



RSAT Assessment of Ubolratana Dam in the Nam Pong river basin Khon Kaen, Thailand.

Rapid Basin-wide Hydropower Sustainability Assessment Tool



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1 Executive summary

Following RSAT Action Plan 2014 – 2015, an RSAT overview training session was organized for Thailand on 28 – 29 July 2015 with around 20 participants from government, academic, and civil society attended the overview. Participants at the training agreed to conduct an RSAT assessment at Ubolratana Hydropower Dam in the Nam Pong Basin, Khon Kaen province. The assessment was conducted between 24 and 27 August 2015. This report provides a description of the assessment objectives, method, results and participant feedback.

The objective of the Ubolratana RSAT dialogue and assessment were that:

1. Participants get a good understanding of the Ubolratana hydropower project and the river basin issues.
2. Priority hydropower sustainability topics are reviewed for the basin using the RSAT.
3. Dialogue takes place between government agencies, EGAT and local stakeholders on the project performance in relation to the priority RSAT topics.
4. Practical recommendations for further action are proposed.
5. The applicability of RSAT for Thailand is reviewed and improvements to the tool proposed where necessary.

Figure 1 Ubolratana Hydropower Dam and Nam Pong Basin in the Lower Mekong Basin

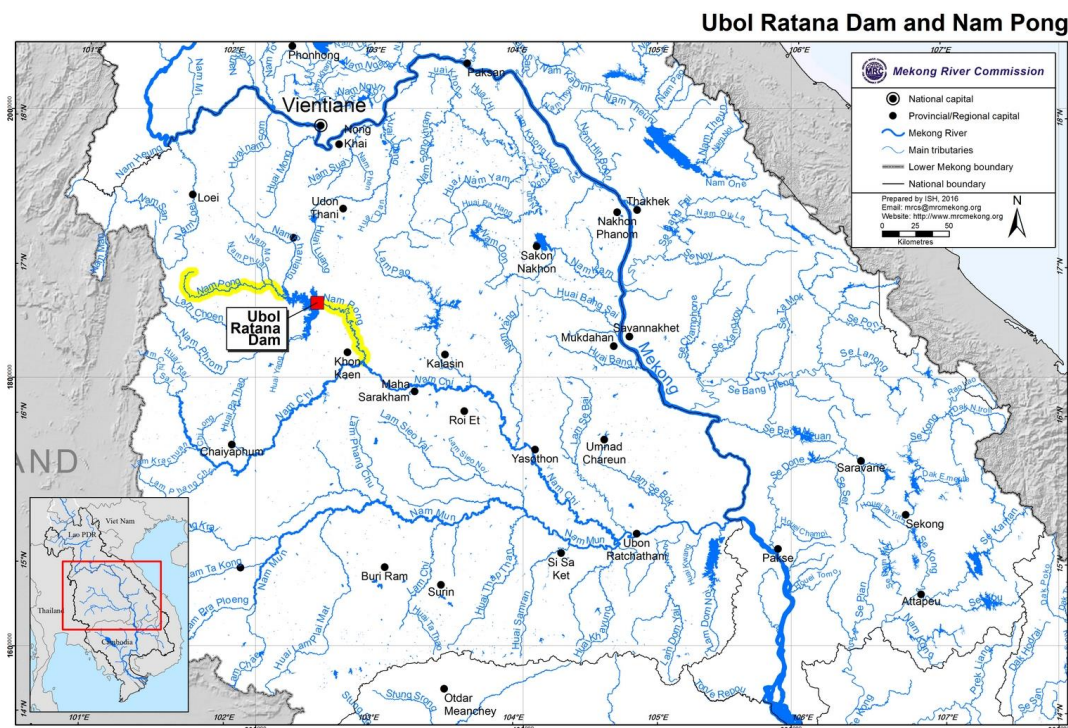
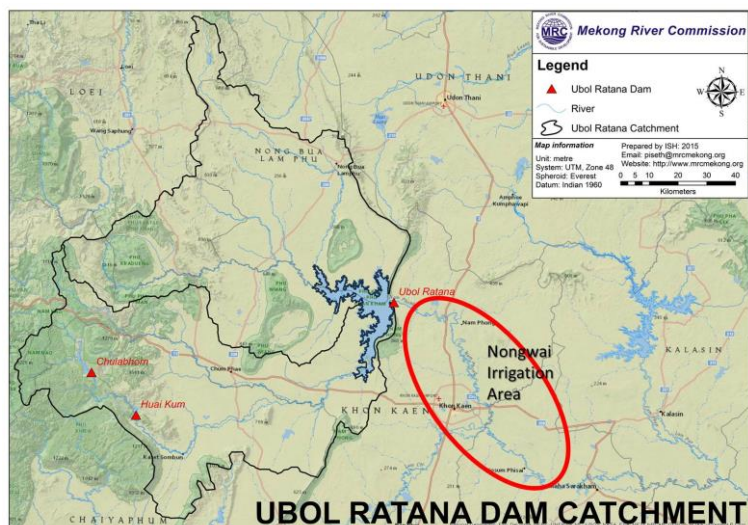


Figure 2: Ubonratana Dam Catchment and Nong Wai irrigated area



Nam Pong basin:
 Area cover 15,000 km²
 Land used: 27% forest
 64% agriculture
 9% water body and reservoir

Ubolratana Multipurpose Dam
 Storage capacity of 2.5 million m³
 Surface area of 410 km²
 Annual power product 54.73 MKWH

Nong Wai Irrigation Weir
 35 km downstream
 Irrigating 40,000 ha

1.1 Result of Ubolratana RSAT assessment

At the RSAT overview training participants selected four Topics for Ubolratana RSAT assessment. The National Consultant collected data and prepared a gap analysis for the assessment. The assessment included a one day field visit and three days for dialogue, analysis, and development of recommendations. Due to substantial technical content of the selected topics and the limited time for the assessment, participants were only able to analyse the root cause and develop

NOTE from Facilitator: The development of the recommendations for action needs careful attention. While the recommendations coming out of this work were of interest to the participants, they were also as a very high level and aspirational. For the RSAT dialogue to be successful on an ongoing basin process, it would be important for the actions and recommendations to contain elements that can be progressed by the participants in the room. In that way future workshops can allow follow-up on progress and empower participants to make progress in tackling the issues on the table.

recommendations for Topics 6 and 7. A summary of priority issues and recommendations for both topics for the Ubolratana Dam and Nam Pong Basin is provided below.

1.1.1 Topic 6: Biodiversity conservation and ecosystem connectivity

Participants agreed that priority issue for the Ubolratana basin is on the lack of understanding among the local stakeholders including communities, factories, and farmers on the importance of biodiversity and ecosystem which is deteriorating and has caused sharp reduction in captured fishes and also affected aquaculture. From the RSAT worksheet participants agreed that the priority actions are:

Action Proposed	Responsible Agency, Person and Date for review (NMC to complete)
<ul style="list-style-type: none"> All concerned government and non-government actors involving in environmental and ecosystem work should agree on one main responsible agency to coordinate an integration of environmental and biodiversity work plan and implementation including data collection for monitoring and planning. 	<p>Agency Responsible for Action: <i>Regional and Provincial Environmental Office.</i></p> <p>Person or Position in Agency to Contact: <i>Not actually identified, TNMC will share the assessment report with all participants</i></p> <p>Date for review of Action: <i>Not defined</i></p>
<ul style="list-style-type: none"> Responsible government agencies and academic institution should work together to raise awareness of the people in all sectors on laws and regulations about environmental and ecosystem protection and conservation and apply peer pressure in the community and social norm in reinforcement of such laws and regulations. 	<p>Agency Responsible for Action: <i>Khon Khen University and all stakeholders</i></p> <p>Person or Position in Agency to Contact: <i>Not actually identified, TNMC will share the assessment report with all participants</i></p> <p>Date for review of Action: <i>Not defined</i></p>
<ul style="list-style-type: none"> Civil Society and academics to help community to revitalize local wisdom and local community life by establishing community learning centres so that elders could transfer local wisdom to younger generation. 	<p>Agency Responsible for Action: <i>Representatives from two River Basins and community development groups in Northeast region attended the assessment will take that action in their constituencies.</i></p> <p>Person or Position in Agency to Contact: <i>Not actually identified, TNMC will share the assessment report with all participants</i></p> <p>Date for review of Action: <i>Not defined</i></p>
<ul style="list-style-type: none"> All relevant stakeholders both government and civil society groups join together to protect and revitalize national food source in the ecosystem through research and participatory development approach. 	<p>Agency Responsible for Action: <i>All of the participants from government and civil society groups attended the assessment</i></p> <p>Person or Position in Agency to Contact: <i>Not actually identified, TNMC will share the assessment report with all participants</i></p> <p>Date for review of Action: <i>Not defined</i></p>

1.1.2 Topic 7: Flows and reservoir management

Priority issue identified evolved from the discussion on water demands by different sectors resulted from government policy promoting large mono-crop and industrialization to boost up economic of the northeast region. The consequence was seen in people become poorer and the water becomes polluted with sharp reduction of natural fish and ecosystem. From the RSAT worksheet participants agreed that the priority actions are:

Action Proposed	Responsible Agency, Person and Date for review (NMC to complete)
<ul style="list-style-type: none"> EGAT, Local Admin Organizations, relevant ministries and civil society to develop capacity of the villagers to acquire knowledge enabling them to catch up with economic growth and the consequence. How? Needs an immediate action? 	<p>Agency Responsible for Action: <i>EGAT as it has development projects with communities around the Ubolratana Dam reservoir</i></p> <p>Person or Position in Agency to Contact: <i>Not actually identified, TNMC will share the assessment report with all participants. It could be Head of Information Centre of EGAT Ubolratana Dam.</i></p> <p>Date for review of Action <i>Not defined</i></p>
<ul style="list-style-type: none"> Independent neutral institute such as Khon Kean University should help villagers to assess the situation. The assessment tool such as RSAT could be applied in this case. 	<p>Agency Responsible for Action: <i>It is proposed that Khon Khen University to take this action</i></p> <p>Person or Position in Agency to Contact: <i>Not actually identified, TNMC will share the assessment report with all participants. It could be the lecturer from KKU who participated in this assessment to take action.</i></p> <p>Date for review of Action: <i>Not defined</i></p>
<ul style="list-style-type: none"> Civil Society capacity should be strengthen to take the lead in promoting the principle of self-sufficient economy to the villagers and support them to put into practice. 	<p>Agency Responsible for Action: <i>Representatives from two River Basins and community development groups in Northeast region attended the assessment will take that action in their constituencies.</i></p> <p>Person or Position in Agency to Contact: <i>Not actually identified, TNMC will share the assessment report with all participants</i></p> <p>Date for review of Action: <i>Not defined</i></p>
<ul style="list-style-type: none"> Ministry of Education should review the education strategy that responds to the need of the people. 	<p>Agency Responsible for Action: <i>The group did not specify the agency attended the assessment to take this recommendation to the Ministry of Education.</i></p>

	<p>Person or Position in Agency to Contact: <i>Not actually identified, TNMC will share the assessment report with all participants</i></p> <p>Date for review of Action: <i>Not defined</i></p>
<ul style="list-style-type: none"> • Government should implement wealth-distribution and improve tax system to benefit the development at the local level including initiate decentralization that enable civil sector to have voice on issue(s) affected them. 	<p>Agency Responsible for Action: <i>The group did not specify the agency attended the assessment to take this recommendation to the government.</i></p> <p>Person or Position in Agency to Contact: <i>Not actually identified, TNMC will share the assessment report with all participants</i></p> <p>Date for review of Action: <i>Not defined</i></p>

2 Introduction

The Rapid Basin Wide Hydropower Sustainability Assessment Tool (RSAT) was conceived in the Mekong Region as early as 2001 and underwent a research and regional consultation stage between 2001 to 2010 with the support of various donors and inputs from various consultants. A formal partnership between MRC, ADB and WWF was formed in 2006 and is named the Environmental Considerations for Sustainable Hydropower Development (ECSHD). The research and consultation phase culminated in a technical report in 2007 titled “Environmental Criteria for Hydropower Development in the Mekong Region”. As per the recommendations of the 2007 report, RSAT version 1 was developed for trial in MRC member countries in 2010.

The RSAT was developed to assess hydropower sustainability in a basin wide context, to complement other existing tools that assess hydropower sustainability at the individual project level. The RSAT is designed to assess the sustainability of sub-basins with hydropower development, which may include multiple projects at different stages of development. The RSAT has been under development since 2010 including a series of trials and national and regional consultations in MRC member countries. One trial was conducted in Vietnam in 2011 in the Upper Sre Pok sub-basin. The current version (RSAT v4) has been developed under the MRC-ISH program. RSAT assessments have been completed or are currently in progress or planned in nine hydropower sub-basins in the Mekong region.

The RSAT Overview workshop was conducted for Thailand participants between 28 and 29 July 2015 participated by 37 participants from government line agencies, academy, and civil society representatives. Consultant team walked the participants through RSAT principles, process, and analysis methodology which will result in critical issues and recommendation to ensure sustainability of hydropower project(s) in the assessed basin/sub-basin.

Following the introduction of 10 RSAT Topics and brief presentation on Ubolratana Dam and Nam Pong basin, participants agreed to conduct assessment on four RSAT Topics most relevant to the situation and condition at Ubolratana Dam and Nam Pong River Basin. The four topics selected were:

- Topic 1 – Institutional Capacity,
- Topic 4 – Equitable sharing of hydropower costs and benefits,
- Topic 6 – Biodiversity conservation and ecosystem connectivity, and
- Topic 7 – Flows and reservoir management.

2.1 Objectives and scope of the 2015 Ubolratana dialogue and assessment

The objectives of the Ubontatana RSAT dialogue and assessment, 2015 were:

- ⇒ Participants get a good understanding of the Ubolratana hydropower project and the river basin issues.
- ⇒ Priority hydropower sustainability topics are reviewed for the basin using the RSAT.
- ⇒ Dialogue takes place between government agencies, EGAT and local stakeholders on the project performance in relation to the priority RSAT topics.
- ⇒ Practical recommendations for further action are proposed.
- ⇒ The applicability of RSAT for Thailand is reviewed and improvements to the tool proposed where necessary.

