventory20 of air emission at one major port in each of the Member Countries;

20Mid-Tier Inventory – A mid-tier inventory approach is often used by inland ports, such an inventoryrequires port-specific

- Prepare training material and guidance for national consultants;
- Regional training workshop to train national consultants in the methodology for completing the mid-tier emission inventory;
- Complete emissions inventory in Lao PDR, Thailand, Cambodia and Viet Nam;
- Compile information from all Member Countries;
- Draft findings from emission inventories and prepare recommendations;
- Prepare final report.

BUDGET

100,000 US$

HUMAN RESOURCES

1) International port consultant.
2) International energy-efficiency expert.
3) National consultant for Ports (Cambodia).
4) National consultant for Ports (Lao PDR).
5) National consultant for Ports (Thailand).
6) National consultant for Ports (Viet Nam).

PROPOSED EXECUTING/IMPLEMENTING AGENCY

This project could be implemented under the Global Green Growth Institute (GGGI) that is established in Cambodia and Viet Nam to reduce greenhouse and CO2 emissions across a number of industrial sectors.

TIME AND WORK SCHEDULE

Month	Output/activity
0-1	**Output 1:** Mid-tier emissions inventory • Determine the methodology for conducting a mid-tier inventory21 of air emissions at one major port in each of the Member Countries.
2-3	**Output 2**: Regional training workshop • Prepare training material and guidance for national consultants; • Regional training workshop to train national consultants in the methodology for completing the mid-tier emission inventory.
4	**Output 1:** Mid-tier emissions inventory • Complete emissions inventory in Lao PDR; • Complete emissions inventory in Thailand; • Complete emissions inventory in Cambodia;

activity data, but applies "typical" port emission rate averages byship type.

[21] Mid-Tier Inventory – A mid-tier inventory approach is often used by inland ports, such an inventoryrequires port-specific activity data, but applies "typical" port emission rate averages byship type.

	• Complete emissions inventory in Viet Nam.
5-6	**Output 1:** Mid-tier emissions inventory • Compile information from all Member Countries; • Draft findings from emission inventories and prepare recommendations; • Prepare final report.

SOCIAL ISSUES

This action is not expected to have any adverse social impacts.

ENVIRONMENTAL ISSUES

This action is not expected to have any adverse environmental impacts.

ECONOMIC ASSESSMENT

Not relevant.

PRIORITY OF ACTION (H/M/L)

Medium: start of the short-term action in 2018.

FINANCING PLAN (PUBLIC/PRIVATE)

This project could be implemented under the Global Green Growth Institute (GGGI) that is established in Cambodia and Viet Nam to reduce greenhouse and CO_2 emissions across a number of industrial sectors.

PRIOR ACTIONS REQUIRED

Consult with the Air Emissions expert in the Pollution Control Department in Thailand.

Consult with the GGGI in Cambodia and Viet Nam for potential funding for climate mitigation in the transport sector.

FOLLOW-UP ACTIONS REQUIRED

Consult with PEMSEA to determine if there are any funds or methodology for air emissions used at maritime ports in Southeast Asia.

8.7 SHORT TERM ENVIRONMENTAL ACTION 7 (SEN7)

TITLE

Review the energy efficiency of existing vessels in the Mekong Basin and develop a case study in Cambodia and Viet Nam to compare the most sustainable routes from Phnom Penh to the sea

BACKGROUND AND RATIONALE

Compared to road transport, IWT vessels can carry larger volumes of cargo relative to the extra fuel needed, resulting in lower emissions per ton-km (DFID 2011). IWT can reduce congestion, emissions and has less fatalities than either road or rail transport. Congestion costs include air pollution, energy consumption, greenhouse gas (GHG) emissions and road accidents. However, if improvements are not made for vessels to use more energy efficient engines and cleaner fuels, it is estimated that in 2020 ships will emit more SOx and NOx that all other land transport in the EU combined (PIANC 2011). In the Mekong Delta in Viet Nam the World Bank reported:

- IWT (on vessels larger than 250 DWT) can generate lower CO_2 emissions per ton-km than road freight transport;
- Significant improvements in the national fleet's environmental performance are required.

Efficiency improvements for vessels are expected to have a much larger impact on reducing greenhouse gas (GHG) emissions than any reasonable shift from road to IWT transport. Determining measures to reduce emissions is required to promote inland navigation as a more sustainable transport option. This action will take into account waterway safety, operational schedules and energy-efficiency.

LOCATION

This report will be completed in Cambodia, Viet Nam and home-based.

OBJECTIVES

The objectives of the action are to:

- Evaluate the energy-efficiency of IWT vessels operating in Cambodia and Viet Nam;
- Implement a case study to investigate the energy efficiency of the following three routes from Phnom Penh to Cai Mep; and
- Determine measures to reduce GHG emission for IWT vessels in the Mekong Basin.

OUTPUTS AND DELIVERABLES

The outputs of this action will be:

- **Output 1:** Technical Report on Energy Efficiency of IWT vessels; and
- **Output 2:** Case Study: 'Energy Efficient Options from Phnom Penh to Cai Mep'

ACTIVITIES

Designing a sound methodology for collecting data and information on inland vessels in Cambodia and Viet Nam will be critical to the success of this action. The methodology should consider using:

Lloyd's Register

Lloyd's Data contains information on ship characteristics that are important for preparing detailed marine vessel inventories including the following: name, type,age, flag, dead weight tonnage (DWT), maximum vessel speed, Engine power plant configuration, auxiliary engine characteristics, contents of the vessel's fuel tanks, etc. Lloyds Register can be used for the maritime vessels operating in Cambodia and Viet Nam. Information on registered Vietnamese inland vessels could be obtained from VIWA.

Ship surveys during site visits

Ship surveys will need to be collected for inland vessels to determine the following:

Hours of operation (annual and average daily, plus schedules if relevant and available)
Percentage of time in operational modes (e.g. idling, half power, full power)
Vessel characteristics
Number, type, and horsepower (or kilowatts) of main engine(s)
Number, type, and horsepower (or kilowatts) of auxiliary engine(s)
Other operational parameters such as fuel consumption rates and dredging volumes
Qualitative information regarding how the vessels are used in service

This information can be built into a ship survey to be completed during site visits.

Pilot Data

Consolation with river pilots and captains in Cambodia and Viet Nam will be invaluable to the calculation of time in modes and specific information on:

- Traffic conditions and congestion;
- Weather conditions i.e. - high winds, monsoon rains and storms can obscure visibility and reduce vessel speed in the water; and
- Vessel operations and schedule.

The following activities will be undertaken to complete this action:

- Review existing literature on energy efficiency for inland vessels (i.e. PIANC) and WB study for inland navigation in Viet Nam;
- Determine methodology for ship survey to collect information on vessels operating in Cambodia and Viet Nam;
- Site visit to survey vessels alongside Phnom Penh Container Terminal, Cambodia;
- Consultation with MPWT Waterway Department, PPAP and Pilots;
- Site visit to survey vessels at two major inland ports in Viet Nam;
- Consultation with VIWA, VINMARINE, port authorities, shipping companies, pilots and other stakeholders in Viet Nam;
- Determine IWT fleet emission factor, CO2 emissions per ton km from engine power ratings and load factors for inland vessels surveyed, taking into account:

Engine Power Ratings: Calculating the representative engine power ratings for each vessel and the development of activity profiles for each ship type. Using this information, emissions per ship call and mode can be determined using the equation: E = P x LF x A x EF, where:

- **E** = Emissions (grams [g])
- **P** = Maximum Continuous Rating Power (kilowatts [kW])
- **LF** = Load Factor (percent of vessel's total power)
- **A** = Activity (hours [h])
- **EF** = Emission Factor (grams per kilowatt-hour [g/kWh])

Load factors: are expressed as a percent of the vessel's total power. At service or cruise speed, the load factor is 83 percent. At lower speeds, the Propeller Law should be used to estimate ship

propulsion loads, based on the theory that propulsion power varies by the cube of speed as shown in the equation:

- **LF** = $(AS/MS)^3$ where:
- **LF** = Load Factor (percent)
- **AS** = Actual Speed (knots)
- **MS** = Maximum Speed (knots)

Existing Viet Nam IWT CO2 emissions factor (EF)

Viet Nam IWT CO_2 emissions 2010

Average IWT fleet emission factor (gCO_2/ton-km)	71
IWT a ton-km (billion ton-km)	23
IWT CO2 emissions (million tons CO_2)	1.6

***Source**: Ecorys/World Bank*

Using the above information the team will implement a case study to compare the energy efficiency of a 5,000 DWT cargo vessel sailing from Phnom Penh Container Terminal to Cai Mep International Port along the following three routes:

Route	Distance (km)
1. Phnom Penh to Cai Mep by Cho Gao Canal	371
2. Phnom Penh to Cai Mep by Mekong Mainstream	368
3. Phnom Penh to Cai Mep by Vam Nao, Bassac and Quan Chanh Bo Canal	495

- Assess the current situation of vessels going from Phnom Penh to the Cai Mep, considering:
  - The 368 km stretch of the Mekong mainstream linking Phnom Penh with the Cai Mep International container Port in Viet Nam. Based on an average speed (downstream) of 16.5 km per hour and a 2 hour border clearance delay, self-propelled container barges can navigate the stretch in 36 hours.
  - A majority of cargo vessels now navigate along the Cho Gao Canal in Viet Nam, thereby avoiding the often extensive delays associated with waiting for high tide. Using this route, the distance between Phnom Penh and Cai Mep is 371 km, and the transit time is slightly longer (38 hours), owing to the slower average speed permitted on the canal.
- Determine the most energy-efficient route from Phnom Penh to Cai Mep considering ton per km, vessel speed, waterway conditions, vessel schedules and data obtained from pilots, shipping companies and ship surveys.

BUDGET

200,000 US$

HUMAN RESOURCES

1) Energy-efficiency expert.
2) International vessel expert (i.e. Maritime Chief Engineer).
3) Transport planning expert.
4) National consultant for vessels (Cambodia).
5) National consultant for vessels (Viet Nam).

PROPOSED EXECUTING/IMPLEMENTING AGENCY

This project could be implemented under the Global Green Growth Institute (GGGI) that is established in Cambodia and Viet Nam to reduce greenhouse and CO2 emissions across a number of industrial sectors.

TIME AND WORK SCHEDULE

Month	Output/activity
0-2	**Output 1:** Technical Report on Energy Efficiency of IWT vessels • Review existing literature on energy efficiency for inland vessels (i.e. PIANC) and WB study for inland navigation in Viet Nam; • Determine methodology for ship survey to collect information on vessels operating in Cambodia and Viet Nam.
3-4	• Site visit to survey vessels alongside Phnom Penh Container Terminal, Cambodia; • Consultation with MPWT Waterway Department, PPAP and pilots; • Site visit to survey vessels at two major inland ports in Viet Nam; • Consultation with VIWA, VINAMARINE, port authorities, shipping companies, pilots and other stakeholders in Vietnam.
5	• Determine IWT fleet emission factor, CO_2 emissions per ton km from engine power ratings and load factors for inland vessels surveyed.
6	**Output 2:** Case Study: 'Energy Efficient Options from Phnom Penh to Cai Mep' • Implement a case study to compare the energy efficiency of a 5000DWT cargo vessel sailing from Phnom Penh Container Terminal to Cai Mep International Port.

SOCIAL ISSUES

This action is not expected to have any adverse social impacts.

ENVIRONMENTAL ISSUES

This action is not expected to have any adverse environmental impacts.

ECONOMIC ASSESSMENT

The studies related to energy efficiency and emissions of IWT on certain **routes have already been completed.** The results of the economic analysishave been presented in the Waterway Design section.

PRIORITY OF ACTION (H/M/L)

Medium: start of the short-term action in 2018.

FINANCING PLAN (PUBLIC/PRIVATE)

This project could be implemented under the Global Green Growth Institute (GGGI) that is established in Cambodia and Viet Nam to reduce greenhouse and CO_2 emissions across a number of industrial sectors.

PRIOR ACTIONS REQUIRED

Consult with the GGGI in Cambodia and Viet Nam for potential funding for climate mitigation in the transport sector.

FOLLOW-UP ACTIONS REQUIRED

Consult with WB on progress of inland navigation investments in Viet Nam.

8.8 LONG TERM ENVIRONMENTAL ACTION 1 (LEN1)

TITLE

Establish transboundary environmental management and monitoring systems to ensure the effective management of wastes, water pollution, air emissions, oil spill response, and contingency planning for IWT

BACKGROUND AND RATIONALE

Monitoring systems can be established in River Information Systems (RIS) to integrate real-time monitoring of water quality and oil spill response and electronic recording of wastes, air emissions and storage of dangerous goods. The following short-term actions for water pollution and environmental assessment would need to be completed prior to this long-term action being implemented:

- **Environment short-term actions 1:** Environmental assessment guidelines to determine transboundary impacts of IWT;
- **Environment short-term action 4:** Extent of oil spill pollution and water quality parameters for IWT;
- **Environment short-term action 6:** Air emissions inventory for major inland ports in the Mekong Basin.
- This long-term action would also need to be combined with RIS and contingency planning for oil spill response for ports and vessels.