2.2 RSAT assessment methods

The assessment methods used in the Ubolratana assessment are listed below:

- Data collection, interview and presentation of data for 4 selected topics and 4 criteria (national consultant)
- Multi-criteria gap analysis (consultant team)
- Workshop 1- RSAT Overview, training and familiarisation
- Workshop 2 – RSAT Group dialogue and assessment of 4 RSAT topics (in Thai and English language)
 - Field visit to Ubolratana dam and affected communities around the reservoir
 - Group ranking of priority gaps and root cause analysis for each topic
 - Dialogue among stakeholders
 - SMART recommendations for action
 - Topic and issue ranking and prioritisation
 - Capacity building needs identification

There were two main steps to the Ubolratana RSAT assessment process. Firstly the national consultant collected data and information for each topic and conducted a gap analysis against the RSAT topics and criteria. The results of the gap analysis and list of references for each topic are found in Appendix 5 of this report. The national consultant prepared a PowerPoint presentation summarising the data collected and the gap analysis for each topic. In the second stage of the assessment the data and gap analysis for each topic were presented to a multi-stakeholder group. The group then has a discussion to determine the priority issues for the topic and make recommendations based on the information presented and on their own experience in the basin. The results of the group dialogue to identify priority issues for each topic and make recommendations, is included in Section 6 and 7 of this report.

Section 4 to 7 of this report presents a summary of the data presentation, gap analysis, priority issues and recommendations for each of the four RSAT topics selected for this assessment.

2.3 Participation

The actual number of participants at the workshop was 37 people among them 11 are female. Majority of them are government officials at national and provincial level from Department of Water Resources, Environmental Impact Evaluation Bureau, Royal Irrigation Department, EGAT, academic from universities in Khon Kean – Sakonnakorn – and Pitsanulok, representative from civil society water user groups from the province of Loei – Sakonnakorn – Udonthani – and Ubonrajathani, and from MRC/ISH. The full list of participants is included in Appendix 1.

All participants were able to bring their knowledge to the dialogue and participated in a vigorous discussion. It was particularly useful to have knowledgeable engineers from EGAT in the room, who understood the technical operations of the scheme and were able to explain the role of the hydropower operation in the basin as a multi-purpose project. During the field trip the participants were also able to get a good understanding of the situation of the basin particularly on the water quality and the operation of the downstream irrigation scheme which is the priority water user in the basin at the current time.

2.4 Location

The assessment took place at Ubolratana Dam in Khon Kean province between 24 and 27 August 2015.

2.5 The topics and assessment process

Ubolratana Dam was the first multipurpose dam constructed in 1960 and has been operating in generating electricity; provide water for irrigation system for 40,000 ha of land downstream from the Dam site; and also for flood protection for communities and farmland downstream. The four RSAT topics selected are most relevant for conducting assessment at this Dam in order to understand current practice, identify gap and issues threaten the sustainability of Ubolratana Hydropower Dam operation, and develop recommendation to address those issues identified.

Topic 1 – Institutional Capacity,

Topic 4 – Equitable sharing of hydropower costs and benefits,

Topic 6 – Biodiversity conservation and ecosystem connectivity, and

Topic 7 – Flows and reservoir management.

Normally it would be important to cover all the RSAT topics. However, with time and budget constraints, it was determined to select key topics for discussion. A follow up assessment may be able to consider the remainder of the RSAT topics.

2.6 Field Trip

A one-day field trip was organized for MRCS and some participants who arrived earlier to understand the operation of Ubolratana Dam by EGAT in connection to Nong Wai irrigation managed by RID. The team also visited the resettlement site of the directly affected communities, flood protection dike, and a village partially inundated by the reservoir. Key elements of the field trip are highlighted below.

1. EGAT presentation on Ubolratana Dam and its reservoir operation noted:
 - a. Adhere to standard good practice including dam safety maintenance and emergency plan,
 - b. Water level monitoring system including water quality in the reservoir and downstream,
 - c. Reservoir management to enable irrigation system rather than for power generating,
 - d. Contributions to the Power Development Fund (PDF) according to the law to assist project affected communities, and
 - e. Besides contributing to the PDF, EGAT implements Corporate and Social Responsibility (CSR) projects to improve livelihood and income of the people in the resettlement site and in the villages residing at the edge of the reservoir.
2. Project Affected communities:
 - a. Affected population who had to move because of reservoir after the dam constructed were given housing land and farm land at the Ubolratana Dam Resettlement site by the then Energy Department.
 - b. EGAT was established many years after resettlement scheme was carried out but continue monitoring and provision of assistance to resettled population.
 - c. Resettled population receive funding from PDF for communal activity and implemented livelihood improvement projects using EGAT CSR fund.
 - d. EGAT constructed and regular maintain an earthen dike to protect Non Sang sub-district from flood when water in the reservoir is at peak up to the flood alarm level. Pump stations were installed to pump rain water out during the flood alarm period.
3. Visited the village at the edge of reservoir where EGAT implement CSR project that improve livelihood and income of the villagers. Their special rice production is so popular that they could

not produce to meet the demand. EGAT still oversee and support the organization of the villagers to manage all of the activities which is growing strong steadily.

2.7 Limitations of the RSAT Assessment

The RSAT assessment for the Ubolratana basin was considered as a “trial” assessment in order for the Thailand authorities and the TNMC to gain a better understanding of the RSAT and to consider future use of the tool in Thailand. As such the full list of topics was not considered and the depth of the assessment was limited.

Participation: While there was broad representation from major stakeholders, it was also clear that certain local decision making bodies were not represented. Notably there is a Water Management Committee for the Nam Pong basin; key representatives from that body were not involved in the assessment workshops. Their presence would have allowed a clearer path and responsibility for the recommended actions.

As a learning exercise, the assessment allowed various parties to air views on the wider consideration for management of the basin issues. While these high level and aspirational recommendations for action are useful, it is always important to have practical and implementable actions. Readily implementable actions and recommendations with clear responsibility were limited in this trial assessment.

Access to data and quality of data – the national consultant was responsible for collection of data. The data that was gathered and presented had substantial gaps in details. In particular, it was difficult to collect evidence of integrative processes and the enforcement and implementation of plans and laws.

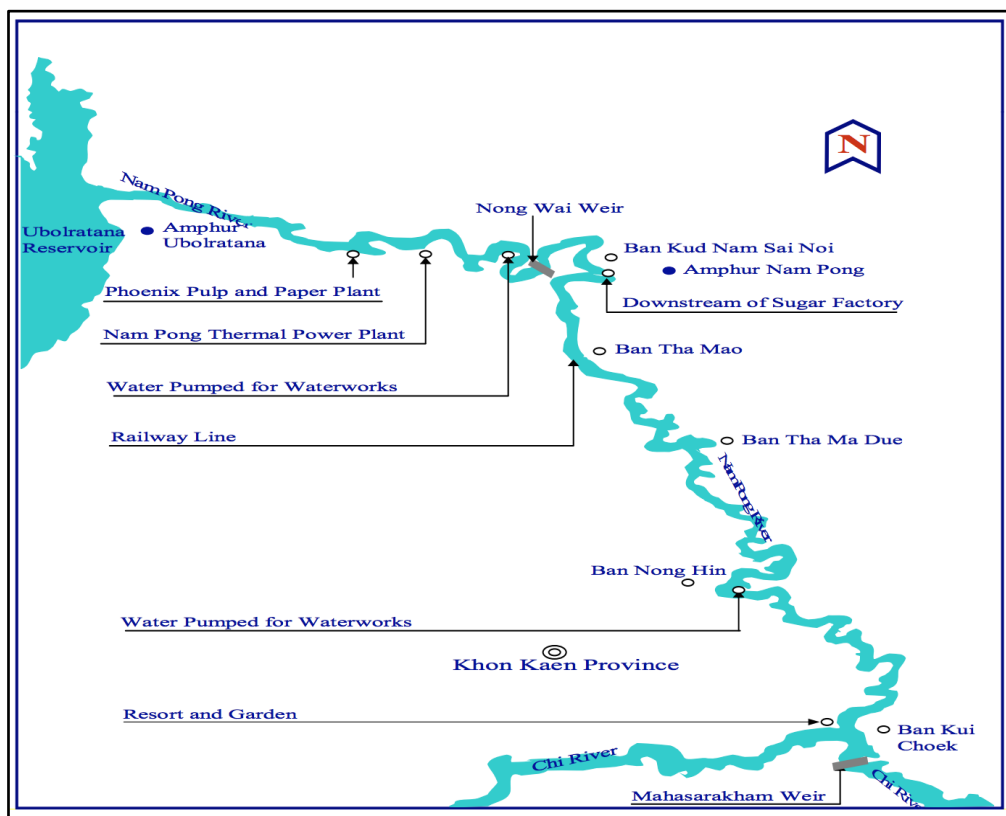
3 Overview of the Nam Pong Basin

3.1 Description of the basin geography and hydrology of Nam Pong Basin

The Nam Pong River Basin lies between 16° and 101° 15' and 102° 45'E and covers an area of about 12,560 km², originating in the mountain range of Petchaboon province and flow passes the boundary line between Sibunruang and Nonsang districts of Nongbualamphu and the boundary line between Sichomphu and Phuwieng District Khon Kean Province before heading to the of Ubolratana dam. After passing through the Ubolratana Dam the river flows past the Nong Wai weir and finally reaches the Chi River at Phra Sub-District, Muang District, Khon Kean Province.¹

In the present day, there are 3 main structures that regulate the stream of Nam Pong River; Ubolratana Dam, Nong Wai Weir and Mahasarakam Irrigation Dam. The distance between Ubolratana Dam to Nong Wai Wier is 35 km; and 92 km. from Nong Wai Weir to Mahasarakam Irrigation Dam. Figure 1 below showed the Nam Pong River headwater to Nong Wai Weir and Mahasarakam irrigation dam and establishments along the Pong River.

Figure 3 The Nam Pong System and the Location of Major Industrial Sites



¹ The Nam Pong Basin (Thailand), Thiraphan Bhukaswan, National Inland Fisheries Institute, Department of Fisheries Bangkok, Thailand, <http://www.fao.org/docrep/003/x6861e/X6861E07.htm#ch>, accessed on 14 September 2015

3.2 History of Nam Pong River Development

Nam Pong River is the major branches of Chi River that joins Mun River in Ubonrajathani before flowing to the Mekong River. A number of reports from the survey and study conducted by the government of Thailand and United Nations Economic Commission for Asia and the Far East (ECAFE) confirmed that there should be dam constructed across the Nam Pong River in order to store water and to improve flood protection measure of the lower area, to generate power and facilitate irrigation and ensure water supply for domestic and industrial demands. In 1964, the National Energy Authority was assigned to construct the dam at the narrowest part of the river called Pong Neep, and that was the name of the dam at that time. The Irrigation System to distribute the water released from the power house is assigned to Royal Irrigation Department (RID).²

In 1965, Pong Neep Dam (recently renamed 'Ubolratana') was completed. The reservoir area of the dam is 370 km² with maximum storage of 2,431 million m³ at 182 m above the mean-sea level (MSL). Maximum in-flow to fill the reservoir was 5,893 million m³ and minimum in-flow was 557 million m³ average in-flow is 2,495 million m³/year. The water discharged from the powerhouse and/or spillway, enters the Nong Wai Wier. Nong Wai irrigation system was developed in concurrent with the construction of Ubolratana Dam to irrigate farming in the region. Ubolratana Dam besides generate electricity, it is also to supply water for 1) Agricultural demand, 2) Industrial needs 3) Domestic use and 4) to maintain environmental flow. Nong Wai Weir irrigated about 300,000 Rai (or approx. 46,000 ha of land) in four districts of Khon Kean and in two districts of Mahasarakam province. The water conditions or water quality and water quantity were examined by EGAT and the Royal Irrigation Department operating Nong Wai Irrigation Weir

In the 1978, unexpected floods occurred at the Ubolratana Dam and caused a maximum discharge of 3,800 m³/sec. Over the spillway that is designed at 2,500 m³/sec. The large flood happened again in the 1980 and spilled over the spillway inundated the cultivated area downstream of the dam. EGAT got an offer from KFW to study on flood control and reservoir management of Ubolratana Dam in 1980 and the summary report on Ubolratana Dam-Flood Protection Study was released in the 1983. In the same year, the cabinet approved the project to increase the dam height and enlarge the base of the dam and installed the Automatic gate operation which was completed on October 2, 1987. Table 1 shows the general feature of Ubolratana Power Plant Flood Protection.

Table 1 General Description of the Ubolratana Dam and Power Station

Location Basin Mae Nam Chi, River Nam Pong, Koksung Sub-District , Ubon Ratana District, Khon Kane Province		
Purpose Power Generation. Irrigation. Flood Control		
Hydrology		
Catchment area	Sq.km	12,104
Avg. Annual inflow	MCM	2,309 (1971-2000)
Reservoir		
Normal High Water Level	M (MSL)	182

² NongWai Operation and Maintenance Project, <http://www.nongwai.net/index.php/watershed>, accessed on 14 September 2015.