LOCATION

This action would be home-based with consultations carried out in Lao PDR, Cambodia, Thailand and Viet Nam.

OBJECTIVES

The objectives of this action are to determine the feasibility of incorporating real-time monitoring of the environmental impacts of inland navigation on the Mekong River.

OUTPUTS AND DELIVERABLES

Output 1: Architecture for integrating water quality and environmental monitoring of inland navigation into the RIS.

ACTIVITIES

The following activities will be undertaken to complete this action:

- Reviewing existing infrastructure for the RIS in the Mekong countries;
- Determine the existing water quality monitoring parameters, systems, equipment, laboratory and analytical equipment;
- Consultations with national line agencies in Member Countries to determine how accidents, type and volume of wastes and water quality incidents are recorded;
- Analyze existing water quality information in the Member Countries;
- Assess the current inland navigation traffic to determine navigation hotspots;
- Prepare a feasibility study for installing real-time monitoring of water quality in navigation hotpots (i.e. downstream of ports and terminals) to determine trends and respond to water quality incidents that are fit for purpose in the Mekong region;
- Determine electronics system (forms) for ports and terminals to record the volume and type of solid and liquid wastes, dangerous goods, emergency response equipment and air emissions in RIS;

- National and regional workshop to prioritize water quality monitoring and information to be recorded in RIS;
- Finalize recommendations for Member Countries.

BUDGET

100,000 US$

HUMAN RESOURCES

1) Water quality monitoring expert.
2) RIS or information systems expert.

PROPOSED EXECUTING/IMPLEMENTING AGENCY

This should be implemented by the MRCS or a Mekong Commission for Regional Navigation.

TIME AND WORK SCHEDULE

Month	Output/activity
0-2	**Output 1:** Architecture for integrating water quality and environmental monitoring of inland navigation into the RIS • Reviewing exiting infrastructure for the RIS in the Mekong countries. • Determine the existing water quality monitoring parameters, systems, equipment, laboratory and analytical equipment.
3	**Output 1:** Architecture for integrating water quality and environmental monitoring of inland navigation into the RIS • Consultations with national line agencies in Member Countries to determine how accidents, type and volume of wastes and water quality incidents are recorded. • Analyze existing water quality information in the Member Countries. • Assess the current inland navigation traffic to determine navigation hotspots.
4	**Output 1:** Architecture for integrating water quality and environmental monitoring of inland navigation into the RIS • Prepare feasibility study for installing real-time monitoring of water quality in navigation hotpots (i.e. downstream of ports and terminals) to determine trends and respond to water quality incidents that are fit for purpose in the Mekong region. • Determine electronics system (forms) for ports and terminals to record the volume and type of solid and liquid wastes, dangerous goods, emergency response equipment and air emissions in RIS.
5-6	**Output 2:** Architecture for integrating water quality and environmental monitoring of inland navigation into the RIS • Regional workshop to prioritize water quality monitoring and information to be recorded in RIS. • Finalize recommendations for Member Countries.

SOCIAL ISSUES

This action is not expected to have any adverse social impacts.

ENVIRONMENTAL ISSUES

This action is not expected to have any adverse environmental impacts.

ECONOMIC ASSESSMENT

Not relevant.

PRIORITY OF ACTION (H/M/L)

High: this long term action should be implemented in 2025-2028.

This action should be incorporated into the overall RIS architecture.

FINANCING PLAN (PUBLIC/PRIVATE)

This should be funded by the MRCS or Mekong Commission for Regional Navigation.

PRIOR ACTIONS REQUIRED

The environmental short term actions 1, 4 and 6 need to be completed prior to this action.

FOLLOW-UP ACTIONS REQUIRED

Ensure that the RIS architecture is not developed without considering real-time monitoring of water quality, oil spills and recording information on wastes and dangerous goods (type and volume) and air emissions inventories of major inland ports and terminals.

8.9 LONG TERM ENVIRONMENTAL ACTION 2 (LEN2)

TITLE

Conduct further environmental assessment to determine zones or restrictions for port/vessel operations, the transport of DG, dredging/sand mining activities and location of waste management facilities

BACKGROUND AND RATIONALE

The assessment of the environmental and socio-economic conditions, ecotourism, waterway conditions (reefs, rapids, shoals, sandbars, etc.) and navigation hotpots can be used to determine zones or restrictions for inland navigation, these could include:

- Zones for speed and size restrictions for IWT vessels to minimise environmental impacts and improve safety;
- Zones for restricting or limiting transport of dangerous goods as recommended in the MRC Risk Analysis and Regional Action Plan (RAP) to reduce risks of oil spills and water pollution in environmentally sensitive areas;
- Zones for port and vessel waste as described in the RAP; and
- Zones for dredging or sand mining activities.

The following short-term actions for water pollution and environmental assessment would need to be completed prior to this long-term action being implemented:

- **Environmental short-term action 1:** Environmental assessment guidelines to determine transboundary impacts of IWT;
- **Environmental short-term action 3:** Dredging and sand mining impact and risk assessment;
- **Environmental short-term action 4:** Extent of oil spill pollution and water quality parameters for IWT.

LOCATION

Home based with consultations carried out in the Mekong countries.

OBJECTIVES

The objectives of this long-term action are to propose zones for:

- Transport and storage of dangerous goods;
- Vessel type, speed and size; and
- Dredging and sand mining activities.

OUTPUTS AND DELIVERABLES

Output 1: Proposed zones for inland navigation in the Mekong Basin.

ACTIVITIES

The following activities will be undertaken to complete this action:

- Incorporate the findings from short-term environmental actions 1, 3 and 4;
- Review RAP Waterway Action 12 (Waterways) Introducing Geographical Zones in the Mekong River and Related Technical and Operational Requirements for Tankers;
- Evaluate current cargo throughput and statistics for the transport of petroleum products and dangerous goods;
- Review the impacts of vessels speed and size on aquatic environment and riverbanks (i.e. wave height and erosion)

- Analyze the current state of the environment report for the Mekong countries including WWF eco-regions, protected areas and socio-environmental trends/challenges in the LMB;
- Determine the extent of waterway dredging and maintenance activities in the LMB;
- Review accident, incident reporting and water quality data from the LMB;
- Compile waterway and port laws, rules and regulations for vessels;
- Overlay inland navigation hotspots with environmental and socio-economic areas of significance to determine zones;
- Regional and national consultations to review proposed zones and restrictions; and
- Finalize zones and prepare recommendations for implementation and monitoring.

BUDGET

100,000 US$

HUMAN RESOURCES

1) Environment/water resources expert.
2) Dangerous goods expert.
3) Vessels expert.

PROPOSED EXECUTING/IMPLEMENTING AGENCY

This should be implemented by MRCS.

TIME AND WORK SCHEDULE

Month	Output/activity
0-3	**Output 1**: Proposed zones for inland navigation in the Mekong Basin • Incorporate the findings from short-term environmental actions 1, 3 and 4; • Review RAP Waterway Action 12 (Waterways) Introducing Geographical Zones in the Mekong River and Related Technical and Operational Requirements for Tankers; • Evaluate current cargo throughput and statistics for the transport of petroleum products and dangerous goods; • Review the impacts of vessels speed and size on aquatic environment and riverbanks (i.e. wave height and erosion); • Analyze the current state of the environment report for the Mekong countries including WWF eco-regions, protected areas and socio-environmental trends/challenges in the Mekong Basin; • Determine the extent of waterway dredging and maintenance activities in the Mekong Basin; • Review accident, incident reporting and water quality data from the Mekong Basin; and • Compile waterway and port laws, rules and regulations for vessels.
4-5	**Output 1**: Proposed zones for inland navigation in the LMB. • Overlay inland navigation hotspots with environmental and socio-economic areas of significance to determine zones; and • Regional and national consultations to review proposed zones and restrictions.

6.	**Output 1**: Proposed zones for inland navigation in the LMB. • Finalize zones and prepare recommendations for implementing and monitoring and incorporate into technical report.

SOCIAL ISSUES

This action is not expected to have any adverse social impacts.

ENVIRONMENTAL ISSUES

This action is not expected to have any adverse environmental impacts.

ECONOMIC ASSESSMENT

Not relevant.

PRIORITY OF ACTION (H/M/L)

Very High: The long term action should be implemented in 2021-2024.

FINANCING PLAN (PUBLIC/PRIVATE)

This should be funded by the MRCS under core functions.

PRIOR ACTIONS REQUIRED

Short term environmental actions 1, 3 and 4 should be completed prior to this action.

FOLLOW-UP ACTIONS REQUIRED

Align with waterway classification for vessels in the Mekong Basin.

8.10 LONG TERM ENVIRONMENTAL ACTION 3 (LEN3)

TITLE

Conduct climate change threat and vulnerability assessment for key IWT infrastructure and integrate IWT into regional and national adaptation plans and green growth/low carbon development strategies

BACKGROUND AND RATIONALE

The predicted changes in the flow regime of the Mekong Basin are increases in river flow both for the wet and the dry seasons. The predictions suggest an increase in annual mean flow at 4-13% for the wet season and 10-30% for the dry season. The increased flow in the Mekong River will boost water availability in the dry season, but it will also increase the risk of flooding in the wet season. Areas downstream of Kratie including the delta and Tonle Sap area are particularly at risk.

The increased flow in the dry season will create opportunities for increased navigation in both the Upper (Chiang Saen to Pakxe) and Lower (Kratie to Mekong Delta) Mekong. However, increased flooding may impact on port, landing facilities, connecting roads and bridges. A climate change threat and vulnerability assessment is required to determine the climate change impacts to existing and future navigation projects.

A climate change threat and vulnerability assessment was undertaken by the ADB of existing and future transport projects in Viet Nam due to concerns about the impacts of climate change on project bridges, approach roads and interconnecting roads. ADB (2014) reported that if mean sea level rises by one meter in the Mekong Delta, it is estimated that 11,000 km of roads could be submerged and that up to 695 km of national highways are at risk of inundation. Increases in frequency and duration of rainfall, sea level rise, and increasing river flow will result in elevation of river water levels. Design requirements for future ports, terminals, roads, bridges (navigation clearance) must consider the impacts of sea level rise and increased flooding, particularly in the Mekong Delta.

IWT can contribute to reducing $C0_2$ and GHG emissions if energy efficiency is improved and navigation may benefit from increased wet and dry season flows. Climate change adaption plans will need to consider climate proofing of IWT infrastructure, navigation clearance (bridges, roads, power lines) as well as how to respond to floods. IWT can lead to a reduction in CO2 per ton km if the energy efficiency of inland navigation vessels in the Mekong region is improved. The following short-term actions should be completed:

- **Environmental short term action 5**: Air emissions inventory for major inland ports; and
- **Environmental short term action 6**: Energy-efficiency of inland navigation vessels.

LOCATION

Home based with consultations carried out in the Mekong region.

OBJECTIVES

The objectives of this action are to:

- Carry out a climate change vulnerability assessment for existing and proposed inland ports and terminals in the LMB; and
- Ensure that IWT is integrated into regional and national climate change adaptation and mitigation policy and planning.

OUTPUTS AND DELIVERABLES

Output 1: Baseline assessment report.

Output 2: Climate change vulnerability assessment for Mekong navigation.

Output 3: Mainstreaming IWT into climate mitigation and adaptation plans policy paper.

ACTIVITIES

The following activities will be undertaken to complete this action:

- **Output 1**: Baseline assessment
  - Conducting a baseline assessment to describe the past and existing situation, trends and drivers and projecting the changes that will occur irrespective of climate change;
  - The baseline involves the review of technical, economic and development literature, existing databases, consultation with other experts, and national line agencies;
  - Consultations with national line agencies includingPublic Works, Transport and Planning on locations of existing and planned ports, terminals, roads and bridges; and
  - Consultation with national line agencies includingWater Resources and Hydrometeorology to determine hydrological data, rainfall and temperature trends in past extreme events and national emissions scenarios.
- **Output 2**: Climate change vulnerability assessment
  - Consultations with Climate Change department to review regional/national climate downscaling under different scenarios (i.e. high, average and low emission development);
  - Determine the climate change threats through an analysis of past extreme events and trends and through climate modeling and downscaling of future climate and hydrology against various scenarios.
  - Mekong climate study assessments focus on a 25-year timeframe from 2045 to 2069 (referred to as "2050") as a suitably distant and sufficiently clear signal in both the directionality and scale of change in the Mekong hydro climate system.
  - Using the 2050 timeframe assess changes in a number of hydro climate variables, including: temperature, sea level rise, rainfall, runoff, erosion, stream flow, flood depth/duration and tropical storm events;
  - Modeling and downscaling to convert scenarios of future emissions scenarios to changes in climate and subsequently to changes to these variables at the local level, including
  - Downscaling to the locations of existing and proposed location of ports and terminals for flood depth/duration, sea level rise, erosion and tropical storm events;
  - Downscaling to the location of existing and proposed bridges and power lines for increases in water level, stream flow and flood depth duration.
  - The scenarios can be used to determine climate proofing for future regional and national transport planning; and
  - National and regional workshops to demonstrate scenarios and climate proofing for future ports and terminals.
- **Output 3**: Climate change vulnerability assessment
  - Evaluate the findings from environmental action 7.5 and 7.6 and from Output 1 and 2 of this action;
  - Review existing climate adaptation and mitigation plans in the Mekong countries;
  - Analyze the transport sector strategies for green transport or low emissions development policies for the transport and industrial sectors;
  - Review climate change adaptation plans for responding to flooding and natural disasters, i.e. inland vessels can be incorporated into national contingency planning;
  - Assess any emission reduction targets targeted at the transport or industrial sectors; and

- Prepare policy brief on using IWT for climate mitigation and adaptation plans.