Normal Storage Capacity	MCM	2,263.6
Normal Surface Area	sq.km	401.2
Minimum Water Level	M (MSL)	175.5
Maximum Flood Level		186.6
Dam		
Type		Rockfill-Clay Core
Crest Level	M (MSL)	188.1
Crest Length	M	885
Crest Width	M	6.0
Height	M	35.1
Max. Base Width	M	125
Volume of Embankment	MCM	0.580
Upstream Slope		1:3, 1:1.5
Downstream Slope		1:1.3, 1:1.5
Spillway		
Type		Radical Gate, Orifice Type
No. of gates		4 (Four)
Dimension (Width x Height)	M x M	12.0 x 7.8
Design Flood Discharge	CMS	3,500
Sill level	M (MSL)	171
Penstock		
No. of penstock	Units	3
Dimension	M x M	4.5 x 4.5
Max. Discharge	CMS	210
Powerhouse		
Type		Underground, Reinforced Concrete
General Capacity	KW	25,000
Turbine		
Type		Kaplan, Vertical Shaft
Output	KW	3 x 8,780
Design Head	M	16
Generator		
Type		Synchronous, 3 - Phase
Rating	KVA	3@10,500/12,075
Transformer		
Number	Units	3
Capacity	MVA	10.5
Voltage	kv	115/10
Annual Energy Production	MKWH	54.733 (1996-2000)
Construction Period		July 1984 – March 1987

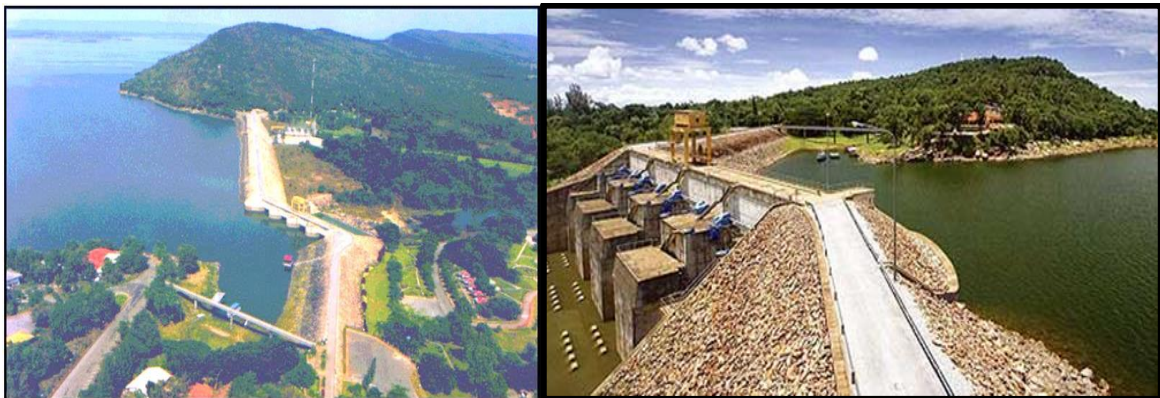
3.3 Hydrology of Nam Pong River System

From the report of water balance study of Sethaputra et al., 1979, the average rainfall over the catchment area of Ubolratana reservoir is 1,200 mm/year. The water runoff from Nam Pong River is collected by the reservoir of 2,340 million m³ annually. The 14% of this number precipitate directly into the Ubolratana reservoir. The annual inflow is classified by 60% of inflow is the regulated out

flow, 20% of inflow is lost by seepage, and 15% of inflow lost by evaporation and another 5% is temporarily stored in the reservoir.³

Before the Ubolratana Dam was constructed on the Nam Pong River, the downstream area was regularly flooded and this area was indicated. The regular flood hazard area downstream resulted in limited farming activities in the wet season. The construction of Ubolratana dam resulted in the flood level in this area decreased with less frequency of flooding than before the construction. However, the dam has a smaller influence on floods further downstream.

Figure 4 Ubolratana Reservoir and Dam (Source: EGAT)



3.4 Geographic Scope of the Assessment

The RSAT assessment this time covered the area including the Ubolratana Dam (including the reservoir area) to Nong Wai weir and its irrigation area of the Nam Pong River Basin. The Pong River or Lam Nam Pong is the only main watercourse flowing past Nong Wai weir, Figure .

Figure 5 Location of the Ubolratana Dam and the Nong Wai Weir

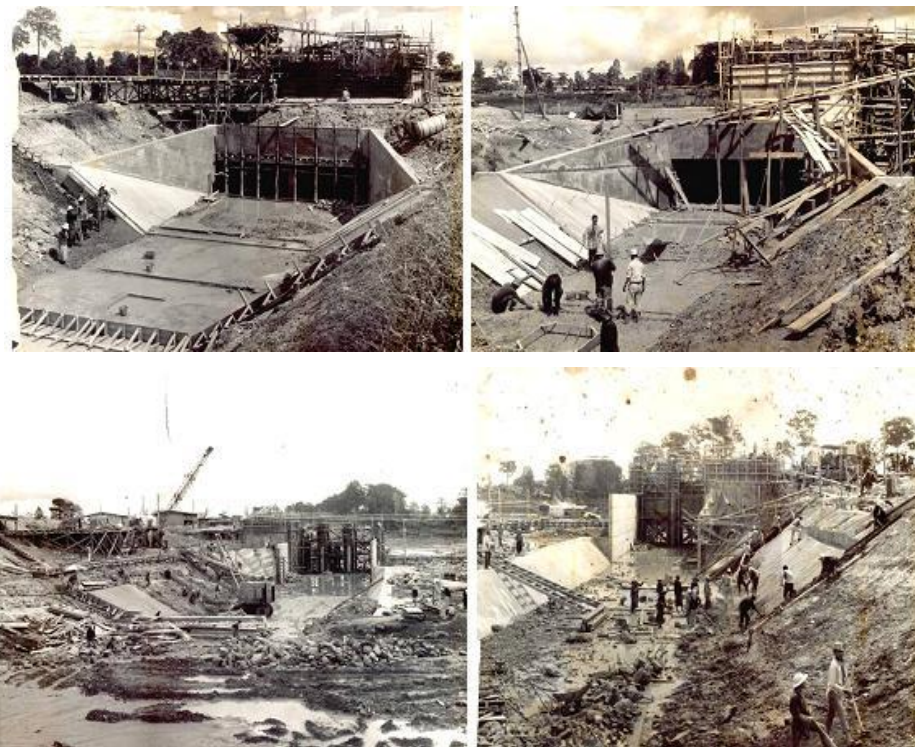


³ Hydrological studies, Sethaputra, S. et al., In Nam Pong Environmental Management Research Project Working Document Number, 10. Bangkok, Mekong Secretariat, 1979

In 1965, Royal Irrigation Department, Ministry of Agriculture and Cooperation undertook the construction Headwork of the Nong Wai in Nam Pong District Khon Kean Province. The OGEE reinforced concrete weir with 5.90 m. height, 125.24 m. crest length, and maximum crest level of 163 m. (MSL). The weir was constructed across the river bed 35 km. south of Ubolratana dam or 33 km. north of the city of Khon Kean Province along Khon Kean-Udonrthani Friendship Highway, followed by the construction of the irrigation system as described below,

1. Water spillways on the Right (2 Bending spillway 3.0x2.0 m.) and Left (2 Bending spillway 3.0x2.0 m.) operated water distribution into both sides of Lam Nam Pong River bank.
2. Sand drainage spillway of the Right (2 Bending spillway 4.0x2.25 m.) and the left (3 Bending spillway 4.0x2.25 m.) drained sediment to allow for sufficient water distribution.
3. Emergency spillway 3.5 high by 240 m. long, weir head 166 m. drainage capacity 1,000 m³/sec.

Figure 6 Early Construction of the Nong Wai Weir and Irrigation canals



Timeline of Nong Wai Weir Distribution System of both banks of Nam Pong was:

1964-1972 Construction of the Right main distribution canal and all branch canals

1972-1975 Construction of the Left main distribution canal and all branch canal systems

The development phases were as followed:

1975-1979 Improvement of Irrigation system over the upper left bank of the Project in Nam Pong District, Sumsong District and Muang District of Khon Kean Province covered an area of 58,500 rai or 9,000 hectares under the Nam Pong Irrigation Project Phase I, with financial supported from the International Development Agency (IDA)

1976-1983 Undertaking land consolidation works and improvement of irrigation system on the right bank of the Project in Nam Pong and Muang Khon Kean District Khon Kean Province over and

irrigated area of 68,800 rai or 10,545 hectares under the Nong Wai Pioneer Agriculture Project-Right Bank with financial supported from Asian Development Bank (ADB).

1979-1985 Construction and Improvement of the main and on-farm irrigation system on the left bank of the lower part of the Project in Chiang Yeun District, Khon Kean Province and Kosumpisai District, Mahasarakham Porvince covered an area of 127,500 rai or 19,615 hectares under the Nam Pong Irrigation Project-Phase II with financial supported from the Kreditanstalt für Wiederaufbau (KFW)

1985 Construction Rubber Weir with air pump extended from regular weir at 0.60 x125.24 m which increased storage capacity of the weir from 62 million m³ to 81 million m³.

3.5 Description of the socio economic status

E-san or Northeast Thailand is the region which is always known asa 'drought prone area' and 'marginal' thus water became the focus of regional development since 1950s. A number of irrigation development projects have been developed in the region over the last decades to enable farming activities in order to improve the food security of the region. As a result, the economic of region has been continuously depending on the Thai government and International Aid Agencies attempt to both balances the seasonality of rainfall and to counter the intra-season variation that constrains rain fed cultivation. Ubolratana dam is one of the development schemes, as the first multi-purpose project of the region which include irrigation, flood control mechanism, and hydropower, which was prioritised for construction. The regional water planning in Thailand has begun to trigger the dream of 'Green Northeast'.

During the construction period of the Ubolratana Dam, there was a resettlement project to move people from the inundated area to the allocation land. There were 2,750 families resettled and each family was allocated 15 Rai (2.5 ha.) and also cash compensation. As recorded in the study done in 1979, the land in the resettlement area has poor soil quality resulting in destruction of nearby forest as the villagers resorted to traditional slash-and-burn agriculture. In the 1980s, the report recorded that general improvement in socio-economic conditions of resettled communities remained problematic; health and nutritional problem were common.⁴

During the field visit, the group interview and one-to-one interview have been conducted with villagers from two villages near the reservoir. The villagers said that the living conditions have improved both financially and standard of living. For public health care access, there are Sub-district health post and district hospital cover the entire area surrounding the reservoir. As confirmed by the head of village in Non Sang district, all villagers have access to the health service and all pregnant women deliver babies at the hospital. All babies are vaccinated at sub-district health post and at district hospital. Primary and secondary schools are located in the communities and 100% of the households in the area have electricity.

3.6 Operation of the Ubolratana Hydropwoer as a Multi-purpose dam

As mentioned earlier, Ubolratana dam was built as a multi-purpose dam and has been one of the agents to serve the development purpose of the Northeast region since 1960s. The scheme included irrigation, flood prevention, power generation, fisheries, recreation, and transportation. Later, maintenance of an environmental flow became one of the functions. There has been close cooperation and coordination between EGAT who is responsible for the dam operation and RID who implements irrigation system downstream. After Nam Pong Power Plant generated electricity from

⁴ Lagler, Karl Frank, Environmental Management and Water Resource Development in the Nam Pong Basin of Northeastern Thailand; A Report of the Nam Pong Environmental Management Research Project, 1979

natural gas, the Ubolratana Hydropower plant only generated electricity when released the water through turbines in the power house. Ubolratana Dam releases approximately 300,000 m³ daily in the normal year for irrigation, domestic and industrial uses. In the drought year, the release of water from the dam is under close cooperation with RID and Khon Kaen Provincial Water Committee. Ubolratana Dam's operation during crisis flow chart is shown in Figure 6.

Figure 7 Proportional use of the Ubolratana Dam storage

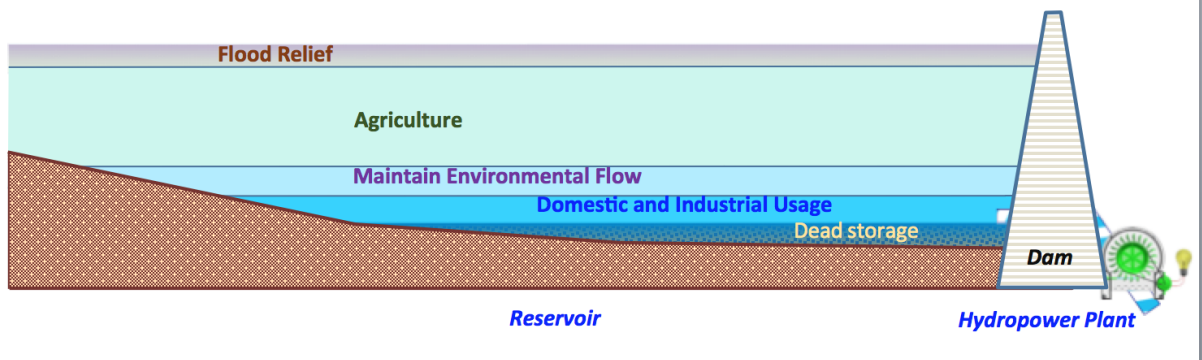
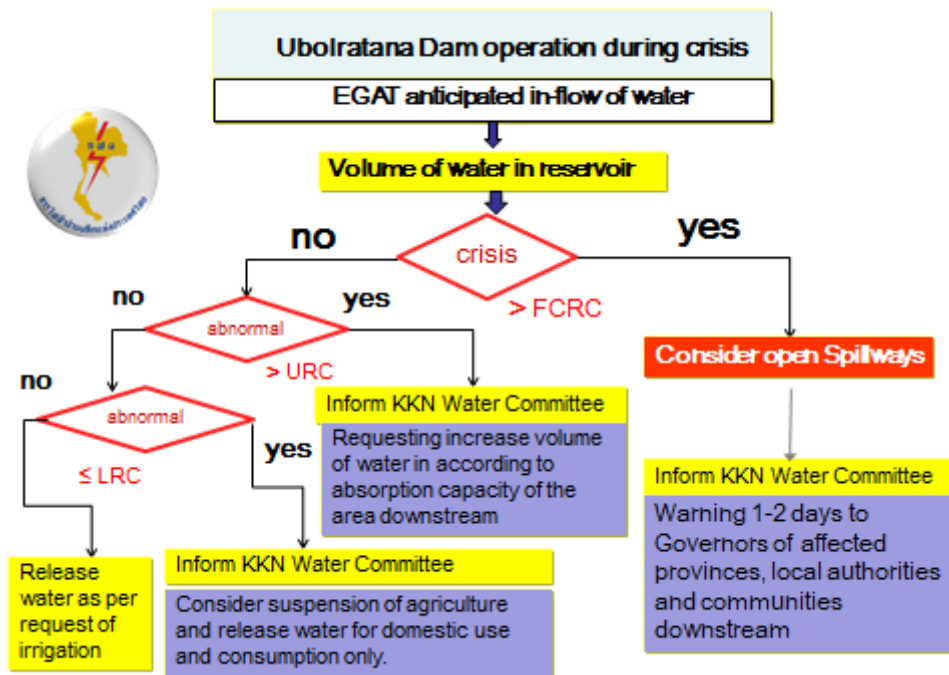


Figure 8 Ubolratana Dam operation flow chart



4 Findings: Topic No 1 – Institutional Capacity

Intent:

The intent of Topic 1 is that there are clear roles and responsibilities and that they key institutions have good capacity to fulfil their roles and work together to enable delivery of balanced and equitable hydropower development outcomes in the sub-basin

Sub-topics:

1.1 Transboundary institutional capacity

1.2 National to local institutional capacity

1.3 Water and energy sector integrated planning

Ubolratana Hydropower Dam was constructed in 1960 on the Nam Pong River, a tributary of Chi River, after the Feasibility Study was approved by the cabinet. The construction including compensation to effected community was done by Energy Department at that time and later on transferred all hydropower operation to recently established Electricity Generating Authority of Thailand (EGAT). Nowadays the institutions from national to local level relevant to Ubolratana HPP operation and the Nam Pong River basin include the following agencies;

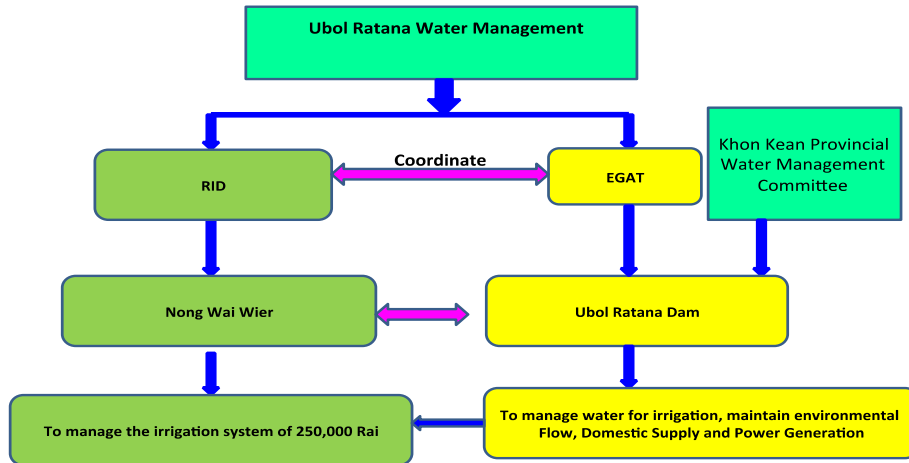
1. Electricity Generating Authority of Thailand – Government Enterprise,
2. Department of Water Resource – Ministry of Natural Resources and Environment,
3. Office of Natural Resources and Environmental Policy and Planning – Ministry of Natural Resources and Environment,
4. Fisheries Department – Ministry of Agriculture and Cooperatives,
5. Royal Irrigation Department – Ministry of Agriculture and Cooperative,
6. Marine Department – Ministry of Transportation,
7. Department of Social Development and Welfare – Ministry of Social Development and Human Security,
8. Department of Industry – Ministry of Industry,
9. Ministry of Tourism and Sport
10. Provincial Water Work – Government Enterprise,
11. Provincial, District, and Tambon authorities of Khon Kaen, Chaiphum, and Mahasarakram.

The coordination and cooperation of these institutions have been under the so-called ‘Ubolratana Water Management Committee’ chaired by Governor of Khon Kaen and EGAT act as Secretary of this committee. Beside this committee, there are also Chi River Basin Committee under the Prime Minister Office cover the whole of Chi River Basin (Nam Pong is a tributary of Nam Chi) and Khon Kaen Provincial Water Management Committee.

We can understand the role and scope of responsibility of these three River Committees from geographical and size of basin. The Chi River Basin cover Chi catchment areas (seven provinces) including Nam Pong which is the tributary of Chi while the ‘Ubolratana Water Management Committee’ covers Nam Pong sub-basin of Chi River consists of three provinces mentioned above, and Khon Kaen Provincial Water Management Committee covers only one province. Each of these

committees has clear mandate, role and responsibilities however institution members may be repeated. The overall responsibilities are shown in Figure below.

Figure 9: Ubolratana Water Management Working Group⁵



4.1 Gap Analysis and Evidence found

Some key concerns evolved from Gap Analysis presented by National Consultant included:

4.1.1 Topic 1.2 National to local institutional capacity

1. Overlapping responsibilities among line agencies member of the Water Committee
2. Even though Khon Kaen Province Water Management Committee include all water user group but communities and farmers is not included as stakeholders in the 'formal' setting.
3. No evident of conflict resolution is sharing among the agencies or publicly.
4. There are 2 national agencies involve energy which are Energy Planning and Policy Office (EPPO) and Energy Regulatory Commission (ERC) but cross-sector coordination works better through personal relationship and networking.
5. There is national Power Development Plan but not able to find national sustainable development policy framework.
6. The baseline and monitoring data are collected at different time and different location in the basin and kept by various line agencies. There is no focal point agency to have all data kept for processing and/or analysis. With this situation it is not clear on how management plans are implemented and their performance is measured.

4.1.2 Topic 1.3 Water and energy sector integrated planning

1. There is no clear mechanism to ensure policies and plans made by energy and water ministries and RBOs are aligned. For Nam Pong sub-basin the relationship between Ubolratana Dam and

⁵ Presentation on the Ubolratana Dam for Participants of "The National Workshop for the RSAT Dialogue Assessment of Ubolratana Basin", Ammara Meethom, Electronic Generating Authority of Thailand (Ubolratana Dam), August 2015

Nong Wai irrigation weir is strong resulting in effective water management with fast response to flood and drought situation.

2. RBO is currently inactive since the current government is in the office in 2014.

From the gap analysis presented by national consultant, participants worked together in plenary to identify strength, weakness, opportunity, and threat of the basin. The SWOT analysis sheet was used to record the result of brainstorming by all participants as shown in

Figure below.

Figure 10 SWOT Analysis for Topic 1 - Institutional Capacity

Topic 1 – Institutional capacity	
<p>Strength</p> <p>1. มีคณะกรรมการน้ำระดับชาติที่มียุทธศาสตร์ที่ชัดเจน พอสมควว (2558-2569) There is national water committee with decent strategy (2015 – 2026)</p> <p>2. การจัดการน้ำในระดับท้องถิ่น เชื่อมอุบลรัตน์ หน่วยงาน ท้องถิ่นทำงานประสานกัน ได้ค่อนข้างดี – เมื่อน้ำที่ของ แต่ละหน่วยงานถูกจัดอย่างชัดเจนรวมถึงความสัมพันธ์ที่ ดีระหว่างหน่วยงาน There is good relationship between agencies e.g. EGAT at Ubonratana Dam and RID in which each understand each other role and duty well thus enable greater coordination and collaboration in water resources management.</p>	<p>Opportunity</p> <p>3. แผนยุทธศาสตร์ด้านน้ำที่มีความชัดเจนเอื้อ ให้มีการทบทวนบทบาทของแต่ละภาคส่วน ที่เกี่ยวข้อง Water strategy enables the review of role and responsibilities of related and concerned institutions.</p> <p>4. ถ้า พรบ น้ำได้รับการอนุมัติจะมีการจัดตั้ง กองทุนน้ำ และองค์กรทั้งระดับชาติและ ท้องถิ่นสามารถขอจัดการกองทุนเพื่อเข้ามา บริหารจัดการน้ำของตนเองได้ If the water act is approved, there will be 'Water Fund' established in which the people could set up organization at both local and national level to manage the fund for their water resource management.</p>
<p>Weakness</p> <p>5. เรื่องน้ำมีหน่วยงานที่เกี่ยวข้องมากกว่า 30 หน่วยงานและ ขาดองค์กรที่ดูแลรับผิดชอบหลักและสอดคล้องอย่าง บูรณาการ – 11 There are over 30 institutions with responsibility related to water resource usage and management in which lack of main coordination body to ensure integration and well coordination of implementation of their plans related to water resources management.</p> <p>6. ยังไม่มีกฎหมายมารองรับ (รอ พรบ น้ำ) There is no Water law</p>	<p>Threat</p> <p>7. มีกลุ่มคนไม่เห็นด้วยอาจจะออกมาต่อต้าน There is group of people always resisting projects.</p> <p>8. การนำไปปฏิบัติไม่เป็นไปตามนโยบายหรือ แผนการที่วางไว้ The implementation does not in according to policy and/or plan</p> <p>9. การตีความกฎหมายไม่เป็นไปตาม เจตนารมณ์และทำให้กลุ่มคนใช้ประโยชน์ จากช่องว่าง The interpretation of the law does not follow the intention of the law and some group of people has taken advantage from the loop hole of the law.</p>

Having considered the result of SWOT analysis for Institutional Capacity, participants selected the issue of **'lack of coordination among too many institutions that have part or whole responsibility related to water resource usage and management particularly on the issue of no key institution been identified to lead such a coordination'** resulting in poor integration and coordination of implementation of their water resources management plans.

4.2 Recommendations for action

N/A not enough time to reach this level

4.3 Developed recommendation

N/A not enough time to reach this level

5 Findings – Topic No 4 – Equitable sharing of hydropower costs and benefits

The intent of benefit sharing is to distribute the benefits of hydropower equitably to river basin residents and across the economy

Sub-topics:

- 4.1 Transboundary benefit sharing
- 4.2 National to local benefit sharing
- 4.3 Financing ecosystem protection and other measures

There are 2 types of the Equitable sharing of hydropower costs and benefits examined in the study area which are Power Development Fund (PDF) and the Corporate Social Responsibility (CSR) programme run by EGAT.

5.1 Power Development Fund (PDF)

Power Development Fund was established under the Energy Industry Act B.E. 2550 (2007). Goal of PDF is to improve the quality of life of people and the environment in the vicinity of power plants. The largest portion of fund collected per unit of energy generated is allocated to local funds to develop and rehabilitate a community that is affected by the hydropower and power plant operation. Table 1 below shows contribution rate of different type of energy generation to PDF.

Table 2 Contribution Rates to the PDF imposed on Power Generation Licensees⁶

Fuel	Satang/kWh
Coal, Lignite	2.00 or US\$ 0.001 [*]
Hydropower	2.00 or US\$ 0.001
Fuel oil, Diesel	1.50 or US\$ 0.00041
Natural gas	1.00 or US\$ 0.00028
Wind, Solar	1.00 or US\$ 0.001 [*]
Biogas, Biomass	1.00 or US\$ 0.001 [*]
Residues and wastes	1.00 or US\$ 0.001 [*]
Municipal Solid Waste	1.00 or US\$ 0.001 [*]
Other Renewable Energy	1.00 or US\$ 0.001 [*]

^{*}Exchange rate on 23 Sep 2015 from Google https://www.google.la/webhp?sourceid=chrome-instant&rlz=1C1NOOH_enLA545LA545&ion=1&espv=2&ie=UTF-8#q=0.02+THB+to+USD

According to the Energy Regulation Committee, Regulation on the Power Development Fund for Development or Rehabilitation of Localities Affected by Power Plant Operation, B.E. 2553 (2010), effective since 9 February 2011, it is required that Power Development Fund committees in designated areas be established to manage the Fund in each area. The committee components will differ based on the category of the Fund management, as can be summarized in the table below.

⁶ Fact Sheet Power Development Fund, <http://www.erc.or.th/ERCWeb2/EN/Front/StaticPage/StaticPageEN.aspx?p=13&Tag=Fact%20Sheet%20Power%20Development%20Fund> accessed on 13 September 2015

Ubolratana Dam is under the “Khon Kaen Power Development Fund Area”. It is categorised under Category B. Area covered 29 sub-districts (Tambon), 6 districts (Amphoe) which are Ubolratana, Nong Rue, Phu Wiang, Nong Nakham of Khon Kaen province and Non Sang and Sri Bunruang of Nong Bua Lumpoo province. In 2015, the allocated fund of 1,200,000 THB consists of 160,000 THB budgeted for Management fee and 1,040,000 THB budgeted for 22 projects in 22 sub-districts.

5.2 Corporate Social Responsibility (CSR) program by EGAT

EGAT adopted CSR principle in operating the state enterprise by working through CSR project to engage with the communities who is one of the important stakeholders. There are numerous social projects both at a community scale and up to those for the society at large. For Ubolratana Dam, CSR project divided into (first) to build up good relationship with the communities and (second) to provide financial support to income-generating projects in the communities surrounded the reservoir. Ubolratana Dam spent 95,744 USD in 2013, 78,371 USD in 2014 and 66,327 USD in 2015 on the CSR projects with effected communities around the Dam site.

Figure 11 EGAT CSR Projects at Resettlement Site near Ubolratana Dam



5.3 Gap Analysis and Evidence found

Some key concerns evolved from Gap Analysis presented by National Consultant included:

5.3.1 Topic 4.2: National to local benefit sharing

1. No data disaggregation is publicly disclosed for Power Development Fund (PDF) and the authorisation of the fund approval is centralised even though the programme has been approved at the provincial level but the final decision is made at the central committee.
2. In EGAT CSR report only mention briefly about the overall CSR program but no section about the contribution of Ubolratana Dam in the report. However, there is an internal report keeping track of budget and programmes approved at Ubolratana Dam but it does not publicly disclosed.
3. There is a national framework call Power Development Fund (PDF) but not much involvement from the community (community can propose the project to get sponsorship but no right to make decision as mention in gap above)
4. Consultation with beneficiaries on proposal (project) assessment and selection is still limited or doesn't exist. The criteria for using fund as spelled in the act are rigid and only allowable for a few possible communal projects type. The case of PDF fund at Ubolratana Dam, the amount of fund is so small while the coverage area is large resulting in no project with significant impact could be implemented.

5.3.2 Topic 4.3 Financing ecosystem protection and other measures

1. None of the existing fund, PDF and CSR, contributes to ongoing funding of environmental protection e.g. Payment for Ecological Services (PES) and/or natural resource management beside no one really know or understand what PES is.
2. Ubolratana Dam has department that responsible for the environmental protection however, only one staff that have direct responsibility regard the environmental works in which it is unclear that there is adequate resources and human capacity for environmental protection and natural resource management measures in the sub-basin.
3. Carbon credit scheme seems to get less attention and/or less discussion in Thailand during the past few years and there is neither carbon credit nor carbon-financing scheme at Ubolratana Dam.
4. Ubolratana Hydropower Projects was initiated long before the creation of ESIA studies; therefore no Hydropower ESIA studies, management plans and financial studies assess financing options (including carbon finance) to address the financing of environmental mitigation measures and environmental off-set programs in the sub-basin.
5. There is no evidence of ecosystem service restoration in the reservoir watershed e.g. reforestation, riparian vegetation management, water quality and quantity of inflow to dam but the opportunity for such system does exist.