BUDGET

300,000 US$

HUMAN RESOURCES

1) International transport planner.
2) International climate change/hydrological modeling expert.
3) International transport/civil engineer.
4) National expert for climate change/hydrology in Lao PDR.
5) National expert for climate change/hydrology in Thailand.
6) National expert for climate change/hydrology in Cambodia.
7) National expert for climate change/hydrology in Viet Nam.
8) National expert for transport planning in Lao PDR.
9) National expert for transport planning in Thailand.
10) National expert for transport planning in Cambodia.
11) National expert for transport planning in Viet Nam.

PROPOSED EXECUTING/IMPLEMENTING AGENCY

The project should be implemented by the MRCS for climate change adaptation and regional transport planning.

TIME AND WORK SCHEDULE

Month	Output/activity
0-2	**Output 1**: Baseline assessment • Conduct a baseline assessment to describe the past and current situation, trends and drivers and the projected changes to these systems irrespective of climate change; • The baseline will involve the review of technical, economic and development literature, existing databases and consultations with expertsand national line agencies; • Consultations with national line agencies including Public Works, Transport and Planning on locations of existing and planned ports, terminals, roads and bridges; and • Consultations with national line agencies including Water Resources and Hydrometeorology to determine hydrological data, rainfall and temperature trends in past extreme events and national emissions scenarios; **Output 2:** Climate change vulnerability assessment • Consultations with Climate Change department to review regional/national climate downscaling under different scenarios (i.e. high, average and low emission development).
3-7	**Output 2:** Climate change vulnerability assessment • Determine the climate change threats through an analysis of past extreme events and trends and through climate modeling and downscaling of future climate and hydrology against various scenarios;

	• Using the 2050 timeframe, assess changes in a number of hydro-climate variables including: temperature, sea level rise, rainfall, runoff, erosion, stream flow, flood depth/duration and tropical storm events; • Modeling and downscaling to convert scenarios of future emissions to changes in climate and subsequently to changes to these variables at the local level for ports, terminal, roads, bridges and power lines; • Run scenarios to determine climate proofing for future transport regional and national transport planning; • Prepare report on scenarios and climate proofing for regional workshop.
8	**Output 2:** Climate change vulnerability assessment • National and regional workshop to demonstrate scenarios and climate proofing for future ports and terminals.
9	**Output 2:** Climate change vulnerability assessment • Final report.
9-11	**Output 3**: Policy paper on IWT and climate mitigation • Evaluate the findings from environmental action 7.5 and 7.6; • Review existing climate adaptation and mitigation plans in the Mekong countries; • Analyze the transport sector strategies for green transport or low emissions development policies for the transport and industrial sectors; • Review climate change adaptation plans for responding to flooding and natural disasters i.e. inland vessels can be incorporated into national contingency planning; • Assess any emission reduction targets targeted at the transport or industrial sector.
12	**Output 3**: Policy paper on IWT and climate mitigation • Prepare policy brief on using IWT for climate mitigation and adaptation plans.

SOCIAL ISSUES

This action is not expected to have any adverse social impacts.

ENVIRONMENTAL ISSUES

This action is not expected to have any adverse environmental impacts.

ECONOMIC ASSESSMENT

Not relevant.

PRIORITY OF ACTION (H/M/L)

Very High: Implement the long term action in 2021-2024. Climate proofing investments has both economic and social benefits.

FINANCING PLAN (PUBLIC/PRIVATE)

Regional and national green climate funds for the Mekong region.

This action can be funded by GGGI or climate finance.

PRIOR ACTIONS REQUIRED

Environment actions 7.5 and 7.6 related to air emissions from major ports and energy-efficiency of vessels are required.

Consult with WB, ADB and IFC to ensure that future investments are climate proofed and that the design of roads and bridges considers inland navigation.

FOLLOW-UP ACTIONS REQUIRED

Keep an eye on port and terminal developments in the Mekong region as this action could be brought forward to a short-term action in case of rapid development.

9 SOCIAL ACTIONS

9.1 SHORT TERM SOCIAL ACTION 1 (SSO1)

TITLE

Conduct further analysis of the Social Impact Monitoring Vulnerability Assessment (SIMVA) and other household surveys (e.g. Household Income and Expenditure Survey (HIES)) in the Mekong corridor for employment and education, access to infrastructure and ownership of transport assets.

BACKGROUND AND RATIONALE

Developing cargo and passenger transport on the Mekong River can provide direct and indirect economic benefits,which can improve thelivelihoods of rural communities. The socio-economic conditions require more assessment in relation to local IWT. Further analysis of theHousehold Income and Expenditure Surveys (HIES) and the Social Impact Monitoring and Vulnerability Assessment (SIMVA) is required to determine the access and use of IWT by rural communities. The SIMVA was carried out to provide data on the number of people who rely on the Mekong's natural resources for livelihoods and their vulnerability to changes. More than 29.6 million people are estimated to live within 15 km of the Mekong mainstream, defined as the Mekong corridor. The table below shows the number of people living in the Mekong corridor.

Country	Corridor population	Percentage living in the corridor (%)	Percentage of corridor population (%)
Cambodia	9,895,525	70	33
Lao PDR	3,430,040	53	12
Thailand	2,499,395	4	8
Viet Nam	13,851,600	16	47
All Countries	29,676,560		100

***Source**: Hall and Bouapao (2010)*

With such a large proportion of rural communities living with 15 km of the Mekong River and its tributaries, IWT is a popular mode of short and medium distance transport and has increased people's access to social services, markets and created employment opportunities. More research is required to determine how rural IWT in the Mekong can be improved to provide more economic and employment opportunities.

LOCATION

This action will be primarily home-based with consultations carried out in the Mekong countries.

OBJECTIVES

The objectives of this action are to consolidate data and information from HIES, SIMVA and the National Statistical Yearbook to determine the use of IWT an itsimportance to rural communities for education, employment and access to services.

OUTPUTS AND DELIVERABLES

Output 1: Socio-economic report for IWT

ACTIVITIES

The activities to complete this action include:

- Analyze the SIMVA, HIES and other socio-economic studies in relation to IWT in the Mekong countries;

- Prepare survey for national statistics office and ministries responsible for social affairs in the Mekong countries;
- Complete surveys with national statistics office and national line agencies responsible for social affairs, employment, youth affairs and rural development;
- Compile information from population census, statistical yearbooks, HIES and demographic and health surveys;
- Determine if specific socio-economic studies have been competed that show:
  - Contribution of rural IWT in terms of employment or economic benefits at the national level;
  - Statistics related to rural communities and access to inland water transport;
  - Significance of rural communities using inland water transport for fishing, access to services (school, health) and employment opportunities;
  - Issues for vulnerable groups (women, people with disabilities, ethnic minorities) in accessing IWT.
- Prepare recommendations for improving access to IWT and financial incentives for increasing ownership of transport assets; and
- Prepare socio-economic report for IWT in the Mekong region.

BUDGET

100,000 US$

HUMAN RESOURCES

1) International Socio-Economic expert.
2) National socio-economic expert for Lao PDR.
3) National socio-economic expert for Thailand.
4) National socio-economic expert for Cambodia.
5) National socio-economic expert for Viet Nam.

PROPOSED EXECUTING/IMPLEMENTING AGENCY

MRCS should implement this action as part of basin development planning.

TIME AND WORK SCHEDULE

Month	Output/activity
0-1	**Output 1**: Socio-economic report for IWT • Analyze the SIMVA, HIAS and other socio-economic studies in relation to IWT in the Mekong countries; and • Prepare survey for national statistics office and ministries responsible for social affairs in the Mekong countries.
2-3	**Output 1**: Socio-economic report for IWT • Complete surveys with national statistics office and national line agencies responsible for social affairs, employment, youth affairs and rural development; • Compile information from population census, statistical yearbooks, HIAS and demographic and health surveys; • Determine if specific socio-economic studies have been competed that show rural IWT.

4	**Output 1**: Socio-economic report for IWT • Prepare recommendations for improving access to IWT and financial incentives for increasing ownership of transport assets; and • Prepare socio-economic report for IWT in the Mekong region.

SOCIAL ISSUES

This action is not expected to have any adverse social impacts.

ENVIRONMENTAL ISSUES

This action is not expected to have any adverse environmental impacts.

ECONOMIC ASSESSMENT

Not relevant.

PRIORITY OF ACTION (H/M/L)

High: Start this short-term action in 2017.

FINANCING PLAN (PUBLIC/PRIVATE)

This should be funded by MRCS and development partners.

PRIOR ACTIONS REQUIRED

Consultation with MRCS Environment Programme (EP) on the status of SIMVA.

FOLLOW-UP ACTIONS REQUIRED

Ensure that the use of IWT and ownership of transport asset is incorporated into regional and national livelihood and household surveys.

9.2 SHORT TERM SOCIAL ACTION 2 (SSO2)

TITLE

Undertake further surveys of passengers, boat owners and rural communities and develop case studies to determine how local boat transport can be integrated with national and regional IWT

BACKGROUND AND RATIONALE

With such a large proportion of rural communities living with 15km of the Mekong River and its tributaries, IWT is a popular mode of short and medium distance transport and has increased people's access to social services, markets and created employment opportunities. Globally, 12.3 % of rural populations, or 50 % of all rural households, have access to water transport (World Bank 2007). The future development of IWT in the Mekong region is essential to achieving the goals of poverty reduction and provides the following opportunities:

- **Economic**: Agricultural and industrial production (e.g. garments, food processing), markets and tourism; and
- **Administrative**: access to education, health, cultural and social services.

As well as access to transport, the costs of transport also need to be considered. If transport costs are too high this reduces economic opportunities by making important imports (e.g. fuel and fertilizer) and exports (e.g. rice and consumables) more expensive and unable to compete on domestic or international markets. Rural communities, where people depend exclusively on IWT, are more likely to be affected by the quality of services provided by transport operators in terms of costs, time, safety and links to other transport modes. The use of privately owned boats in rural communities for fishing, passenger, cargo transport and employment should also be assessed.

On-the-spot surveys of local waterway users were conducted as part of the Baseline Conditions (BC) report to determine the current situation and how IWT can be improved. The local questionnaires were developed with Member Countries to identify and provide better understanding of waterway users in the Mekong Basin.Developing cargo and passenger transport on the Mekong River can provide direct and indirect economic benefits improving livelihoods for rural communities. The socio-economic conditions requires further assessment to link IWT with national and regional transport routes in the Mekong basin. The surveys completed in the current situation report were only a small sample, but provide a useful insight into the use of IWT by local communities. The survey and approach can be used as a basis for more detailed assessments of local communities and IWT use in the future. These findings will be incorporated into the short and long term social actions for the regional Master Plan.

LOCATION

This action will be home-based and also include undertaking surveys of rural IWT users at passenger and/or small cargo ports in the Mekong countries.

OBJECTIVES

The objective of this action is to determine the users of IWT in rural communities and attitudes towards this mode of transport using surveys at passenger and/or small cargo ports in the Mekong countries.

OUTPUTS AND DELIVERABLES

The outputs of this action will include:

- **Output 1**: Socio-economic survey for IWT.
- **Output 2:** Final report.

ACTIVITIES

The following activities are required to complete this action:

- Analyze information from the BC report and approach
  - The initial surveys and findings can be used to formulate more extensive surveys of local IWT users.
- Review existing literature of IWT in the Mekong region and other transboundary river basins;
- Design a survey (qualitative and semi-quantitative) for rural IWT users at passenger and/or small cargo ports in the Mekong countries
  - The aims of the survey will be to categorize IWT users, type of vessels, use of IWT (i.e. access to services or employment), issues and how IWT can be improved.
- Prepare training materials and guidance notes on completing the surveys;
- Train the national consultant in using the survey;
- Determine the passenger and/or small cargo ports to include in the survey in Lao PDR, Thailand, Cambodia and Viet Nam;
- Situational analysis in each of the locations to determine the existing agricultural, aquaculture and other livelihoods;
- National consultants undertake surveys at the passenger and or/small cargo ports;
- Compile and analyze survey data and information collected;
- Dissect findings related to use of IWT, issues and how IWT can be improved;

- Prepare recommendations for improving access to IWT and financial incentives for increasing ownership of transport assets; and
- Complete final report and submit to Mekong countries.

BUDGET

150,000 US$

HUMAN RESOURCES

1) International socio-economic expert.
2) National socio-economic expert for Lao PDR.
3) National socio-economic expert for Thailand.
4) National socio-economic expert for Cambodia.
5) National socio-economic expert for Viet Nam.

PROPOSED EXECUTING/IMPLEMENTING AGENCY

Implemented by MRCS and could be done in partnership with universities or research institutes in the Mekong region.

TIME AND WORK SCHEDULE

Month	Output/activity
0-1	**Output 1**: Socio-economic survey for IWT • Analyze information from the BC report and approach; • Review existing literature of IWT in the Mekong region and other transboundary river basins; • Design a survey (qualitative and semi-quantitative) for rural IWT users at passenger and/or small cargo ports in the Mekong countries;

	• Prepare training materials and guidance notes on completing the surveys.
2-3	**Output 1**: Socio-economic report for IWT • Train the national consultant in using the survey; • Determine the passenger and/or small cargo ports to include in the survey in Lao PDR, Thailand, Cambodia and Viet Nam; • Situational analysis in each of the locations to determine the existing agricultural, aquaculture and other livelihoods; • National consultants undertake surveys at the passenger and or/small cargo ports.
4-6	**Output 2**: Final report • Compile and analyze survey data and information collected; • Dissect findings related to use of IWT, issues and how IWT can be improved; • Prepare recommendations for improving access to IWT and financial incentives for increasing ownership of transport assets; • Complete draft report and submit to national consultants for review and input; • Prepare final report.

SOCIAL ISSUES

An ethics statement will be provided to participants in the survey to ensurethere is consent from the participant.

ENVIRONMENTAL ISSUES

This action is not expected to have any adverse environmental impacts.

ECONOMIC ASSESSMENT

Not relevant.

PRIORITY OF ACTION (H/M/L)

High: Start this short-term action in 2017.

FINANCING PLAN (PUBLIC/PRIVATE)

MRCS and development partners should fund this action.

PRIOR ACTIONS REQUIRED

Determine if household surveys along the Mekong mainstream are being implemented, as questions on IWT could be incorporated.

FOLLOW-UP ACTIONS REQUIRED

Communicate findings to other research institutes to ensure that IWT is included in future surveys.

9.3 SHORT TERM SOCIAL ACTION 3 (SSO3)

TITLE

Identify and promote eco-tourism and river-related tourism along the Mekong River to create more employment opportunities for rural communities.

BACKGROUND AND RATIONALE

There is huge potential for waterborne tourism, even ecotourism that can create socio-economic opportunities in both urban and rural areas. New international traffic opportunities such as tourist boat services between Siem Reap and Ho Chi Minh City are being promoted through the new navigation agreement between the two countries. Port facilities in Ho Chi Minh City and Phnom Penh are expected to be complemented by plans for improving the Chong Kneas Port on the Tonle Sap Lake near the Angkor temple complex. Waterborne tourism potential in Lao PDR and Thailand is limited by the number of adequate ports and landing areas. Reliability and safety are matters of concern.

Major tourist sites are located close to a number of navigable channels and in reach of well-equipped cruise ships. Cross-border waterborne tourism in the region could add substantially to the existing tourism options.Tourism has proven to be a major force for social and economic development in all MRC Member Countries, and water-based tourism could play an important part in the diversification strategy to keep the tourism industry healthy and growing. Waterborne tourism has an added benefit in creating socio-economic opportunities for rural communities.

LOCATION

Home-based and consultations with national line agencies including Waterways, Tourism and Trade and national and local tour operators.

OBJECTIVES

The objectives of this action are to:

- Review existing passenger services and tourism opportunities along the Mekong River;
- Develop a Mekong Tourism Atlas for rural waterborne transport and the tourism industry including travel agencies, tour operators and visitors to the Mekong region.

OUTPUTS AND DELIVERABLES

Output 1: Baseline Report.

Output 2: Mekong Tourism Atlas.

ACTIVITIES

The following activities are required to complete this action:

- Review substantial information and data relevant to Mekong tourism and inland navigation within the MRC;
- Prepare survey to determine the current situation for Mekong tourism including passenger services, eco-tourism and international cruises;
- Consultation with national line agencies, national and local tour operators in the Mekong countries to complete surveys on Mekong tourism;
- Define stretches where development of eco-tourism and passenger services should be prioritised for socio-economic development;
- Develop scenarios for linking rural waterborne transport and local-ecotourism with national and international cruises and passenger transport;

- Prepare recommendations to develop waterborne passenger transport and tourism in the Mekong Basin in relation to other modes of transport;
- Prepare recommendations for prioritised investments in inland waterway infrastructure and sources of finance for regional passenger transport, tourism and rural waterborne transport;
- Prepare the Mekong Tourist Atlas, containing:
  - An overview description, and country level descriptionswith photographs of the ports, landing facilities and tourist attractions in the Lower Mekong basin;
  - An overview map and more detailed maps for each country showing the locations of the ports, landing facilities and tourist spots along the river;
  - Mapping and description of the Mekong waters for navigation in the dry and wet season;
  - Classification and description of the different types of boats operating on the Mekong waters;
  - A 'catalogue', to a standard format, presenting data on each of the ports and landing facilities.
- Compile data and information for key passenger ports including,
  - Plan view diagram of each port or landing facility, plus photographs;
  - Coordinated data for each location;
  - Contact details of the operator;
  - Port capacity, and permissible draught (wet and dry season);
  - Handling facilities for cargo and passengers;
  - Storage facilities;
  - Rail and road connections and services;
  - Local water transport services;
  - Maintenance facilities and other services available; and
  - Other relevant features of the port or landing facility.
- Prepare the catalogue of tourist sites accessible from the passenger ports comprising:
  - Local maps showing the location of each of the sites and access to them;
  - Description and photograph of each site;
  - Local tourist services available: transport, tour companies; and
  - Tourist accommodation: hotels and guesthouses.
- Prepare recommendations for a tourism summit on IWT to launch the Mekong atlas with national line agencies, private sector and travel industry.

BUDGET

200,000 US$

HUMAN RESOURCES

1) International consultant for Transport Planning.
2) International consultant for Tourism/Trade development.
3) National consultant for waterway tourism in Lao PDR.
4) National consultant for waterway tourism in Thailand.

5) National consultant for waterway tourism in Cambodia.

6) National consultant for waterway tourism in Viet Nam.

PROPOSED EXECUTING/IMPLEMENTING AGENCY

This regional approach to Mekong tourism could be implemented by MRCS through ASEAN initiatives for tourism.

TIME AND WORK SCHEDULE

Month	Output/Activity
0-1	**Output 1**: Baseline Report • Review substantial information and data relevant to Mekong tourism and inland navigation within the MRC; • Prepare survey to determine the current situation for Mekong tourism including passenger services, eco-tourism and international cruises.
2-3	**Output 1**: Baseline Report • Consultations with national line agencies and national and local tour operators in the Mekong countries to complete surveys on Mekong tourism.
4-5	**Output 1**: Baseline Report • Define stretches where development of eco-tourism and passenger services should be prioritised for socio-economic development; • Develop scenarios for linking rural waterborne transport and local-ecotourism with national and international cruises and passenger transport; • Prepare recommendations to develop waterborne passenger transport and tourism in the Mekong Basin in relation to other modes of transport; • Prepare recommendations for prioritized investments in inland waterway infrastructure and sources of finance for regional passenger transport, tourism and rural waterborne transport.
6-8	**Output 2**: Mekong Tourism Atlas • Prepare the Mekong Tourist Atlas; • Compile data and information for key passenger ports; • Prepare the catalogue of tourist sites accessible from the passenger ports.
9	**Output 2**: Mekong Tourism Atlas • Prepare recommendations for a tourism summit on IWT to launch the Mekong atlas with national line agencies, private sector and travel industry.

SOCIAL ISSUES

This action is not expected to have any adverse social impacts.

ENVIRONMENTAL ISSUES

This action is not expected to have any adverse environmental impacts.

ECONOMIC ASSESSMENT

The economic benefits from this action will include: induced economic growth and increased employment in countries/areas/regions targeted for this initiative.

PRIORITY OF ACTION (H/M/L)

Very High: Start this the short term action in 2016.

FINANCING PLAN (PUBLIC/PRIVATE)

Governments could fund this first phase and the investments prioritized and funded by private investors.

PRIOR ACTIONS REQUIRED

Ensure improvements to fleet and waterway safety are communicated to cruises and passenger vessels.

FOLLOW-UP ACTIONS REQUIRED

DisseminateMekong Atlas to international tourism and travel agencies.

9.4 LONG TERM SOCIAL ACTION 1 (LSO1)

TITLE

Develop landing facilities for local passenger transport to improve safety and create further economic opportunities for rural IWT users

BACKGROUND AND RATIONALE

Major tourist sites are located close to a number of navigable channels and in reach of well-equipped cruise ships. Cross-border waterborne tourism in the region could add in a substantial way to the existing tourismoptions. Tourism could prove to be a major force for social and economic development of all member countries. River-related tourism can play an important part in the diversification strategy to keep the tourism industry healthy and growing. Waterborne tourism has as added benefit in that it creates a lot of jobs and, if managed well, the impact on the environment is small.

Based on the results of a 2008 study conducted by the NAP on the economic potential of waterborne transport on the Mekong,tourism development has been identified as a significant driver for economic expansion on the river. Tourist cruises have the potential to benefit many small regional towns located along the river that may not otherwise have access to such a market. The introduction of modern and safe standards for passenger jetties at selected tourist sites along the river will therefore benefit both waterway-related tourism sectors as well as improve the livelihood of the rural communities.

In 2015, surveys were conducted in the data collection phase to determine the attitudes of local IWT users at different passenger ports along the Mekong River. Passengers reported that they used IWT to access services, for employment and for transporting goods to and from markets. They also reported that the safety and efficiency of boats and landing facilities needs to be improved. Further developing local cargo and passenger transport on the Mekong River can provide direct and indirect economic benefits, thereby improving livelihoods for rural communities.

The NAP has implemented 11 landing facilities between2010-2013.The installation of this internationally recognized system of landing facilities greatly improves the safety and efficiency of tourism. Ten more sites should be prioritized in Lao PDR and Cambodia on the Mekong mainstream based on the socio-economic survey of rural IWT users and river-related tourism sites. The landing facilities will improve safety and provide more socio-economic opportunities for rural IWT users. The landing facilities can link rural IWT with national and regional transport routes. Smaller boats can be used to transport cargo upstream or downstream from national ports to smaller landing facilities.

LOCATION

This action will be carried out in Lao PDR and Cambodia. The floating pontoons will be delivered to Vientiane and Phnom Penh, respectively. The sites for the floating pontoons along the Mekong mainstream will be prioritized during national consultations. The floating pontoons will be installed by the national line agencies, following training on installation, maintenance and operations.

OBJECTIVES

The objectives of this action are to:

- Procedure and deliver the floating pontoons in Lao PDR and Cambodia; and
- Install five landing facilities in Lao PDR and Cambodia supported by operations and maintenance (O&M) manuals.

OUTPUTS AND DELIVERABLES

The outputs and deliverables under this action are:

- **Output 1: Preparation of tenfloating pontoons with dimensionabout 2.7 m wide and 10.5m long-** with technical requirements and quantities as specified in the activities below.

- **Output 2: Delivery of the floating pontoons to Vientiane, Lao PDR and Phnom Penh, Cambodia**- expected delivery is 4 months after signing the contract (includes 2 months for manufacturing and 2 months for shipping/transportation).
- **Output 3: Training on the installation of the floating pontoons-**to inform the national line agencies responsible for the process of installation.
- **Output 4: Installation of 10 floating pontoons in priority sites along the Mekong mainstream in Lao PDR and Cambodia-**these sites will be determined following regional/national consultations with key stakeholders.
- **Output 5: Operations and maintenance manual-** prepared for national line agencies responsible for maintenance and monitoring of floating pontoons.