5.4 Analysis of Strengths and Weaknesses

Participants worked together in plenary to identify strength/weakness/opportunity/threat of the basin in order to address key issues from Gap Analysis presented by National Consultant. Figure below is the SWOT analysis for Topic 4.

Figure 12 SWOT Analysis for Topic 4 - Equitable Sharing of Costs and Benefits

Topic 4 – Equitable sharing of cost and benefits

<p>Strength</p> <ol style="list-style-type: none"> 1. มีกองทุนใช้เงินตามความประสงค์ของชุมชน There is fund for community activities 2. มีโครงสร้างกลไกในการจัดสรรเงินกองทุนที่มีขอบเขตในการใช้เงินทั้ง 6 อำเภอรอบเขื่อน There is structure and mechanism for managing fund for districts around the Ubonratana Dam. 3. EGAT มีงบประมาณด้านสิ่งแวดล้อม และ CSR สมทบ EGAT has additional budget for environmental and CSR. 	<p>Opportunity</p> <ol style="list-style-type: none"> 4. มีกองทุน และมีนโยบายระดับชาติจัดสรรเงินกองทุนลงในพื้นที่ There is national fund and policy to allocate fund to the local level
<p>Weakness</p> <ol style="list-style-type: none"> 5. ขาดความชัดเจนในการแบ่งปันผลประโยชน์ที่ไม่ได้อยู่ในรูปตัวเงิน Lack clarity in allocation of non-monetary benefit. 6. รายได้จากการขายไฟฟ้าที่ได้จากการปั่นไฟมีจำนวนน้อยและขาดการบริหารจัดการที่ไม่มีประสิทธิภาพ The amount of fund from Hydropower Project is small and has ineffective administration of that fund. 7. กฎระเบียบของกองทุนไม่ยืดหยุ่นให้ใช้เงินกองทุนให้ครอบคลุมถึงการยกระดับความเป็นอยู่ของคนยากจน หรือด้านสิ่งแวดล้อม การใช้เงินกองทุนยังขาดความชัดเจนในด้านสิ่งแวดล้อมและระบบนิเวศ ประกอบกับที่ชาวบ้านยังขาดความรู้ในการใช้เงินเพื่อสิ่งแวดล้อมและระบบนิเวศ Regulation of the fund is not flexible to cover improving livelihood of the poor and/or on environment/ecosystem protection and conservation. It is not clear if the fund could be used for ecosystem and environment. On top of that the people lack understanding on how the use the fund for environment and ecosystem protection. 8. ชาวบ้านไม่มีส่วนร่วมในการตัดสินใจใช้เงินกองทุน People don't participate in decision making on the allocation of fund. 	<p>Threat</p> <ol style="list-style-type: none"> 9. ถ้ามีการปรับอัตราเกณฑ์การแบ่งปันผลประโยชน์จากการขายไฟฟ้าคืนกลับมาสู่ชุมชนจะทำให้ค่าไฟสูงขึ้นเป็นการระของผู้บริโภคอื่นๆ The consumer may have to pay higher electricity bill if the amount of contribution to the fund increased.

Participants agreed that the key issue on inflexible of the fund to cover livelihood improvement activities for the poor and/or on environment/ecosystem protection and conservation should be addressed. Furthermore people’s participation in decision making on the allocation of fund should be encouraged.

5.5 Recommendations for action

N/A not enough time to reach this level

5.6 Developed recommendation

N/A not enough time to reach this level

6 Findings – Topic No 6 – Environment and ecosystem integrity

The intent is that a basin-wide environmental baseline informs hydropower decision making and that hydropower is developed and managed in a way that maintains ecosystem integrity.

Sub-topics:

6.1 Assessment and management of basin wide environmental impacts

6.2 Biodiversity conservation and ecosystem integrity

6.1 Gap Analysis and Evidence found

Ubolratana Dam was constructed in 1960 and there is no EIA prior to the dam construction, however, there is a project called The Nam Pong Environmental Management Research Project launched in 1976 by The Mekong Committee ten years after implementation. There is a report of *Environmental Management and Water Resource Development in Nam Pong Basin of North-eastern Thailand* with include data collection and analysis of changes in variables such as hydrology, water quality, water use, fisheries, land use, socio-economic circumstances, human and animal health, and numbers of insects and pests.

Nam Pong basin is the largest river basin in the Northeast of Thailand that covered 400 km² with daily water consumption of approximately 300,000 m³, 100,000 m³ and 40,000 m³ for irrigation system, communities and industries respectively. The water quality is poor during the dry season due to the overload of pollution from water used in irrigated farming system, industrial and communities combined with the slow flow of a meandering river⁷. In addition, the reduction of forest area of 15% approximately of Pong River basin leading to soil erosion, sedimentation, salinity and flooding. These problems affect directly to quantity and quality of surface water resulting in insufficient water supply of domestic, industrial and irrigated agricultural systems particularly during the dry season. The research recommended the discharge of water at 22.65 m³/sec of downstream of Ubolratana dam is required in order to maintain the DO level to higher than 2 mg/l that suitable for aquatic organism.

Base on the findings above and Gap Analysis against four criteria under each sub-topic presented by National Consultant, participants identified key issues under each sub-topic as shown below:

6.1.1 Topic 6.1: Assessment and management of basin wide environmental impacts

1. There is no centralise environmental including water quality and biodiversity monitoring report of the Chi or Nam Pong River basin, data is collected by each line agencies to serve different purposes of each agency.
2. It is unsure if there is any environmental management plan (at the project level and/or at the national level) at the assessment time.
3. Strategic environmental assessment (SEA) and Cumulative Impact Assessment (CIA) are not a compulsory study in Thailand.
4. No evidence of hydropower environmental impact assessment, management and monitoring exists nor cumulative and basin wide environmental impacts at basin-wide level

⁷ Netnapid T, Wanpen W and Srirat S, Modelling Approach to Water Quality Management in the Lower Pong River, Thailand, KKU Res J 13 (10): November 2008.

6.1.2 Topic 6.2: Biodiversity conservation and ecosystem integrity

1. No biodiversity baseline data and monitoring system in place at the Nam Pong sub-basin.
2. The status of biodiversity is unclear since there is no monitoring and no periodical survey conducted so that the result could be compared with the data in a report of *Environmental Management and Water Resource Development in Nam Pong Basin of North-eastern Thailand* mentioned earlier.
3. There are biodiversity plans and policy at the national level, however, there is no evident found at the assessment time that the compliance with off-set, management and compensation plans is enforced and action is taken to address issues that arise.

6.2 Analysis of Strengths and Weaknesses

Followed the Gap Analysis presented by National Consultant, participants worked in plenary to conduct SWOT analysis through brainstorming and discussion to agree on strength, weakness, opportunity, and threat in which the result is shown in the Figure 13 below.



Figure 13 SWOT Analyses for Topic 6 - Biodiversity and Ecosystem Integrity

Topic 6 – Environmental management and Ecosystem integrity SWOT Analysis

Strength	Opportunity
<p>1. EGAT และ RID เป็นสถาบันแนวหน้าที่ดำเนินการด้านการคุ้มครองสิ่งแวดล้อม และ ระบบนิเวศน์ โดยการให้การศึกษากับประชาชน เช่น การลดการจับปลาเป็นการเลี้ยงปลาเพื่อการบริโภค</p> <p>EGAT and RID as institute leading the Environmental Protection and Ecosystem through educating the villagers e.g. reducing from natural capture of fishes to raising fish for consumption</p> <p>2. หน่วยงานราชการเริ่มเก็บข้อมูลด้านการปนเปื้อนของสารเคมีในน้ำในการตรวจวัดคุณภาพน้ำ</p> <p>LA start to collect the data on chemical substance in water quality</p> <p>3. มีคณะกรรมการน้ำที่มีสมาชิกคือผู้มีส่วนได้ส่วนเสียทั้งราชการและเอกชน</p> <p>There is existing Water Committee consists of various stakeholders both governmental and non-state actors</p>	<p>4. ชาวประมงเริ่มเห็นความสำคัญของการรักษา ระบบนิเวศน์</p> <p>Fisher folks began to realize the necessary in ecosystem</p> <p>5. RSAT อาจเป็นเครื่องมือที่เอื้อให้หน่วยงานราชการ และ ผู้มีส่วนได้ส่วนเสีย ทำการศึกษาวิจัยในด้านการรักษาสิ่งแวดล้อม</p> <p>RSAT could be the tool to open opportunity for concerned LA and stakeholders to begin to conduct study in conserving good ecology</p> <p>6. มีน้ำต้นทุนสำหรับรักษาสิ่งแวดล้อมและระบบนิเวศน์ ในขณะที่มีพื้นที่ท้ายเขื่อนที่เหมาะสมต่อการอนุรักษ์พันธุ์ปลา</p> <p>There is capital water resource for maintain ecology and environment and there is area downstream suitable for fisheries improvement</p> <p>7. ประชาชนอาจจะปรับเปลี่ยนอาชีพและ/หรือ การบริโภค</p> <p>Possible of changing of occupation and/or consumption of the people</p>
Weakness	Threat
<p>8. ขาดการบังคับใช้กฎหมายอย่างเป็นรูปธรรม</p> <p>No concrete action on law enforcement</p> <p>9. ขาดการประสานงานระหว่างหน่วยงานและผู้มีส่วนได้ส่วนเสียในการอนุรักษ์และปกป้องสิ่งแวดล้อมและระบบนิเวศน์</p> <p>Lack of coordination among stakeholders in Environmental and Ecology protection and conservation</p> <p>10. การสร้างเขื่อนมีผลต่อการเชื่อมต่อของแม่น้ำ</p> <p>Connectivity of the water system has been disconnected by dam</p> <p>11. การวางแผนของแต่ละภาคส่วนเป็นแบบแยกกันทำและไม่มีการบูรณาการร่วมกัน ยังไม่มียุทธศาสตร์ด้านน้ำในระดับลุ่มน้ำ</p> <p>Limited planning of each sector with minimum integration of plan. No integrated water using strategy at the basin level</p>	<p>12. ไม่มีข้อมูลละเอียดเพียงพอสำหรับการวางแผนงาน และ การดำเนินการด้านการปกป้องและอนุรักษ์สิ่งแวดล้อมและระบบนิเวศน์</p> <p>Lack of thorough information and data for planning and implementing environmental and ecological protection/conservation</p> <p>13. หน่วยงานมากมายต่างก็มีอำนาจหน้าที่เฉพาะตัวตามกฎหมาย ทั้งยังต่างความคิด และ ความสนใจ</p> <p>There are many agencies with different mandates, ideas, and interests.</p> <p>14. รัฐ(ท้องถิ่น)ยังไม่เพิ่มมาตรการลดและบังคับการใช้สารเคมีเกษตรในพื้นที่เสี่ยงต่อระบบนิเวศ</p> <p>Local authorities and line agencies have not yet created measures to reduce the application of chemical substances in agriculture sector in the highly ecological sensitive area.</p>

Issues: 3, 8, 9 and 1

6.3 Problem Analysis – the RSAT Work sheet

Participants discussed the issues from the Gap Analysis and two issues were identified as major concern to work on Root Cause Analysis for developing SMART recommendations to concerned stakeholders. Root Cause Analysis using Fish-bone diagram to find the answer to ‘Why’ questions was applied and the Table 3 and Table 4 below shows the consequences and the importance with rationale for the high degree rating.

Table 3 Root cause analysis Issue#1: Poor environmental and ecosystem management

Root cause # 1	Consequence	Priority	Recommendations
Ineffectiveness in law enforcement	As law is fundamental requirement for living together in society, lack of law enforcement results in destabilization of society and degradation of natural resources people depending on.	H	<ol style="list-style-type: none"> 1. All government agencies and academic institution work together to raise awareness of the people in all sectors on relevant laws and regulations. 2. Peer pressure in the community and social norm should be applied by all stakeholders
Root cause # 2	Consequence	Priority	Recommendations
Lack of integrated work among different agencies	Environment and ecosystem management must be a holistic approach, with no cooperation from different entities the management fails.	H	<ol style="list-style-type: none"> 1. Main agency to coordinate all efforts must be identified with mandate and budget allocated from government. 2. Role, duty, and mandate of main responsible agency must be clear and agreed by all concerned/relevant line agencies and stakeholders.

Table 4 Root cause analysis Issue#2: Lack of understanding between government and communities

Root cause # 1	Consequence	Priority	Recommendations
Local community life and wisdom have changed due to modernization and urbanization	<ol style="list-style-type: none"> 1. The development of the country would not be achieved without the local community who is the driving force of development. 2. Environmental impact will be wide spread without collaboration of local communities particularly those in the head of watershed area. 	H	<ol style="list-style-type: none"> 1. Revitalize local wisdom and local community life through people network, academic, mass media, and responsible government line agencies. 2. Establish community learning center so that elders could transfer local wisdom to younger generation 3. All relevant stakeholders both government and civil society groups join hand together to protect and revitalize national food source in the ecosystem through research and participatory development approach.