ACTIVITIES

The following activities will need to be carried out to complete the outputs and deliverables of this action:

- Evaluate the technical requirements for the floating pontoon:

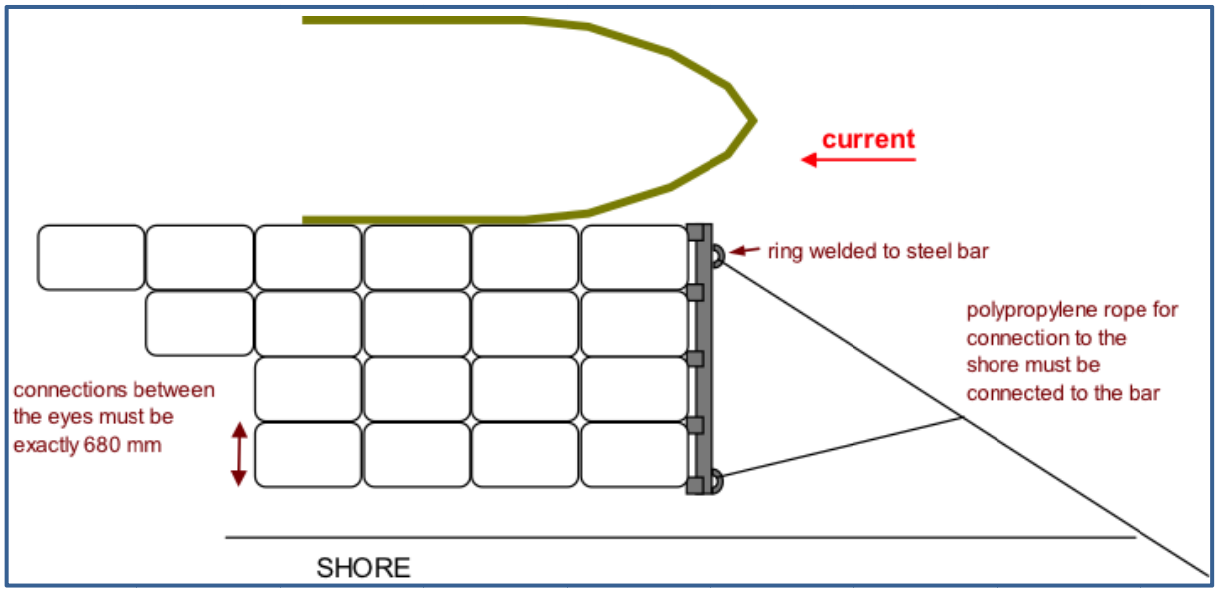
Item	Specification
Buoyancy per sqm	350 kg
Vertical load concentration	150 kg at any point of the deck, without changes
Tensile strength	3 tonnes
Freeboard	at least 30cm
Deck surface	no splits, splinters, nail-pop, or rot
Installation	must be easy - following the manual
Installation	within one day per jetty
Resistant to	acids, oily products, bases and hydrocarbons
UV resistant	full cover
Other condition	rot-proof
Maintenance free	none
Recyclable	100%
Surface	anti-skid
Color	grey in-material color
Certified	by a recognized classification society
Connecting bar	galvanized steel
Minimum requirements	In order to allow for extension of the existing floating jetties the exact distance between the eyes (connections) of the floating modules must be exactly 680 mm

- Determine the quantity of components required for the floating pontoons:

Description	Amount	Remark
Floating pontoons with dimension about 2.7 m wide and 10.5m long	10	
Modules	640	64 modules for each pontoon
Bolders/cleats	60	On 'closed sides' where boats are moored (at two ends of the pontoon)
Connecting bolts	450	Connect between parts inside the pontoon
Side fixations	170	On the outside of the pontoon
Fenders	70	On 'closed sides' where boats are moored

		(every 2 modules)
Polypropylene rope (lines) to connect pontoons to the shore at 40m each, dia. 20 mm	20	2 ropes for one pontoon
Galvanized steel mooring bar to connect 2 modules	20	2 bars for one pontoon

- Prepare procedures for installing the floating pontoons taking into account the conditions of the Mekong River in the wet and dry season.The figure below provides an example of installing the floating pontoons;



Prepare inventory for components and equipment required;

- Arrange for shipping/transportation to Lao PDR and Cambodia;
- Prepare draft O&M manual on installing, maintaining and monitoring the floating pontoons, including time for translation of O&M manuals to Lao and Khmer;
- National consultation meeting in Lao PDR with key line agencies to confirm the priority sites and train national counterparts in installation of the floating pontoons;
- Following the training, national line agencies to install the 5 floating pontoons in Lao PDR;
- National consultation meeting in Cambodia with key line agencies to confirm the priority sites and train national line agencies in the installation of the floating pontoons;
- Following the training, national line agencies to install the 5 floating pontoons in Lao PDR and the 5 floating pontoons in Cambodia.

BUDGET

250,000 US$

HUMAN RESOURCES

The following resources are needed to implement this project:

1) Technical manager.
2) Procurement manager.
3) Customs and freight forwarder.

4) Representatives from Cambodia national line agencies.

5) Representatives from Lao PDR national line agencies.

PROPOSED EXECUTING/IMPLEMENTING AGENCY

MRCS and development partners could provide the funding for the floating pontoons. The floating pontoons have to be installed and maintained by national line agencies (i.e. Waterway Department, Ministry of Public Works and Transport) in Lao PDR and Cambodia.

TIME AND WORK SCHEDULE

Month	Output
0-2	**Output 1:** Preparation of 10 floating pontoons with dimension about 2.7 m wide and 10.5m long.
2-4	**Output 2:** Floating pontoons are delivered toVientiane, Lao PDR and Phnom Penh, Cambodia.
5	**Output 3:** Training on the installation of the floating pontoons in Lao PDR and Cambodia.
6	**Output 4:** Installation of 10 floating pontoons in priority sites along the Mekong mainstream in Lao PDR and Cambodia.
6	**Output 5:** Finalize operations and maintenance manual

***Note**: The delivery of the materials is required at the start of the dry season between November to May. The floating pontoons are difficult to install in the wet season.*

SOCIAL ISSUES

This action will not have any adverse social impacts. The floating pontoons will have a positive social impact by improving safety and creating socio-economic opportunities for rural IWT.

ENVIRONMENTAL ISSUES

This action may have low environmental impact as solid wastes may be generated during the installation. Waste management plans are needed to ensure all wastes are collected and disposed of accordingly from the installation sites in Lao PDR and Cambodia.

ECONOMIC ASSESSMENT

The economic benefits from this action will include: induced economic growth, increased employment and enhanced safety in countries/areas/regions targeted for this initiative.

PRIORITY OF ACTION (H/M/L)

Very High: Start the long term action in 2021-2024 as in many local ports along the Mekong mainstream in Cambodia and Lao PDR the conditions for loading and unloading passengers and cargo are dangerous and require further improvement.

FINANCING PLAN (PUBLIC/PRIVATE)

Public funding will assist to improve the socio-economic opportunities for rural IWT users and improve the safety of passengers.

PRIOR ACTIONS REQUIRED

Determine a list of priority sites for the installation of floating pontoons through dialogue with rural IWT users and national line agencies.

FOLLOW-UP ACTIONS REQUIRED

Ensure that the O&M manual is followed and that regular inspections of the floating pontoons are conducted. A perception survey of rural IWT users and passengers would be useful to determine attitudes towards the use of the floating pontoons.

10 CAPACITY BUILDING ACTIONS

9.1 SHORT TERM CAPACITY BUILDING ACTION 1 (SCB1)

TITLE

Plan and implement national, bilateral and regional Inland Waterway Transport education and training actions on navigation techniques and equipment (crew certification), on navigation safety including carriage and handling of dangerous goods, on hydrodynamics, hydrography and waterway design and maintenance, on inland waterway vessel design and construction, registration and inspection, and on inland waterway transport socio-environmental issues.

BACKGROUND AND RATIONALE

The "Training Plan to Implement the Activities under the Navigation Programme" is part of the MRC Navigation Programme 2013-2015 (Outcome 5 Institutional Arrangements and Capacity Building).

Cfr. "Formulation of a Training Plan to Implement the Activities under the Navigation Programme - Final Report", MRCS NAP, December 2014.

Although most of the MRC NAP outputs and activities are focused on only one or two of the four MRC member countries, this NAP Training Plan is based on a Training Needs Assessment for NAP related disciplines and topics. Some countries not involved in some of the NAP outputs or activities also expressed a high need for additional training.

LOCATION

Cambodia, Lao PDR, Thailand, Viet Nam + training of trainers abroad.

OBJECTIVES

The objective of this Action is to assist the Member Countries, their line agencies, the MRCS and relevant stakeholders in the strengthening of their relevant institutional mechanisms and in their capacity building related to the effective implementation of the MRC Navigation Programme.

OUTPUTS AND DELIVERABLES

Based on a Training Needs Assessment in the four MRC Member Countries, the following was proposed to form the "MRC NAP Training Plan":some 24 national seminars/workshops and 24 national short courses (6 per country), some 5 bilateral seminars/workshops and 5 bilateral short courses, some 5 regional seminars/workshops and some 5 training of trainers courses abroad.

ACTIVITIES

In the MRC NAP Training Plan, the following training actions are proposed:

- TA1 One bilateral (Lao PDR-Thailand) short course (2 days) on "The methodology of Master Planning"
- TA2 One national (Viet Nam and possibly some Cambodian) seminar (1 day) on "Port and Waterway Transport Logistics, Multimodal Transport"
- TA3 Four national short courses (5 days) on "Collection and Analysis of Economic and Technical Data"
- TA4 Two bilateral short courses (3 days) on "Fleet and Waterway Classification"
- TA5 Two bilateral short courses (3 days) on "International, Regional and Bilateral Conventions, Agreements and Legal Framework on Cross Border Navigation"
- TA6 Two bilateral workshops (1 day) on "Regulations on Ship Inspection and Registration"

TA7 Two bilateral short courses (3 days) on “Dangerous Goods Vessels Inspection”

TA8 Two bilateral short courses (3 days) on “Mekong Tanker Safety Management”

TA9 Four national short courses (3 days) on “Dangerous Goods Vessels Operations”

TA10 One Training of Trainers course abroad (10 days, 12 participants) on “Design, Construction and Inspection of DG in Ports and Terminals”

TA11 Four national short courses (5 days), including on the job training on “DG Ports and Terminals Infrastructure Inspection and Licensing”

TA12 Four national short courses (5 days), including on the job training on “DG Ports and Terminals Infrastructure Regulations and Standards”

TA13 Four national workshops (1 day) on “PSHEMS Code and Guidelines”

TA14 Four national short courses (5 days) including on the job training on “PSHEMS Development, Set Up and Implementation, Maintenance and Testing of Critical Equipment”

TA15 Four national workshops (1 day) on “Critical Equipment Inspection”

TA16 Four national workshops (1 day) on “Internal Port Safety Auditing”

TA17 Four on the job trainings (3 days each, one in each of the member countries) on “Emergency Response Onboard of DG vessels”

TA18 Two on the job trainings (3 days each, one in a Cambodian and one in a Vietnamese port) on “Emergency and Oil Spill Response of DG inPorts and Terminals”

TA19 Two bilateral short courses (5 days) on “International and National IWT Safety Regulations and on Aids to Navigation”

TA20 Two bilateral short courses (5 days) on “Automatic Identification System (AIS), Vessel Traffic System (VTS), Global Positioning System (GPS), River Information Service (RIS) and Electronic Chart Display Information System (ECDIS)”

TA21 One Training of Trainers course abroad (10 days, 12 participants) on “Oil and Chemical Spill Contingency Planning” and “Vessel and Port Waste Management”

TA22 One regional seminar (2 days) and two bilateral short courses (3 days), including onthejob training on “Oil and Chemical Spill Contingency Planning”

TA23 Four national short courses (3 days) on “Port and Vessel Waste Management”

TA24 Two bilateral workshops (1 day each) on “Cross Border Vessel and Port Waste Management”

TA25 One regional seminar (1 day) on “Climate Change Mitigation and Adaptation Measures”

TA26 Four national awareness workshops (2 days) on “Geographical Zoning of the Mekong River and Related Technical and Operational Requirements for Tankers”

TA27 Two national seminars (1 day) on “Port and Lock Design, Construction and Operation” for which some Cambodian participants can be invited to join the national seminar held in Viet Nam.

TA28 One Training of Trainers course abroad (10 days, 16 participants) on “Bathymetric Survey and Monitoring River Works”

TA29 Four national short courses, including onthejob training (5 days) on “Bathymetric Survey and Monitoring River Works”

TA30 Four national seminars/workshops (2 days) on “Inland Waterway Transport Promotion, Advantages of IWT and Port and Fleet Associations”

TA31 One regional workshop (2 days) on "Harmonized Crew Certification Regulations"

TA32 One regional workshop (2 days) on "Harmonized training standards for crew certification"

TA33 One regional Training of Trainers programme (5 days) on "Crew Standard Training Programmes"

TA34 One regional workshop (2 days) on "Harmonized Training Standards for DG Vessel Crew Certification"

TA35 One regional Training of Trainers programme (5 days) on "DG Vessel Crew Standard Training Programmes"

TA36 Four national workshops (1 day) on "Gender Participation and Capacity Building in the IWT Sector"

Elaborated project files for each of these Training Actions are available in *the "Formulation of a Training Plan to Implement the Activities under the Navigation Programme - Final Report"*, MRCS NAP, December 2014.

BUDGET

The costs for the mentioned Training Actions (excluding the NAP Dangerous Goods RAP Training Actions)for each of the funding partners were estimated as follows:

- International± 400,000 US$
- Regional± 600,000 US$
- National (Public + Private Sector)4 x ± 100,000 US$ =± 400,000 US$

It is worth noting that these budget estimations areabsolute maxima and can be strongly reduced, for example by saving on the logistics costs. Moreover, in the same way as for the DG RAP training actions, many of the higher mentioned training packages will be incorporated under the NAP Outputs. Therefore the absolute budget values are actually relative as they will become part of the agreed outputs.