6.4 Development of Recommendations for action

From the RSAT worksheet as extracted from the above Tables, participants agreed that priority actions are:

Action Proposed	Responsible Agency, Person and Date for review (NMC to complete)
<ul style="list-style-type: none"> All concerned government and non-government actors involving in environmental and ecosystem work should agree on one main responsible agency to coordinate an integration of environmental and biodiversity work plan and implementation including data collection for monitoring and planning. 	<p>Agency Responsible for Action: <i>Regional and Provincial Environmental Office.</i></p> <p>Person or Position in Agency to Contact: <i>Not actually identified, TNMC will share the assessment report with all participants</i></p> <p>Date for review of Action: <i>Not defined</i></p>
<ul style="list-style-type: none"> Responsible government agencies and academic institution should work together to raise awareness of the people in all sectors on laws and regulations about environmental and ecosystem protection and conservation and apply peer pressure in the community and social norm in reinforcement of such laws and regulations. 	<p>Agency Responsible for Action: <i>Khon Khen University and all stakeholders</i></p> <p>Person or Position in Agency to Contact: <i>Not actually identified, TNMC will share the assessment report with all participants</i></p> <p>Date for review of Action: <i>Not defined</i></p>
<ul style="list-style-type: none"> Civil Society and academics to help community to revitalize local wisdom and local community life by establishing community learning centres so that elders could transfer local wisdom to younger generation. 	<p>Agency Responsible for Action: <i>Representatives from two River Basins and community development groups in Northeast region attended the assessment will take that action in their constituencies.</i></p> <p>Person or Position in Agency to Contact: <i>Not actually identified, TNMC will share the assessment report with all participants</i></p> <p>Date for review of Action: <i>Not defined</i></p>
<ul style="list-style-type: none"> All relevant stakeholders both government and civil society groups join together to protect and revitalize national food source in the ecosystem through research and participatory development approach. 	<p>Agency Responsible for Action: <i>All of the participants from government and civil society groups attended the assessment</i></p> <p>Person or Position in Agency to Contact: <i>Not actually identified, TNMC will share the assessment report with all participants</i></p> <p>Date for review of Action: <i>Not defined</i></p>

NOTE from Facilitator: The development of the recommendations for action needs careful attention. While the recommendations coming out of this work were of interest to the participants, they were also as a very high level and aspirational. For the RSAT dialogue to be successful on an ongoing basin process, it would be important for the actions and recommendations to contain elements that can be progressed by the participants in the room. In that way future workshops can allow follow-up on progress and empower participants to make progress in tackling the issues on the table.



7 Findings on Topic#7 – Flows and reservoir management

The intent is that there is enough water for all water uses in the basin and that water is used efficiently

Sub-topics:

- 7.1 Multiple water use optimization and efficiency
- 7.2 Reservoir planning and management
- 7.3 Co-ordinated hydropower operations
- 7.4 Downstream and environmental flows
- 7.5 Flood and drought management

7.1 Gap Analysis and Evidence found

Ubolratana dam is the first dam in northeast Thailand built as a multi-purpose dam. Generating power is one of the dam functions during the early days before the construction of Nam Pong Power Plant that generates electricity from natural gas. Nowadays, Ubolratana dam has two main functions; first is to be the Northeast Hydropower Control Centre to coordinate with other 6-hydropower plants in the regions to generate the power at peak time and/or in according to the water management plan. Second is to work closely with the RID to plan for the water release in response to the irrigation purpose. The main responsibility of the dam is to balance and manage the water both upstream and downstream.

The presentation by EGAT shows close coordination and constant communication between EGAT who manages the reservoir and RID who operate Nong Wai irrigation project to ensure sufficient water is released from the reservoir to irrigate farm land downstream of the dam. The water will be released through powerhouse to generate electricity which will be sent to electricity grid of the Northeast part of Thailand.

EGAT conducted routine Dam Inspection weekly by staff stationed at the dam and every two years by EGAT dam expert. Special inspection is conducted when EQ. M>5 within 200 km. from the dam size and when flood in reservoir volume > 90%. The diagram showing structural of reservoir management system at the Ubolratana dam is shown in Figure 6 on page 19 above.

After brief presentation about Ubolratana Dam flow and reservoir operation, the National Consultant presented Gap Analysis which described by each sub-topic below:

7.1.1 Topic 7.1: Multiple water use optimization and efficiency

1. Though baseline data on water availability recorded by agencies like DWR, EGAT exist, no hydrological model has been developed for the basin that addresses different water use scenarios. Furthermore there is no assessment on the effect of climate change on future water availability and flow.
2. As the purpose of Ubolratana Dam is not only the power generating but also to supply water to meet the demand of agriculture, industry and domestic uses. The management of water from Ubolratana's reservoir is engaged with various government agencies under the Khon Kean Provincial Water Committee. The routine work of the committee mainly on the coordination of Royal Irrigation Department (RID), Electricity Authority of Thailand (EGAT) and the Provincial Waterworks Authority in managing the daily water discharge to meet the

demand of daily consumption of the water by all sectors. Managing water during crisis period is shown in Figure 6 on page 19.

7.1.2 Topic 7.2: Reservoir planning and management

1. EGAT claimed that actual environmental flow release is done according to the recommendation from the Khon Kean University research but some of the measured water releases are different to those recommended (2 million m³/ day) versus actual release (300,000 m³/day); therefore the agreed environmental flow release plan needs to be confirmed.
2. Multiple agencies involve in dam and reservoir management including EGAT in charge of Ubolratana Dam infrastructure and water in the reservoir, Department of Fishery in charge of fisheries both in the reservoir and along the Pong river down to Nong Wai Weir, Department of Marine takes care of boats and piers within the reservoir, Department of Forestry oversees the forest upstream of the reservoir; plans may be different in both objectives and operations in which they did not appear to be in good integration or good coordination.

7.1.3 Topic 7.3: Coordinated hydropower operation

1. Coordination relies on personal relationship

7.1.4 Topic 7.4: Downstream and environmental flows

1. Though there is a reservoir rule curve in operation, monitoring data is not publicly released.
2. No published reports or data could be found regarding the effectiveness of the environmental flow release.

7.1.5 Topic 7.5: Flood and drought management

1. No clear plan was found on drought management (especially related to irrigation); this appeared to be managed on a year by year and season by season basis, it is mostly done as ad hoc.
2. No civil society inclusion in the provincial level of river committee.
3. Not be able to find Flood policy at national or provincial level.

7.2 Analysis of Strengths and Weaknesses

Participants worked together on SWOT analysis in which the result is shown in Figure 12 below. From the SWOT analysis result, participants identified three issues as important to address, they are:

- a) Local Administrative plan and implementation does not link well with the basin
- b) The quality of the water downstream is not good and has negative impact to the food chain of the community
- c) Rapid increase of industry and expansion of agriculture area from economic growth threaten to the availability of water resource.

Figure 14 SWOT Analysis for Topic 7 - Flow and Reservoir Management

Topic 7 – Flow and Reservoir Management

<p>Strength</p> <ol style="list-style-type: none"> 1. มีการประสานระหว่างหน่วยงานอย่างใกล้ชิด There is close coordination between agencies. 2. เปิดเผยข้อมูล และ บริหารจัดการทันทีรวดเร็ว 3. มีประสบการณ์ในการวางแผนงาน และ มีการบริหารจัดการน้ำ มีน้ำใช้ตลอดปี Has experience in planning and water management which ensure sufficient water throughout the year. 4. มีฐานข้อมูลที่ดี และมีข้อมูลมากมายยาวนานในการใช้บริหารจัดการ There is good baseline and plenty of data for management 5. หน่วยงานต่างๆ ที่เกี่ยวข้องเข้าใจสภาพปัญหา และมีความพร้อม มีการวิจัยเข้าไปมีส่งเสริม มีเอกชนในพื้นที่ให้ความสำคัญกับป่า Agencies understand situation and ready, there is researches, and private sectors in the basin give priority to forest protection. 6. มีการนำภูมิปัญญาท้องถิ่นมาใช้บริหารจัดการ/ มีปริมาณน้ำและระบบนิเวศน์ Local wisdoms have been used in managing that ensure sufficient water in the ecosystem. 	<p>Opportunity</p> <ol style="list-style-type: none"> 7. นโยบายการบริหารจัดการน้ำร่วมกันทุกฝ่าย อย่างบูรณาการ Possible to have an integrated water management by all parties. 8. พรบ.การมีส่วนร่วมของชุมชนในการจัดการทรัพยากรธรรมชาติ There is an act that enable participation of communities in natural resources management 9. RSAT เปิดพื้นที่และโอกาสให้ประชาชนมีส่วนร่วมในการวางแผน, บริหาร, การจัดการน้ำ RSAT open space for people to participate in and planning and managing Water Resource 10. ยุทธศาสตร์ของรัฐให้ความสำคัญกับป่าต้นน้ำ Government's strategy stress the important of watershed.
<p>Weakness</p> <ol style="list-style-type: none"> 11. กลไกการบริหารจัดการ และ แผนการบริหารจัดการของท้องถิ่นที่เชื่อมกับกลุ่มน้ำไม่ดีพอ Local Administrative plan and implementation does not link well with the basin 12. คุณภาพน้ำท้ายเขื่อนลงมาไม่ดี มีผลกระทบต่อกระท่อ “ห่วงโซ่อาหาร” ชุมชน The quality of the water downstream is not good and have negative impact to the food chain of the community 13. การไม่มีกฎระเบียบในการบริหารจัดการร่วมกันและการบังคับใช้กฎหมาย Lack of law and regulation in joint management and enforcement of such laws. 14. ขาดการบูรณาการของท้องถิ่นเชื่อมต่อกับยุทธศาสตร์น้ำ Water strategy does not link and integrate the local 	<p>Threat</p> <ol style="list-style-type: none"> 15. การเติบโตของเศรษฐกิจทำให้โรงงานอุตสาหกรรมเพิ่มขึ้นและการเกษตรที่ควบคุมไม่ได้ Rapid increase of industry and expansion of agriculture area from economic growth 16. การเปลี่ยนแปลงสภาพภูมิอากาศ Climate Change 17. ความต้องการใช้น้ำไม่สิ้นสุด Endless demand for water 18. การพัฒนาด้านบทบาท/กฎหมาย ใครคือภาคีที่รับผิดชอบ Unclear responsible body to design/improve the law and role of institutions involved 19. กลไกของรัฐและเครื่องมือที่ใช้ไม่เอื้อต่อประชาชนให้มีส่วนร่วม Government's mechanism does not enable participation of the people.

7.3 Recommendations for action

Due to time constraint, participants were able to work on only one issue which is on **Issue#1: “Rapid increase of industry and expansion of agriculture area from economic growth threaten to the availability of water resource.”** The results of this discussion are shown in Table 5 below.

Table 5 Root cause analysis Issue#1 and 2 Topic 7

Root cause # 1	Consequence	Priority	Recommendations
Villagers don't have base knowledge of key issues, they follow what government told them	<ul style="list-style-type: none"> • There will be conflict and competitive over water resource. • Change in local livelihood leads to less happiness 	H	<ol style="list-style-type: none"> 1. EGAT, Local Admin Organizations, relevant ministries and civil society to develop capacity of the villagers to acquire knowledge enabling them to catch up with economic growth and the consequence. 2. Independent neutral institute such as Khon Kean University should help villagers to assess the situation using available assessment tool.
Root cause # 2	Consequence	Priority	Recommendations
Government policy in promoting mono-crop for economic enhancement only focuses on the need of private sector/investors than the need of the villagers	<ul style="list-style-type: none"> • The villagers become poorer which become burden to the government. 	H	<ol style="list-style-type: none"> 1. Civil Society capacity should be strengthen. 2. Civil Society should take the lead in adopting the principle of self-sufficient economy and make it into practice. 3. Education must respond to the need of the people 4. Government should implement wealth-distribution and improve tax system to benefit the development at the local level. 5. Government should initiate decentralization that enable civil sector to have voice on issue(s) affected them.

7.4 Development of Recommendations for action

From the RSAT worksheet as extracted from the above, participants agreed that priority actions are:

1. EGAT, Local Admin Organizations, relevant ministries and civil society to develop capacity of the villagers to acquire knowledge on the importance of biodiversity and eco-system of the river, enabling them to participate in economic growth and the consequence.
2. Independent neutral institute such as Khon Kaen University should help villagers to assess the water quality situation and its impact to livelihood of the communities using available assessment tool.
3. Civil Society capacity should be strengthened to allow them to take the lead in promoting the principle of self-sufficient economy to the villagers and support them to put into practice. This recommendation developed from inputs of representatives from River Basin Organization participated in the assessment in which the greater demand of water for irrigated agricultural system and industrialization from government's policy in pushing an economic growth in the northeast region. This resulted in deforestation to expand agriculture area, high demand for water and energy for industrialization, and sharp deterioration of river ecology and biodiversity. The GDP has increased as a result of

government policy but the people found themselves poorer and unhealthy from the impact of negative results. Participants from civil society groups insisted this recommendation be included in this topic because there was not enough time to work on Topic 4 – The equitable sharing of cost and benefits.

4. Ministry of Education should review the education strategy in relation to the management of natural resources, water and reservoir management; responsive to the needs of the people.
5. Government should implement wealth-distribution and improve tax system to benefit the development at the local level including initiate decentralization that enable civil sector to have voice on issue(s) affected them. This recommendation is an aspiration recommendation that strongly emphasized by participants from civil society groups participated in the assessment.

Action Proposed	Responsible Agency, Person and Date for review (NMC to complete)
<ul style="list-style-type: none"> • EGAT, Local Admin Organizations, relevant ministries and civil society to develop capacity of the villagers to acquire knowledge enabling them to catch up with economic growth and the consequence. How? Needs an immediate action? 	<p>Agency Responsible for Action: <i>EGAT as it has development projects with communities around the Ubolratana Dam reservoir</i></p> <p>Person or Position in Agency to Contact: <i>Not actually identified, TNMC will share the assessment report with all participants. It could be Head of Information Centre of EGAT Ubolratana Dam.</i></p> <p>Date for review of Action <i>Not defined</i></p>
<ul style="list-style-type: none"> • Independent neutral institute such as Khon Kean University should help villagers to assess the situation. The assessment tool such as RSAT could be applied in this case. 	<p>Agency Responsible for Action: <i>It is proposed that Khon Khen University to take this action</i></p> <p>Person or Position in Agency to Contact: <i>Not actually identified, TNMC will share the assessment report with all participants. It could be the lecturer from KKU who participated in this assessment to take action.</i></p> <p>Date for review of Action: <i>Not defined</i></p>
<ul style="list-style-type: none"> • Civil Society capacity should be strengthen to take the lead in promoting the principle of self-sufficient economy to the villagers and support them to put into practice. 	<p>Agency Responsible for Action: <i>Representatives from two River Basins and community development groups in Northeast region attended the assessment will take that action in their constituencies.</i></p> <p>Person or Position in Agency to Contact: <i>Not actually identified, TNMC will share the assessment report with all participants</i></p> <p>Date for review of Action: <i>Not defined</i></p>

<ul style="list-style-type: none"> Ministry of Education should review the education strategy that responds to the need of the people. 	<p>Agency Responsible for Action: <i>The group did not specify the agency attended the assessment to take this recommendation to the Ministry of Education.</i></p> <p>Person or Position in Agency to Contact: <i>Not actually identified, TNMC will share the assessment report with all participants</i></p> <p>Date for review of Action: <i>Not defined</i></p>
<ul style="list-style-type: none"> Government should implement wealth-distribution and improve tax system to benefit the development at the local level including initiate decentralization that enable civil sector to have voice on issue(s) affected them. 	<p>Agency Responsible for Action: <i>The group did not specify the agency attended the assessment to take this recommendation to the government.</i></p> <p>Person or Position in Agency to Contact: <i>Not actually identified, TNMC will share the assessment report with all participants</i></p> <p>Date for review of Action: <i>Not defined</i></p>

NOTE from Facilitator: The development of the recommendations for action needs careful attention. While the recommendations coming out of this work were of interest to the participants, they were also as a very high level and aspirational. For the RSAT dialogue to be successful on an ongoing basin process, it would be important for the actions and recommendations to contain elements that can be progressed by the participants in the room. In that way future workshops can allow follow-up on progress and empower participants to make progress in tackling the issues on the table.