HUMAN RESOURCES

For international and regional training activities, the NAP Team attached to the Office of the Secretariat in Phnom Penh (OSP) should coordinate the organization and implementation. To enable the NAP Team to fulfill this assignment, a capacity building focal point attached to the team should be set up.

From a country perspective, as many training activities would involve the transport agencies, and subject to specific arrangements of a specific country, a national focal point for capacity building should also be appointed.

PROPOSED EXECUTING/IMPLEMENTING AGENCY

Implementation of this Training Plan should be undertaken, subject to the specific role and function of the trainee, trainer or coordinator, by various relevant stakeholders, education and training entities, the NMC Offices and identified experts in the MRC member countries as well as the MRC NAP Team and related MRCS programmes.

Cambodia:MPWT, IWT Department – Navigation Training Center (NTC)

Lao PDR:MPWT, Waterways Department – Public Works and Transport Training Center (PTTC)

Thailand: MoT, Marine Department – Merchant Marine Training Center (MMTC)

Viet Nam: MoT, VIWA – Waterway Transport Vocational College no.2 (WTVC2)

TIME AND WORK SCHEDULE

The *"Formulation of a Training Plan to Implement the Activities under the Navigation Programme - Final Report", MRCS NAP, December 2014,* proposed to organize all Training Actions in the period 2015 – 2017. However, because this Training Plan can only be started when necessary funding from national, regional and international resources is available, this action should start with the most urgent topics, especially on Dangerous Goods Management and Master Planning.

SOCIAL ISSUES

Stakeholder analysis should be conducted prior to training to identify staff at all levels.

In selecting staff for training and skills development, the national policy of providing equal opportunities to men, women and people with disabilities should be applied. The opportunity should be taken to incorporate environmental and social safeguards into the courses, where appropriate, including gender, disability, HIV/AIDs, environment and social protection.

ENVIRONMENTAL ISSUES

This action is not expected to have a negative environmental impact.

ECONOMIC ASSESSMENT

Not relevant.

PRIORITY OF ACTION (H/M/L)

High.

FINANCING PLAN (PUBLIC/PRIVATE)

National (in-country): Trainee/participants, governments, provincial and local authorities, port authorities, port operators, transport companies, oil companies.

Regional:MRCS NAP, ADB - GMS (Greater Mekong Sub region).

International: World Bank, European Union, Flanders / Belgium, Australia aid, KOICA (Korea), JICA (Japan), ASEAN IAI (receiving funds from Australia, Japan, etc.).

PRIOR ACTIONS REQUIRED

Appoint focal points for capacity building at the MRCS NAP and at the national level in the four MRC member countries.

11 INSTITUTIONAL ACTIONS

11.1 SHORT TERM INSTITUTIONAL ACTION 1 (SIN1)

TITLE

Establish a "Regional Mekong Navigation Center" in order to implement and coordinate the actions of the Regional Master Plan

BACKGROUND AND RATIONALE

Under the present organisational structure of MRC, the National Mekong Committees should support the planning and implementation of the Master Plan Actions. Given thatseveral of the Actions are cross-border actions, and in order to centralise efforts for the implementation of the Master Plan, a "Regional Mekong Navigation Center" should be established, that is directly connected to the National Mekong Committees and the Waterborne Transport related Ministries and Authorities.

LOCATION

It is proposed to locate the Regional Mekong Navigation Center in the MRCS office in Phnom Penh, whichcan take care of all logistic arrangements and support.

OBJECTIVES

Create an authority that will assume all responsibilities to implement the designed Regional Master Plan for Waterborne Transport on the Mekong River Basin.

OUTPUTS AND DELIVERABLES

Coordinate and prepare the Actions (inception notes, project files, terms of reference, etc.), proposed in the Master Plan with regards to fleet, waterway design, port development, legal amendments, safety and security, socio-environment and the accompanying capacity building.

Outline the regional policy on the use of modes of transport, promote multi-modal principles and act as intermediary between the MRCS NAP, the NMCs, the MPWTs and MoTs, the private sector and its professional associations. The Center will be instrumental in facilitating new and additional investments in the sector, will help draft new regulations and will lead international promotional campaigns to develop new commercial opportunities.

The Regional Mekong Navigation Center should consist of a Steering Committee and an Executive Office. The Executive Office should doall the preparatory work for the actions (inception notes, project files, terms of reference, looking for funding opportunities, etc.). All decisions should betaken by the Steering Committee.

Next to the "Regional Mekong Navigation Center", a Project Management Unit (PMU) should be established, but this will be mostly on a national or bilateral level.

ACTIVITIES

A study of the present legislation and policy of the government. Prepare legislation for the creation of regulatory bodies in the overall transport sector.

Draft a national port act. Encourage private sector enterprises to form associations. Maintain a working relationship with the private sector. Evaluate privatisation of sector operational activities.

BUDGET

Estimated costs per year are as follows:

- **US$15,000** Steering committee (15 pax x 500 US$ travel + DSA x 2)

- **US$12,000** Full time executive office director at 1,000 US$ / month
- **US$52,000** 4 months international planning consultant at 13,000 US$ / month
- **US$19,200** 2 full time local financial and technical experts at 800 US$ / month
- **US$7,200** Full time administrative staff at 600 US$ / month
- **US$6,000** Office costs at 500 US$ / month
- **US$ 111,400Total** estimated cost per year

HUMAN RESOURCES

Who	What
Steering Committee	
• 1 representative of the MRCS NAP Team • 4 representatives of the NMCs • 4 representatives of the MPWTs / MoTs • 1 Master Plan Executive Office Directorand ad hoc • 4 representatives of other Ministries or • Authorities	This Steering Committee has a meeting twice a year. The Committee is informed by the MP Executive Office Director about the progress of the MP. The Steering Committee takes all decisions on the basis of documentsprepared by the Executive Office.
Executive Office	
• MP Executive Office Director (fulltime) • 1 financial expert (fulltime) • 1 technical expert (fulltime) • 1 administrative staff (fulltime) • 1 international planning consultant (1/3 time)	The Executive Office does all preparatory work for the actions (terms of reference, tendering, looking for funding opportunities, etc.). Decisions are taken by the Steering Committee.

PROPOSED EXECUTING/IMPLEMENTING AGENCY

MRCS NAP in cooperation with the NMCs, the MPWTs and the MoTs.

TIME AND WORK SCHEDULE

To start as soon as funding becomes available, for a period of 5 years.

SOCIAL ISSUES

This action will have no significant social impacts. This Center will be responsible for implementing the Master Plan, and will therefore play a key role in enhancing the social benefits and mitigating the potential social impacts. Staff of the Executive Office should receive awareness training in key social issues related to their work such as rural poverty, gender mainstreaming and HIV/AIDS.

ENVIRONMENTAL ISSUES

This action will have no significant environmental impacts. The environmental actions should be incorporated into the activities of the Regional Mekong Navigation Center to ensure sustainable navigation i.e. Integrated Planning/SEA, EMP and environmental monitoring to ensure impacts are mitigated and that they reducecarbon emissions.

ECONOMIC ASSESSMENT

Not relevant.

PRIORITY OF ACTION (H/M/L)

High.

FINANCING PLAN (PUBLIC/PRIVATE)

Total US$ 112,000 / year: international grant.

PRIOR ACTIONS REQUIRiD

None.

FOLLOW-UP ACTIONS REQUIRED

None.

11.2 SHORT TERM INSTITUTIONAL ACTION 2 (SIN2)

TITLE

Set up "Mekong Navigation Data and Information Management Centers" in the four MRC Member Countries and study the need for and scope of bilateral and/or regional cooperation on Mekong Inland Waterway Transport Data Management and River Information Services

BACKGROUND AND RATIONALE

It is of concern that there is a lack of data with respect to trade and traffic production and attraction, intra- and inter-regional trade and traffic flows, modal split, as well as the physical aspects of the river and the ports.

Moreover, information and data collection and management on waterway characteristics, obstacles, IWT fleet, port infrastructure and throughput, cargo and passenger transport, dangerous goods transport and storage, accidents and so on, is organised by many different organisations and authorities.

Without vital time-series of trade, port and transport statistics, O/D Structures and modal split, master planning and costbenefit analyses of proposed infrastructure developments is an ineffective exercise.

Although MRC does have a comprehensive overview of all studies and projects carried out by agencies such as the World Bank, ADB, ESCAP and ASEAN, among others, the impression nevertheless is that waterborne transport sector data, lacks overall coordination and focus, and is fragmented and far from complete.

LOCATION

Phnom Penh (Cambodia), Vientiane (Lao PDR), Chiang Rai (Thailand), Ho Chi Minh City (Viet Nam).

OBJECTIVES

Create "Mekong Navigation Data and Information Management Centers" in the four MRC Member Countries to support planning and policy formulation and to provide daily services for safe and efficient passage by inland and sea-going vessels on the Mekong River System.

OUTPUTS AND DELIVERABLES

The output will be adequately staffed, trained and financed units within the Inland Waterway Transport related departments/administrations, functioning effectively.

ACTIVITIES

Establish an appropriate organisational structure within the Inland Waterway Transport related departments/administrations and between the MRC Secretariat, the National Mekong Committees and the related line agencies.

Prepare an objective and detailed analysis of existing organisations dealing with navigation related data collection and prepare harmonized information sheets. Make firm commitments with all organisations to obtain correct and recent information on a regular basis.

At the same time, a study should start on the need for and scope of bilateral and/or regional cooperation on Mekong Inland Waterway Transport Data Management and River Information Services.

Therefore, a working group/task force should be established, preparing the Terms of Reference for such bilateral and/or regional cooperation.

BUDGET

The investment budget to set up and provide substantial technical assistance to the Centers cannot be defined until some detailed policy objectives have been established. An initial estimate for local experts is **US$ 10,000**per country.

The costs for the study of bilateral and/or regional cooperation concerning data and information management can be estimated at **US$ 20,000**.

HUMAN RESOURCES

Two official administrative agents per country, equipped with full IT equipment and all computer literate should be sufficient to staff the National Mekong Navigation Data and Information Management Centers.

PROPOSED EXECUTING/IMPLEMENTING AGENCY

Inland Waterway Transport related departments/administrations, in conjunction with the NMCs, MRCS and donor(s). International support for resources will be limited and of short duration (such as for establishing principles and working methods rather than for continuous implementation).

TIME AND WORK SCHEDULE

To start as soon as funding is available.

SOCIAL ISSUES

This Action is not expected to have any significant social impact. It would be beneficial if the scope of the Centers' responsibilities were to include collecting data on Inland Rural Waterway Transport. Such data is relatively difficult to obtain given the informal nature of the sector, but the wider availability of information on the significance and characteristics of IRWT in the different countries would contribute to increasing its visibility for policy and decision-makers. In recruiting and training staff for the Mekong Navigation Data and Information Management Centers, the national policies of providing equal employment opportunities to men and women should be applied.

ENVIRONMENTAL ISSUES

This action will have no significant environmental impacts. Data on water quality and pollution incidents could be integrated into the data center to monitor environmental impacts of IWT.

ECONOMIC ASSESSMENT

Not relevant.

PRIORITY OF ACTION (H/M/L)

Very High.

FINANCING PLAN (PUBLIC/PRIVATE)

Total 4 x US$ 10,000 + 1 x US$ 20,000: allocation from national budgets.

PRIOR ACTIONS REQUIRED

None.

FOLLOW-UP ACTIONS REQUIRED

None.

11.3 SHORT TERM INSTITUTIONAL ACTION 3 (SIN3)

TITLE

Set up "Mekong Navigation Promotion and Marketing Agencies" in the four MRC Member Countries and study the need for and scope of bilateral and/or regional cooperation on IWT promotion and marketing

BACKGROUND AND RATIONALE

Inland waterway transport suffers from a negative perception on its performance. There is a need to improve the image of IWT. Governments have not taken the initiative to promote IWT. An independent agency that could lobby policy makers, act as interface between policy makers, users and other partners sharing the same goals is required to maximise the use of one of the Mekong Basin's major assets: its rivers.

LOCATION

Cambodia – Phnom Penh, Lao PDR – Vientiane, Thailand – Bangkok, Viet Nam – Hanoi.

OBJECTIVES

Create independent agencies in the four MRC Member Countries that will actively pursue promotional and marketing activities in order to bring as much cargo and passengers as possible to IWT, thus contributing to a better competitive position of IWT.

OUTPUTS AND DELIVERABLES

Creation of independent agencies with participation of the public sector and the private sector that will be recognised by all stakeholders as intermediate entities in promoting IWT.

ACTIVITIES

Secure funds. With the help of the private sector and external donors, set up a Board of Directors in which not only the government but also autonomous entities and the private sector should participate. Hire manager. Find office space. Equip office. Start activities with data collection. Gradually expand organisation and build up profile within the transport community and with the authorities.