8 Comments on the RSAT process

8.1 Evaluation by participants

The RSAT assessment workshop on the Ubolratana Dam was held in Khon Kaen, Thailand between 24 and 27 August 2015. The actual number of participants at the workshop was 37 people; however, only 13 feedback forms were returned, 12 of which contained sufficient information for evaluation. This feedback shows that participants invariably found the RSAT training was helpful and generally agree that that RSAT assessment presents a useful tool that most would be interested in applying to their own work. However, almost half the respondents believe that the assessment process currently covers all important aspects of sustainable hydropower development. Half of all respondents felt that the RSAT presents a valuable tool as a whole, mainly due to its participatory approach, leading to strong stakeholder involvement. One respondent also highlighted the GAP analysis as being useful and suggested that it was sufficient and did not require a SWOT analysis to also be carried out. A second respondent questioned whether it was necessary to conduct a GAP analysis, SWOT analysis and Root-Cause Analysis. This made it a lengthy process.

Finally, participants identified what they believe were the main benefits and limitations of the RSAT assessment method and how these limitations might be overcome. The key benefits and limitations have been summarized below:

Benefits	Limitations
<ul style="list-style-type: none">- Quick and easy assessment method- Flexible tool, can be applied to any context and location- Creates stakeholder dialogue- Allows participation of local communities/civil society- Includes environmental considerations, may encourage environmental protection	<ul style="list-style-type: none">- Not always sufficient baseline data and information available- Participants are required to have profound knowledge of the topic- Law enforcement is still weak, particularly on controlling pollution along the river- Cultural barriers may affect assessment- RSAT is not yet precise enough

Several suggestions were made on how to overcome the limitations listed above. These include:

1. More training sessions and workshops would help enhance the skills and knowledge needed to conduct RSAT assessments.
2. Focus on research and the gathering of data in order to bridge the information gap.
3. RSAT may have to become more adaptable to different contexts and locations.
4. Having an expert present for each topic could ensure a more knowledgeable discussion.
5. Concerns from communities should receive more attention.

8.2 Observations from RSAT facilitators

There is much interest from different stakeholders participated in the assessment. EGAT wants to learn about the tool, the process, and the benefit in having this tool used in their operating area.

They shared how the hydropower dam is operated these days which is mainly to store and feed water to Nong Wai Irrigation Weir 35 km downstream, the water will be released through the power house to generate electricity which will feed into the electricity grid for NE part of the country. The strongest group at the assessment is representatives from Civil Society Water User Groups who want to push their agenda forward. Generally participants were active and contributed their opinions and knowledge during the dialogue. They have open mind and listening to different ideas and argument well particularly on the Topic on benefit sharing and environmental conservation and ecological integration.

The presentation on Flows and Reservoir Management was a bit poor due to lack of information and the background of National Consultant who is expert in Social Science. There should be two experts to work at RSAT National Consultant; one on Socio-Economic and one on hydrology and/or HPP, so that the gap analysis will be more thorough and the presentation will be easy to understand by participants who are mainly non-technical background.

Facilitation is also important that there should be skilful facilitator of that riparian country where RSAT assessment is taken place, he/she will be able to facilitate the dialogue, explain content of RSAT Topic, provide explanation using relevant example in the country, and give instruction on activity and/or task participants have to perform in the local language. This will make the assessment process faster and flow well.

8.3 Recommendations for improvements and future RSAT assessments

The objective of this trial in the Ubolratana basin was to gain an understanding among the participants of the RSAT tool and the dialogue method. In addition the facilitators were gaining vital experience and learning on the best methods to adopt in the presentation of the information and in conducting the dialogue. Several opportunities for improvement were clear; and these are to be taken up in future RSAT enhancements. These include:

1. Presence of knowledgeable operators from the hydropower and irrigation schemes was essential for informed discussion on the topics.
2. Refinement of the SWOT, GAP and Root cause analysis techniques; the participants needed more clear instruction on how this process could work.
3. Certainly more than one workshop would be required to adequately cover all the ten RSAT topics. The time allocated for this workshop was only sufficient to cover two Topics in any detail.
4. The development of the SMART recommendations needs careful facilitation. While the recommendations coming out of this work were of interest to the participants, they were also as a very high level and aspirational. For the RSAT dialogue to be successful on an ongoing basin process, it would be important for the actions and recommendations to contain elements that can be progressed by the participants in the room. In that way future workshops can allow follow-up on progress and empower participants to make progress in tackling the issues on the table.
5. Clearly funding for the ongoing RSAT assessment and dialogue needs consideration. This could be built in to the budget for the local Water Management Committee facilitated by regional expert.

9 Conclusions

The RSAT assessment in the Ubolratana basin successfully illustrated the role RSAT can play in facilitating dialogue in a hydropower basin even with multi-purpose schemes elements. Participants contributed to vigorous discussion and it was heartening to witness good gender balance in the meeting with all voices being heard.

The capacity and knowledge of the participants allowed informed debate and this was essential. It was not easy to get access to published data on these topics, this would certainly be an important aspect to address for future assessments. The more analysis that can be done before the workshop the better and more informed the dialogue.

The facilitation techniques adopted in the workshop could be further enhanced to allow the process to get to the main points early. Extracting the key issues at the appropriate governance level is difficult and this part of the RSAT process needs attention.

The recommendations that came out of the assessment were aspirational rather than immediately actionable; however they represent the views of the stakeholders present. Future workshops in this region would benefit from the participation of higher level officials who were able to progress the recommendations and take accountability for progress.



Annex 1: Participant details

Name	Position	Organization	Email
1. Ms. Nuanlaor Wongpinitwarodom	Policy and Plan Analyst, Senior Professional level	TNMC	nuanlaor@gmail.com
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8. Mr. Wisanu Chooprayoon	Scientist Practitioner	EGAT	
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14. Mr. Pavisorn Chuenchum	MA Student – Faculty of Engineering	Chulalongkorn University	Arthur_king@hotmail.com
15. Mr. Chairat Srinonthong	Policy and Plan Analyst, Senior level	Department of Water Resource, Sector 4	
16. Mr. Kittisak Klongboon	Policy and Plan Analyst	Department of Water Resource, Sector 4	
17. Ms. Supastra Lekjan	Fishery Biologist	Khon Kaen Fisheries Office	supastra@hotmail.com

18. Mr. Pramote Phuengphin	Senior Irrigation Officer	Royal Irrigation at Nong Wai	Mote41en@gmail.com
19. Mr. Phoowadon Hongkarnchanakul	Irrigation Officer, Professional level	Royal Irrigation at Nong Wai	
20. Mr. Prajya Ngamjan	Lecturer	Kasetsart University, Sakon Nakhon Campus	
21. Ms. Supaporn Leekwangkaew	Secretary	NK-XB4 TB Project	
22. Mr. Sakprayong Chansom	Public Relation Officer	EGAT Ubolratana Dam	
23. Ms. Ammara Meethom	Engineer, Senior Professional level	EGAT Ubolratana Dam	
24. Mr. Paitoon Kulruksa	Head of Information Center	EGAT Ubolratana Dam	
25. Mr. Utan Panpoka	Engineer Senior Professional level	EGAT Ubolratana Dam	
26. Mr. Chaiyo Kaokullaya		EGAT Ubolratana Dam	
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30. Mr. Suchart Keurkernpet	Mekong Basin Development Specialist	Udonrthani	
31. Mr. Yoncharn Kamonrat	Loei basin working group	Loei	
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Annex 2: Agenda

Day 1: Field Visit (times and route to be confirmed by TNMC and EGAT and RID – to be discussed in early August 2015)

Time	Topic	Responsible
08:00	Transport depart from Hotels	
09:00	Ubol Rathana dam and power station - overview of the hydro project and operations (hydrology, storage operations, operational constraints)	EGAT, National Consultant, Facilitator
12:00	Lunch (TNMC to arrange)	
13:00	Field visit to upstream and downstream catchment and irrigation areas.	RID, EGAT, National Consultant
16:00	Return to hotels	

Day 2: Project and Basin Overview and RSAT process overview

Time	Topic	Responsible
08:30	Registration	
09:00	Opening remarks from the Chair – clarifications of the objectives of the RSAT assessment	Chair (TNMC to select)
09:15	Introductions: each participant to state organisation, position, how they are involved with the Ubol Rathana project and basin/hydropower. Any previous knowledge of RSAT?	Facilitators and all
09:45	Overview of the RSAT Topics, process and agenda for the next 4 days. Recap of the RSAT overview in Bangkok (28-29 May 2015) and Priority Topics for discussion.	Facilitators
10:30	Coffee break	
10:50	Discussion on the Priority Topics for discussion and confirmation.	Facilitators
11:10	Detailed Overview of the Basin and Ubol Rathana project. Feedback from the Site visit (if undertaken)	National Consultant and Facilitators. Relevant Participants

12:15	Lunch	
13:15	Further Overview of the basin and comments from participants.	National Consultant and Participants
13:45	Performance Statement for Topic #7 - Gap Analysis of Priority Topic (#7 Flows and reservoir Management - to be confirmed)	IC, National Consultant, Facilitators
14:30	Group Discussion on Gap Analysis - Topic #7 – Issues arising from Gaps	Facilitators, Participants
15:00	Coffee break	
15:20	Group Discussion on Gap Analysis - Topic #7 – Issues arising from Gaps – Root cause and SMART Actions to resolve gaps and issues. Allocation of responsibilities.	Facilitators, Participants
17:00	Close of Day 2	

Day 3: RSAT Assessment of Priority Topics

Time	Topic	Responsible
08:30	Meeting Opening - confirmation of agenda for next two days	Chair
08:45	Performance Statement for Topics #6 - Gap Analysis on Topic #6 (Environmental Management)	IC, National Consultant, Facilitators
09:00	Group Discussion on Gap Analysis - Topic #6 – Issues arising from Gaps	Facilitators and Participants
10:15	Coffee break	
10:35	Group Discussion on Gap Analysis - Topic #6 – Issues arising from Gaps – Root cause and SMART Actions to resolve gaps and issues.	Facilitators and Participants
12:00	Lunch	
13:00	Performance Statement for Topics #4 - Gap Analysis on Topic #4 (Equitable sharing of costs and benefits)	IC, National Consultant, Facilitators

13:45	Group Discussion on Gap Analysis - Topic #4 – Issues arising from Gaps	Facilitators and Participants
15:00	Coffee break	
15:20	Group Discussion on Gap Analysis - Topic #4 – Issues arising from Gaps – Root cause and SMART Actions to resolve gaps and issues.	Facilitators and Participants
17:00	Close of Day 3	

Day 4: RSAT Assessment of Priority Topics

Time	Topic	Responsible
08:30	Meeting Opening - review of process from Day 3 and confirmation of agenda for Day 4	Chair
08:45	Performance Statement for Topics #1 - Gap Analysis on Topic #1 (Institutional Capacity)	IC, National Consultant, Facilitators
09:30	Plenary discussion on Gap Analysis – Topic #1 Issues arising from Gaps – Root cause and SMART Actions to resolve gaps and issues.	Facilitators and Participants
10:15	Coffee break	
10:35	Group Discussion on Elaboration of one priority action from each Topic – Specific Actions, Accountability <ul style="list-style-type: none"> • Group #1: Topic 6 and 7 • Group #2: Topics 1 and 4 	Facilitators and Participants
12:00	Lunch	
13:00	Feedback from Group # 1 and # 2	Participants
14:00	Summary on key issues emerging from the RSAT dialogue – Actions and practical suggestions, next steps and reporting.	Participants, National Consultant, Facilitators
15:00	Coffee break	
15:30	Wrap up of the 4 days RSAT dialogue – evaluation and feedback on meeting process and RSAT tool.	Participants
16:00	Closing remarks from the Chair	Chair

Time	Topic	Responsible
16:15	Close of RSAT assessment	

Annex 3: Data collection

9.1 Information sources

Thai National Mekong Committee Secretariat

Department of Water Resource – Ministry of Natural Resources and Environment

Royal Irrigation Department – Ministry of Agriculture and Cooperative

Ubolratana Hydropower Dam - Electricity Generating Authority of Thailand

Mekong River Commission, OSV library - Various study documents on Nam Pong River Basin and Pong Neeb Hydropower Dam (currently named Ubolratana Dam).

9.2 Interviews

No interview was conducted for this assessment.

9.3 Observations on data collection process

Data about Ubolratana is abandon yet quiet scattered. I started with the old documents from Mekhong River Commission (MRC)'s library. There are number or documents include research and preliminary reports dated back to 1960s about both Nam Pong Basin and Ubolratana dam project both before and after dam construction. Even though the dam was constructed long before assessments such as Environmental or Social Assessments are required but documents portrayed well-constructed of the preliminary report and although post-dam construction reports including the resettlement report with solid standard of compensation for those villagers effected from the relocation.

I continued my data collection both offline and online approached. I gathered paper based researched from relevant line agencies such as RID, EGAT and other academic paper. The most helpful session was the field visit with helped me a lot to get the chance to understand many issue at the local level. Moreover, I learnt that local agencies have been collecting many baseline data for years however, most of the information are not publicly publish and in order to get those data, I need to get it to personal context.