Start a study on the need for and scope of bilateral and/or regional cooperation on Mekong Inland Waterway Transport Promotion and Marketing. Therefore, a working group/task force should be established, preparing the Terms of Reference for such bilateral and/or regional cooperation.

BUDGET

The budget per year and per country can be estimated at:

- **US$12,000** Full time executive office director at 1,000 US$ / month
- **US$19,200** 2 full time local experts at 800 US$ / month
- **US$7,200** Full time administrative staff at 600 US$ / month
- **US$20,000** Publications, Promotion Budget
- **US$6,000** Office costs, Transport at 500 US$ / month
- **US$64,400 Total**per year and per country
- The costs for the study of bilateral and/or regional cooperation concerning promotion and marketing can be estimated at **US$ 20,000**.

HUMAN RESOURCES

Manager plus 2 or 3 employees, all computer literate. Manager to be familiar with transport and promotional activities and have contacts within government circles.

PROPOSED EXECUTING/IMPLEMENTING AGENCY

MPWT/MoT, IWT related authorities, companies and private sector.

TIME AND WORK SCHEDULE

Preparatory work (initiative of the Regional Mekong Navigation Center) 2016, establishment of the Agencies 2017.

SOCIAL ISSUES

This action will have positive social impacts. The campaigns will promote greater utilization of IWT the Mekong Basin that will generate significant social benefits. The promotion of Inland Rural Waterway Transport should be considered as a priority for poverty alleviation in rural areas.

ENVIRONMENTAL ISSUES

This action will have no significant environmental impacts. Awareness campaigns can be used to promote IWT as a more sustainable mode of transport than road.

ECONOMIC ASSESSMENT

Not relevant.

PRIORITY OF ACTION (H/M/L)

High.

FINANCING PLAN (PUBLIC/PRIVATE)

Total 4 x US$ 64,400per year and **1 x US$ 20,000** – Private sector and national budget.

PRIOR ACTIONS REQUIRED

None.

FOLLOW-UP ACTIONS REQUIRED

None.

11.4 SHORT TERM INSTITUTIONAL ACTION 4 (SIN4)

TITLE

Study the need for and eventual scope of regional cooperation on hydrodynamic, sedimentological and nautical research

BACKGROUND AND RATIONALE

There is almost no knowledge about the hydraulic, hydrodynamic and sedimentological behaviour of the Mekong River System. Moreover, in almost all study and research projects, foreign expertise is needed.

Due to the fact that this is a task for the whole Mekong River Basin, it is proposed to establish a Regional"Mekong Hydraulic and Nautical Research Center", working in close cooperation with the MRC Secretariat.

LOCATION

MRCS NAP OSP.

OBJECTIVES

Study on the need for and eventual scope of a regional "Mekong Hydraulic and Nautical Research Center", which is well equipped and has a well trained staff to perform all kinds of hydraulic, hydrodynamic, sedimentological and nautical studies on the Mekong River System.

Next to navigation related studies (dredging, river works, etc.), the tasks of this Center could be extended to additional research on bank protection, inundation prevention and environmental studies, among others.

OUTPUTS AND DELIVERABLES

A study report on the need for and the eventual scope of a "Mekong Hydraulic and Nautical Research Center".

ACTIVITIES

1) Study which type of hydrodynamic, sedimentological and nautical research projects are eligible for a Mekong Research Center;
2) Study which type of research is available and eligible for a Mekong Research Center (mathematical modeling, physical modeling, including in situ measurements, etc.);
3) Prepare Terms of Reference and a concept and design note for an eventual "Mekong Hydraulic and Nautical Research Center".

BUDGET

- **US$30,000** for 2 MRC Secretariat (inter)national experts at US$ 2,500 / month
- **US$24,000** for 4 national experts at US$ 1,000 / month
- **US$72,000** for an international consultant at US$ 12,000 / month
- **US$ 126,000** total cost

HUMAN RESOURCES

2 MRC Secretariat (inter)national experts, 4 national experts and 1 international consultant from a "Hydraulic and Nautical Research Center" abroad.

PROPOSED EXECUTING/IMPLEMENTING AGENCY

MRC Secretariat.

TIME AND WORK SCHEDULE

Preparatory, concept and design study: 6 months.

SOCIAL ISSUES

This action will have no significant social impacts.

ENVIRONMENTAL ISSUES

This action will have no significant environmental impacts.

ECONOMIC ASSESSMENT

Not relevant.

PRIORITY OF ACTION (H/M/L)

Medium.

FINANCING PLAN (PUBLIC/PRIVATE)

The **US$ 126,000**budget should be funded by an international grant.

PRIOR ACTIONS REQUIRED

None.

FOLLOW-UP ACTIONS REQUIRED

None.

11.5 LONG TERM INSTITUTIONAL ACTION 1 (LIN1)

TITLE

Study the need for and scope of a regional "Mekong River Navigation Commission" (scenario 2)

BACKGROUND AND RATIONALE

Preparation of an integrated institutional and legal framework for navigation of the Mekong in 2040.

In the (likely) event of better interconnection between the various navigable stretches of the Mekong and of stronger integration between the economies of the riparian countries,it would be a logical step to also integrate the current institutional mechanisms and further harmonize the legal framework for the management of the waterway over its entire navigable length. In the scenario of unhampered 500 DWT navigability between China and the sea, there might indeed be a case for the establishment of a single intergovernmental navigation commission which is competent for the entire Mekong (or at least for the territory of the current MRC Member States). Such an integrated commission should have as its task the gradual elaboration of a fully harmonized legal framework for navigation for all the countries concerned. Ideally, the envisaged commission should replace the JCCCN and the Mekong Navigation Facilitation Committee.

LOCATION

Cambodia, Lao PDR, Thailand and Viet Nam.

OBJECTIVES

Ensure integration of the decision-making mechanisms across the riparian countries, increase efficiency of the governance structure, of competitiveness of waterborne transportation and ports and the overall sustainability of the system.

OUTPUTS AND DELIVERABLES

Legal and institutional study on the integration of the institutional and regulatory framework for the management of the waterway.

ACTIVITIES

Legal and institutional study comprising an analysis of the current structure, an assessment of new needs arising from better navigational conditions and interconnection of river stretches, international benchmarks, political and economic feasibility, alternative solutions and final recommendations.

BUDGET

- **US$ 96,000** for 4 national legal experts at US$ 1,000 / month during 2 years
- **US$ 72,000** for an international legal expert at US$ 12,000 / month during 6 months
- **US$ 168,000** total

HUMAN RESOURCES

4 National Legal experts and 1 International legal expert.

PROPOSED EXECUTING/IMPLEMENTING AGENCY

MRC Secretariat.

TIME AND WORK SCHEDULE

2033-2034.

SOCIAL ISSUES

This action will have no significant social impacts. This Center will be responsible for implementing the Master Plan, and will therefore play a key role in enhancing the social benefits and mitigating the

potential social impacts. Staff of the Executive Office should receive awareness training in key social issues related to their work – rural poverty, gender mainstreaming and HIV/AIDS.

ENVIRONMENTAL ISSUES

This action will have no significant environmental impacts. The environmental actions should be incorporated into the activities of the Regional Mekong Navigation Center (RMNC) to ensuresustainable navigation i.e. integrated planning/SEA, EMP and environmental monitoring to ensure impacts are mitigated and reduce carbon emissions. Environmental protection and IWT should be a key component of the RMNC.

ECONOMIC ASSESSMENT

Not relevant.

PRIORITY OF ACTION (H/M/L)

Low.

FINANCING PLAN (PUBLIC/PRIVATE)

The **US$ 168,000**budget should be funded by an international grant.

PRIOR AND/OR FOLLOW-UP ACTIONS REQUIRED

None.

11.6 LONG TERM INSTITUTIONAL ACTION 2 (LIN2)

TITLE

Set up a "Mekong Water Level Monitoring and Management Body" in Lao PDR

BACKGROUND AND RATIONALE

Future developments in hydropower schemes will dramatically modify the water tables in the different affected stretches. The "cascade", for the time being, consists of nine dams in Lao PDR and two dams in Cambodia. They will all have impounded sections stretching out over several tens of kilometers. Every hydropower scheme has actually attracted the interest of hydropower developers in the region, be it Thailand, China, Malaysia or Viet Nam. Under the preliminary tentative water level situation, tail waters from one hydropower scheme in some cases may reduce the water-head of the upstream hydropower scheme, which will not be accepted and potentially lead to disputes and conflicts of interest. There is actually no clear identified authority (national orregional) that regulates these issues. Moreover, each hydropower scheme has its rules of operation being considered as a run-of-the-river dam. For instance during the early flood, when the waters almost reach flood levels, flush operations will have to be carried out to flush the sediment from the impounded section downstream of the dam. These operations are not without danger for the riparian and should be well prepared and coordinated in case of "simultaneous cascade flushing" (several dams in line carry out the flushing operation) to obtain the best results and limit the possible damage to assets, riverbanks, channels, domestic and commercial navigation and, last but not least, the fish-population.

LOCATION

There is no specific location for this kind of study-work. The consultants will have to liaise with the different authorities in the 4 riparian MRC-countries (Thailand, Lao PDR, Cambodia and Viet Nam) and have consultations while the main study-work can be done anywhere: home-based or in MRC Vientiane or MRC Phnom Penh.

OBJECTIVES

The main objective is to set up a regional Mekong water management body, either (and preferably) under the MRC auspices or under another international and intergovernmental authority that will set the rules and regulations for the water level operations in the Mekong as a direct or indirect result from dam operations. The decisions, which may be of an urgent character, should be binding as they will be purely technical and not in any way political. The daily management will be in the handsof senior technicians with sufficient experience in dam management control and hydropower operations.

OUTPUTS AND DELIVERABLES

The consultants should produce a report with findings after a thorough investigation. Besides the need for an authority dealing with the water levels in the impounded sections of the Mekong, it is necessary that strict rules of operation are respected and followed. The consultants will therefore prepare a manual on rules and operations of each hydropower scheme, which will have to be approved (preferably by law) by each riparian country that is directly or indirectly dealing with the consequences of hydropower development. Operating control parameters have to be built-in to make sure that water level operations at each of the hydropower schemes are in concert with the up- and down hydropower scheme.

ACTIVITIES

Main activities will include, among others:

- Transfer the fundamental and basic knowledge/principles of "run-of-the-river" hydropower schemes to the riparian countries (as far as this has not been done under previous consultancy contracts). In this respect it is imperative to liaise and keep in close contact with

the POYRY consultants from Finland, who have been involved in the hydropower development schemes in Lao PDR right from the start;

- Discuss and set out with the MRC and its national agencies, the hydro-power developers and the Water Resources Ministries, the various operating rules in accordance with the international principles of "run-of-the-river" hydropower schemes, especially those related to waterway maintenance, sediment control, fish migration, erosion and accretion, etc.;
- Invent, create and build-in systems of international control to regulate the water levels in the impounded areas and the stretches up- and downstream of them;
- Define water levels in Hatien or Kolak or Hon Dau, which the water levels in every impounded area can reach in extra-ordinary circumstances, such as Q5, Q10, Q30, Q100 and even Q1000. Provide guidelines for all infrastructures which are near or close to the [impounded] waterway (or up- or downstream) with respect to these levels and the anticipated strong currents, in terms of elevation and kind of erosion protection;
- Issue clarifying statements to all riverside developers and owners living as riparian to the impounded stretches or to those under direct or indirect influence, about the modified conditions of the river after the construction of the dam[s] particularly with respect to the water level management, the sediment flushing operations which are scheduled to take place, the fish migration efforts being made and, last but not least, the modified navigation conditions in these stretches affected by hydropower development schemes.

BUDGET

1 international expert at 12,000 US$ / month	144,000 US$ / year
8 local experts at 1,000 US$ / month, 12,000 US$ x 8 = 96,000 US$ / year	
Office costs at 2,000 US$ / month	24,000 US$ / year
Total	**264,000 US$ / year**

HUMAN RESOURCES

A highly qualified team of 1 international expert, 4 experts from the hydropower development companies and 4 official local experts (1 Thai, 2 Lao and 1 Cambodian), experienced in run-of-the-river hydropower development schemes.

PROPOSED EXECUTING/IMPLEMENTING AGENCY

It is suggested that the MRC-Secretariat be the implementing agency strongly seconded by its national agency and the national Ministries of Water Resources, who already assume the chairmanship of every individual National Mekong Committee.

TIME AND WORK SCHEDULE

Start as soon as possible.

The Xayabury dam is nearing completion and operating rules have to be established together with permanently defining the highest operational levels in the impounded area and defining the maximum allowable tail water level downstream the Xayabury dam from the Pak Lay hydropower development scheme. The latter may be a restriction on the Highest Operation Level downstream and hence on the power generation resulting from the maximum allowable water head that can be reached.

There cannot be a precise work schedule as only one of the cascade hydropower dams is nearing completion (Xayabury), while the second one (Don Sahong) will have insignificant impacts on the water table levels in the impounded stretch or the stretches up- or downstream. As developers will be gradually picking up hydropower schemes on the mainstream, timing should be adapted to this scheme.

SOCIAL ISSUES

This action will have no significant social impacts.

ENVIRONMENTAL ISSUES

This action will have no significant environmental impacts.

ECONOMIC ASSESSMENT

While an economic assessment is not relevant for this action, the maintenance of water levels throughout the hydro-dam chain in Lao PDR will be critical for the achievement of the economic benefits ascribed to other actions, e.g. channel improvements to allow operation of 500 DWT barges.

PRIORITY OF ACTION (H/M/L)

High.

FINANCING PLAN (PUBLIC/PRIVATE)

The initial budget should be mainly provided by the hydro-development schemes in order to build awareness and provide guidelines and regulations for each of the schemes. The development of the manual/guidelines/regulations is in fact a one-time job, which can be done during the construction of the first hydropower mainstream dam (Xayabury). However, this work will need fine-tuning as more hydropower schemes are developed and more river stretches are affected.

PRIOR ACTIONS REQUIRED

Consultations and agreement on the composition of the “Mekong Water Level Monitoring and Management Body”.

FOLLOW-UP ACTIONS REQUIRED

None.

11.7 LONG TERM INSTITUTIONAL ACTION 3 (LIN3)

TITLE

Depending on the results of the short term study, establish two bilateral or one regional "Mekong Navigation Data and Information Management Center" and "River Information Service".

BACKGROUND AND RATIONALE

Lack of data with respect to trade and traffic production and attraction, intra- and inter-regional trade and traffic flows, and the physical aspects of the river and ports, is an area of concern. Moreover, information and data collection and management on waterway characteristics, obstacles, IWT fleet, port infrastructure and throughput, cargo and passenger transport, dangerous goods transport and storage, accidents and so on, is organised by many different organizations and authorities.

Without vital time-series of trade, port and transport statistics, and river and port characteristics, master planning and cost-benefit analyses of proposed infrastructure developments is an ineffective exercise.

Although the MRC does have a comprehensive overview of all studies and projects carried out by agencies such as the World Bank, ADB, ESCAP and ASEAN, among others, waterborne transport sector data lacks overall coordination and focus and is fragmented and far from complete.

The Short Term Institutional Action 2 proposes to create "Mekong Navigation Data and Information Management Centers" in the four MRC Member Countries to support planning and policy formulation and to provide daily services for safe and efficient passage by inland and seagoing vessels on the Mekong River System. The Centers would alsoserve to study the need for and scope of bilateral and/or regional cooperation on Mekong Inland Waterway Transport Data Management and River Information Services.Depending on the results of this short term study, this Action proposes to establish two bilateral or one regional "Mekong Navigation Data and Information Management Center" and "River Information Service".

LOCATION

MRCS OSP and/or OSV.

OBJECTIVES

Two bilateral **(scenario 1)**or one regional **(scenario 2)**"Mekong Navigation Data and Information Management Center" and "River Information Service" to support planning and policy formulation and to provide daily services on a regional level for safe and efficient passage by inland and seagoing vessels on the Mekong River System.

OUTPUTS AND DELIVERABLES

The output will be an adequately staffed, trained, financed and effectively functioning unit in cooperation between the four MPWT/MoT Inland Waterway Transport related departments/administration.

ACTIVITIES

- Establish an appropriate organizational structure (working group/task force/coordinating mechanism) within the MRC Secretariat and between the MPWT/MoT inland waterway related departments/administrations, the National Mekong Committees and the related line agencies;
- Prepare an objective and detailed analysis of existing authorities and organizations dealing with Mekong navigation related data collection and make firm commitments with all these institutions to obtain correct and recent information on a regular basis;
- Manage the collected data and information by applying arithmetic and statistical theories;

- Publish yearbooks and (river and port) atlases for all IWT related stakeholders.

BUDGET

The investment budget to set up the center can be estimated at **US$10,000** (IT hardware and software). To provide substantial technical assistance in order support to a Regional Mekong Data Management Center, yearly costs can be estimated as follows:

- **US$ 12,000**for 1 full time Coordinator at US$ 1,000 / month
- **US$ 38,400** for 4 full time experts at US$ 800 / month
- **US$7,200** for 1 full time administrative staff
- **US$6,000** office costs and transport at US$ 500 / month
- **US$63,600** total cost / year
- **Total 10,000 US$ + 20 x 63,600 US$ = 1,282,000 US$**

HUMAN RESOURCES

1 Coordinator.

2 National technical experts.

2 National economic experts.

1 Administrative staff.

All computer literate and familiar with waterborne transport and data management activities.

PROPOSED EXECUTING/IMPLEMENTING AGENCY

MRCS NAP in conjunction with the NMCs, the MPWTs/MoTs, data collecting line agencies and donors. International support should include training activities for the designated experts.

TIME AND WORK SCHEDULE

Depending on the results of the short term study, start as soon as funding becomes available.

SOCIAL ISSUES

This action is not expected to have any significant social impacts. It would be beneficial if the scope of the Centers' responsibilities were to include collecting data on Inland Rural Waterway Transport. Such data is relatively difficult to obtain given the informal nature of the sector. However the wider availability of information on the significance and characteristics of IRWT in the different countries would contribute to increasing its visibility to policy and decision-makers. In recruiting and training staff for the Mekong Navigation Data and Information Management Centers, the national policies of providing equal employment opportunities to men and women should be applied.

ENVIRONMENTAL ISSUES

This action will have no significant environmental impacts. Data on water quality and pollution incidents could be integrated into the data center to monitor environmental impacts of IWT.

ECONOMIC ASSESSMENT

Not relevant.

PRIORITY OF ACTION (H/M/L)

Very High.

FINANCING PLAN (PUBLIC/PRIVATE)

Total **US$ 10,000** investments and **US$ 63,600** / year to support the Center - Allocation from four national budgets.

PRIOR ACTIONS REQUIRED

None.

FOLLOW-UP ACTIONS REQUIRED

None.

11.8 LONG TERM INSTITUTIONAL ACTION 4 (LIN4)

TITLE

Depending on the results of the short term study, establish two bilateral or one regional "Mekong River Inland Waterway Transport Promotion and Marketing Agency".

BACKGROUND AND RATIONALE

Inland waterway transport suffers from a negative perception regarding its performance. There is a need to improve the image of IWT. Governments have not taken the initiative to promote IWT. An independent agency that could lobby policy makers, act as an interface between policy makers, users and other partners sharing the same goals is required to maximise the use of one of the Mekong Basin's major assets: its rivers.

The Short Term Institutional Action 3proposes to create independent agencies in the four MRC Member Countries that will actively pursue promotional and marketing activities and to start a study on the need for, and scope of, bilateral and/or regional cooperation on Mekong Inland Waterway Transport Promotion and Marketing. Depending on the results of this short term study, this Action proposes to establish two bilateral or one regional "Mekong Navigation Promotion and Marketing Agency".

LOCATION

MRCS OSP.

OBJECTIVES

Create one or two independent agencies that will actively pursue promotional and marketing activities in order to bring as much cargo as possible to IWT, thus contributing to a better competitive position for IWT.

OUTPUTS AND DELIVERABLES

Two independent bilateral agencies**(scenario 1)** or one regional agency**(scenario 2)**with participation of the public sector and the private sector, that will be recognised by all stakeholders as an intermediate entity in promoting IWT.

ACTIVITIES

Secure funds. With the help of the donors set up a Board of Directors in which governmentsas well as autonomous line entities and private companies should participate. Hire a manager. Find office space. Equip office. Start activities with data collection. Gradually expand organisation and build up profile within the transport community and with authorities.

BUDGET

The budget per year can be estimated at:

- **US$14,400** Full time executive office director at 1,200 US$ / month
- **US$38,400** 4Full time local experts at 800 US$ / month
- **US$14,400**2 Full time administrative staff at 600 US$ / month
- **US$40,000** Publications and promotion budget
- **US$12,000** Office costs and transport at 1,000 US$ / month
- **US$119,200 Total**per year or **US$ 29,800** per year and per country

HUMAN RESOURCES

Manager plus 4 experts and 2 administrative staff, all computer literate. Manager and experts should be familiar with transport and promotional activities and have contacts within the government.

PROPOSED EXECUTING/IMPLEMENTING AGENCY

MPWT/MoT, IWT related authorities, line agencies, companies and private sector. The initiative to create the agency could be taken by the Regional Mekong Navigation Center.

TIME AND WORK SCHEDULE

Depending on the results of the short term study,start as soon as funding becomes available.

SOCIAL ISSUES

This action will have positive social impacts. The campaigns will promote greater utilization of IWT in the Mekong Basin that couldgenerate significant social benefits. The promotion of Inland Rural Waterway Transport should be considered as a priority for poverty alleviation in rural areas.

ENVIRONMENTAL ISSUES

This action will have no significant environmental impacts. Awareness campaigns can be used to promote IWT as a more sustainable mode of transport than road. Implementing the short-term environmental actions will be important for this action.

ECONOMIC ASSESSMENT

Not relevant.

PRIORITY OF ACTION (H/M/L)

Medium.

FINANCING PLAN (PUBLIC/PRIVATE)

Total **US$ 119,200** per year or **US$ 29,800** per year and per country to be paid from contributions from the private and the public sector in the four MRC member countries.

PRIOR ACTIONS REQUIRED

None.

FOLLOW-UP ACTIONS REQUIRED

None.

11.9 LONG TERM INSTITUTIONAL ACTION 5 (LIN5)

TITLE

Depending on the results of the short term study, establish a regional "Hydrodynamic and Nautical Research Center".

BACKGROUND AND RATIONALE

There is almost no knowledge about the hydraulic, hydrodynamic and sedimentological behaviour of the Mekong River System. Moreover, in almost all studies and research projects, foreign expertise is needed. Due to the fact that this is a task for the whole Mekong River System, it is proposed to establish a regional"Hydraulic and Nautical Research Center", working in close cooperation with the MRC Secretariat.

LOCATION

MRCS OSP.

OBJECTIVES

The Short Term Institutional Action 4, proposed to execute a study on the need for, and eventual scope of, a regional "Mekong Hydraulic and Nautical Research Center".

Depending on the results of this study, this Action recommends to establish a regional "Mekong Hydraulic and Nautical Research Center", which is well equipped and has a well trained staff to perform all kinds of hydraulic, hydrodynamic, sedimentological and nautical studies on the Mekong River System.

Next to navigation related studies (dredging, river works, etc.), the tasks of this Center could be extended to additional research on bank protection, inundation prevention and environmental studies, among others.

OUTPUTS AND DELIVERABLES

A well-equipped and staffed regional "Mekong Hydraulic and Nautical Research Center".

ACTIVITIES

Provision of offices and eventual construction of a test hall.

Training of engineers and technical staff.

Procurement of (measurement) equipment, IT hardware and software.

BUDGET

The investment costs can be estimated at:

- **US$ 250,000** Building for physical scale models + offices
- **US$ 250,000** Measuring equipment (in situ and on model)
- **US$ 250,000** IT hardware and software
- **US$ 200,000** Training of technical staff
- **US$ 950.000 Total**

The yearly operational costs can be estimated at:

- **US$ 120,000** for 10 civil engineers at US$ 1,000 / month
- **US$96,000** for 10 technicians at US$ 800 / month

- **US$72,000** for 10 workers and administrative staff at US$ 600 / month
- **US$60,000** operational and office costs at US$ 5,000 / month
- **US$ 348,000** Total / year

HUMAN RESOURCES

10 Well trained civil engineers.

10 Technical staff.

10 Workers and administrative staff.

PROPOSED EXECUTING/IMPLEMENTING AGENCY

MRC.

TIME AND WORK SCHEDULE

Construction of test hall and offices, procurement of equipment: 1 year.

Training of engineers and technical staff:1 year.

SOCIAL ISSUES

This action will have no significant social impacts.

The construction of the buildings will provide employment opportunities. Opportunities for unskilled and artisan employment and provision of support services (e.g. transport of workers) should be offered first, on an equal opportunity basis, to local men and women. HIV/AIDS awareness training should be provided to all construction workers employed at the site.

In recruiting and training staff for the Center, the policy of providing equal employment opportunities to men and women should be applied.

ENVIRONMENTAL ISSUES

This action will have no significant environmental impacts.

ECONOMIC ASSESSMENT

Not relevant.

PRIORITY OF ACTION (H/M/L)

Medium.

FINANCING PLAN (PUBLIC/PRIVATE)

The Centercould be set up as a public foundation, so that inland and foreign public and private organizations can ask for studies and pay for it.

Initial investments and training (**950,000 US$**)should be financed with donor help.

PRIOR ACTIONS REQUIRED

Provision of offices and eventual construction of a test hall.

Training of engineers and technical staff.

Procurement of (measurement) equipment, IT hardware and software.

FOLLOW-UP ACTIONS REQUIRED

None.

Mekong River Commission

Cambodia • Lao PDR • Thailand • Viet Nam

For more information on the **Navigation Programme**, visit
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