Annex 4: Participants feedback summary

Participant feedback on RSAT assessment workshop

Ubolratana Dam, Khon Khen, Thailand.

24 – 27 August 2015

The RSAT assessment workshop on the Ubolratana Dam was held in Khon Khen, Thailand between 24 and 27 August 2015. The actual number of participants at the workshop was 37 people; however, only 13 feedback forms were returned, 12 of which contained sufficient information for evaluation. Among these twelve feedback respondents, merely 9 specified their personal details, with 4 male and 5 female respondents. As the table below shows, representatives from government, academia and civil society were present:

Table 1: Breakdown of feedback respondents who specified personal details, by type of organization and gender:

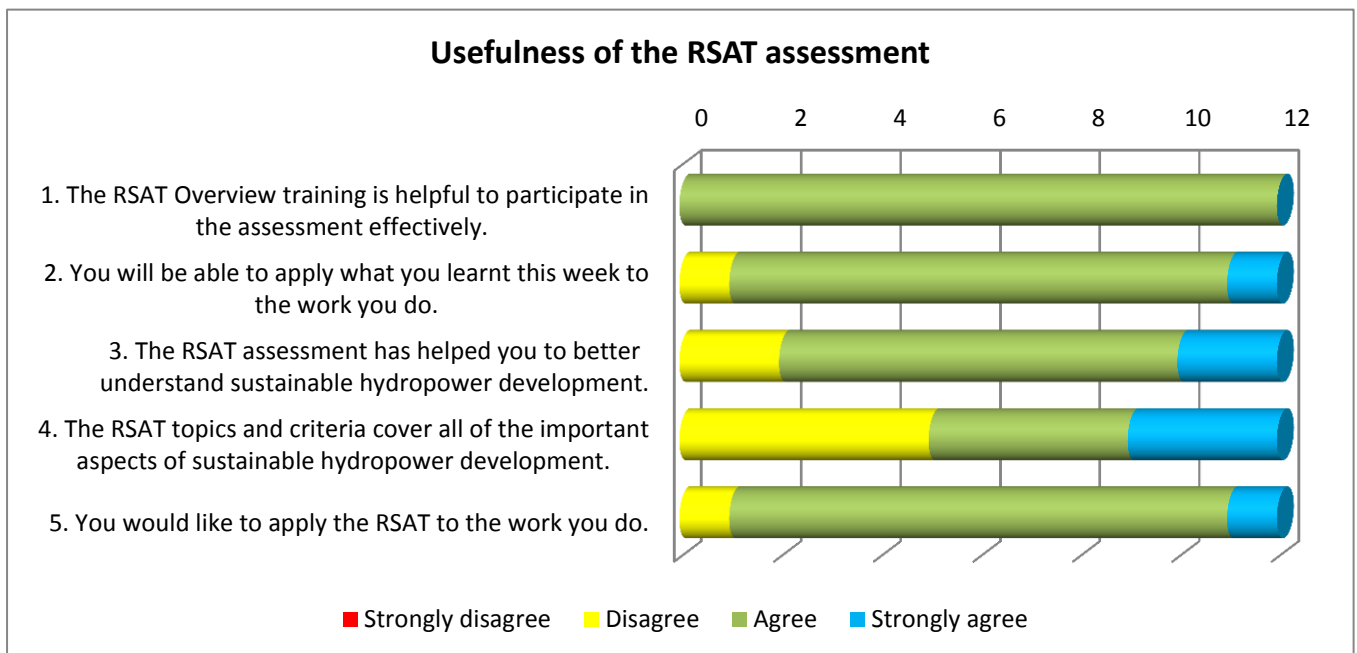
Organization type	Total	Gender	
		Male	Female
Government	5	1	4
Academic	3	2	1
Civil Society/NGO	1	1	0
Total	9	4	5

The evaluation form asked participants to rate the usefulness of the RSAT training and assessment, responding to several statements with either 'Strongly disagree', 'Disagree', 'Agree', and 'Strongly agree', as shown below:

Statements	Strongly disagree	Disagree	Agree	Strongly agree
1. The RSAT Overview training is helpful to participate in the assessment effectively.	0	0	12	0
2. You will be able to apply what you learnt this week to the work you do.	0	1	10	1
3. The RSAT assessment has helped you to better understand sustainable hydropower development.	0	2	8	2
4. The RSAT topics and criteria cover all of	0	5	4	3

the important aspects of sustainable hydropower development.				
5. You would like to apply the RSAT to the work you do.	0	1	10	1

This feedback shows that participants invariably found the RSAT training was helpful and generally agree that that RSAT assessment presents a useful tool that most would be interested in applying to their own work. However, almost half the respondents believe that the assessment process currently covers all important aspects of sustainable hydropower development, as shown in the graph below:



Questions on which aspects of the RSAT assessment they found most and least useful generated a number of insights:

1. Half of all respondents felt that the RSAT presents a valuable tool as a whole, mainly due to its participatory approach, leading to strong stakeholder involvement.
2. Specific topics that were highlighted as particularly useful by individuals include topics 7 (two mentions) and topics 3, 5, 6 and 9 (one mention each).
3. Topics identified as least useful include topics 1 and 2 (two mentions each) and topic 4.3 (one mention).
4. One respondent also highlighted the GAP analysis as being useful and suggested that it was sufficient and did not require a SWOT analysis to also be carried out. This point was emphasized by a second respondent questioning whether it was necessary to conduct a GAP analysis, SWOT analysis and Root-Cause Analysis.

A number of valuable suggestions were made by participants on how to improve the RSAT assessments and which topics to add to the RSAT:

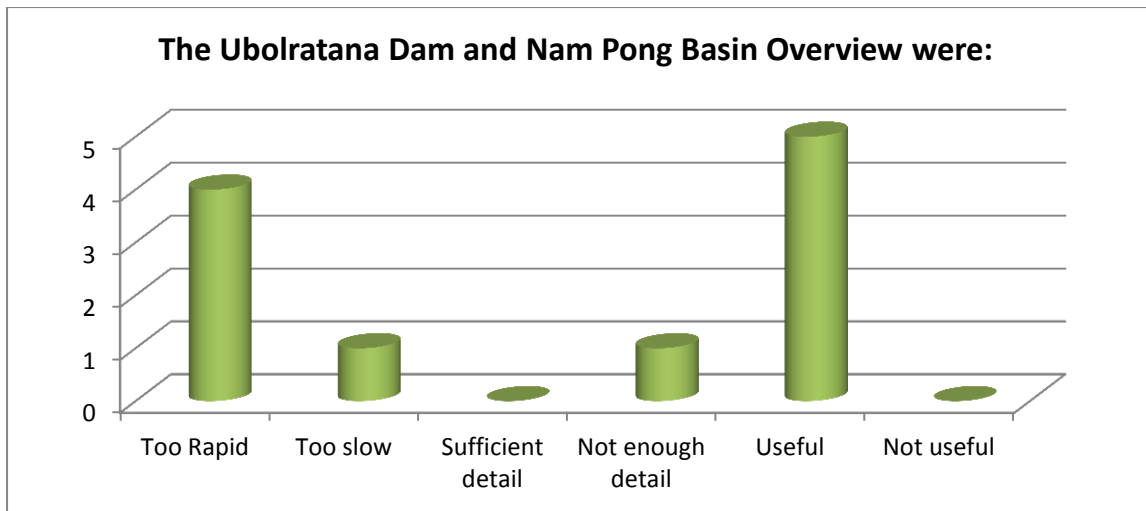
1. "Shorten the process, e.g. [...] take SWOT off. Seven topics could be reduced. For example, topics 6 and 7 could be combined. [...] Simplify the process for wider audience."
2. "Improve RSAT tool to suit the area or location [that is to be assessed]."
3. Several respondents mentioned wider communication and participation as a potential for the RSAT.
4. "The facilitator must thoroughly understand RSAT so that he/she will be able to pass on the knowledge and know how to participants."
5. "Prepare and search the baseline data to cover all parts of [the] topic. If the data cover[s] all part[s], it can help stakeholder[s] to make a right decision."
6. "A simple checklist for each topic should be developed to help participants easily understand each part of the topic assessed."
7. Topics that were suggested to be added to the RSAT assessment were:
 - Environmental management and fertility of ecosystems (two mentions)
 - Livelihood, cultural and political aspects
 - Resilience and adaptation at the community level
 - Roadmap to basin development
 - Application specifically to small and medium scale projects

Region-specific issues

When asked how useful they found the Ubolratana Dam and Nam Pong Overview, almost half of all respondents answered "useful", with another four expressing that they had been "too rapid". Only 11 valid responses were gathered for this section, as shown below:

	Too Rapid	Too slow	Sufficient detail	Not enough detail	Useful	Not useful
The Ubolratana Dam and Nam Pong Basin Overview were:	4	1	0	1	5	0

The feedback shows that while close to half of respondents were satisfied with the region/specific overviews, the most prominent point of criticism was that the section was carried out too rapidly. This is further emphasized by another respondent wishing for more detail in the presentation. The graph below illustrates these points:



Part of the workshop consisted of a field trip to visit the Dam site, resettlement of affected population from reservoir, and communities benefiting from PDF and EGAT CSR projects. Respondents were asked to comment on this experience, with 8 of the respondent having participated in the field trip. Comments on the trip included:

1. "Very useful because the field visit enables participants to learn and to listen to opinions from communities and/or line agencies in the basin which help the assessment [address the project's] impacts more directly."
2. "Gain understanding on the basin development e.g. irrigation system downstream and learn about communities upstream of Ubolratana Dam."
3. "Good case study for Ubolratana Dam, but [would be] greater if the [...] field trial [were put] in [wider] perspective; and organize the lessons learnt to improve [...] RSAT and simple use."
4. "Field visit provide wider view of the area/location [that is] to be assessed."

Useful remarks were also provided on how and by whom RSAT may be used in Thailand:

1. "1) RSAT version for small and medium projects; 2) RSAT version for existing project such as Ubolratana Dam, Nam Phram Dam etc. aimed to increase the capacity of project. Both need to identify target [stakeholder] exactly."
2. "RSAT tool is quite limited to use in Thailand because all of the hydropower dams were constructed long time ago. Line agencies should be the institute to use RSAT to assess the project."
3. "I think RSAT can apply in Thailand if [...] Thailand need[s] more hydropower dam[s]. But now in our country. [there is] no area to build the hydropower dam or big dam. If it [becomes] possible, we can apply RSAT to assess the project after its operation (like a post EIA)."

Applying RSAT

Respondents provided an overwhelmingly positive response to the question whether RSAT assessment outputs could be applied to their work. Only one respondent did not believe he would find an application of RSAT assessment outputs in his own work, whereas 11 others gave a positive response.

	Yes	No
I can use the RSAT assessment outputs (data presentations, recommendation, problem analysis, etc.) and apply any of them to my work	11	1

When asked what they would require if they were to adopt RSAT in their own agency, respondents raised several needs (most commonly named first):

1. Trainers/facilitators to provide expert knowledge
2. Access to baseline data and relevant information
3. Stakeholder network to conduct assessment collaboratively
4. Stronger community/civil society networks

7 of 12 respondents do not currently use any other tools for basin wide planning for hydropower. Of those who do, the most commonly used tool was the MRC's Basin Development Plan, followed by the rainfall-runoff model, IWRM, strategic planning.

Finally, participants were asked to identify what they believe were the main benefits and limitations of the RSAT assessment method and how these limitations might be overcome. The key benefits and limitations have been summarized below:

Benefits

- Quick and easy assessment method
- Flexible tool, can be applied to any context and location
- Creates stakeholder dialogue
- Allows participation of local communities/civil society
- Includes environmental considerations, may encourage environmental protection

Limitations

- Not always sufficient baseline data and information available
- Participants are required to have profound knowledge of the topic
- Law enforcement is still weak, particularly on controlling pollution along the river
- Cultural barriers may affect assessment
- RSAT is not yet precise enough

Several suggestions were made on how to overcome the limitations listed above. These include:

6. More training sessions and workshops would help enhance the skills and knowledge needed to conduct RSAT assessments.
7. Focus on research and the gathering of data in order to bridge the information gap.
8. RSAT may have to become more adaptable to different contexts and locations.
9. Having an expert present for each topic could ensure a more knowledgeable discussion.
10. Concerns from communities should receive more attention.

Annex 5: Results of Gap Analysis for each topic by National Consultant

Results of Gap Analysis against performance statements in all four criteria for each topic are presented below:

Topic 1 – Institutional Capacity

Topic 1.2: National to local institutional capacity	
<p>A. River basin planning:</p> <ul style="list-style-type: none"> • A national and provincial river basin planning and management framework exists and includes broad stakeholder participation across sectors. • Arrangements for data management and sharing, conflict resolution and co-ordination mechanisms exist and include stakeholders from local to national levels. 	<p>Evidence of strengths and areas where criteria are fully met:</p> <ul style="list-style-type: none"> - River basin committee is available at the basin level (Chi River consists of representatives from various agencies in 7 provinces) <p>Summary of key gaps:</p>
<p>B. Energy / power sector planning and regulation</p> <ul style="list-style-type: none"> • National energy planning and regulatory agencies operate within a national sustainable development policy framework. • Mechanisms for cross sectoral co-ordination to address sustainability considerations of hydropower exist at all project stages. 	<p>Evidence of strengths and areas where criteria are fully met:</p> <p>Summary of key gaps:</p> <ul style="list-style-type: none"> - Not sure if Energy Planning and Policy Office (EPPO) and Energy Regulatory Commission (ERC) could be counted
<p>C. Hydropower Projects:</p> <ul style="list-style-type: none"> • Hydropower projects comply with relevant national laws and regulations at all project stages and disclose relevant data and reports. • Risk and impact assessment studies are informed by adequate baseline data, apply the precautionary principle and are consultative. • Management plans are implemented and their performance is measured. 	<p>Evidence of strengths and areas where criteria are fully met:</p> <p>Summary of key gaps:</p>
<p>D. Regulatory and Governance:</p> <ul style="list-style-type: none"> • A national policy and regulatory framework for hydropower that promotes sustainable development and IWRM principles exists and is implemented. • Responsible agencies have the capacity to implement and enforce hydropower and related policies, plans and regulations for new and existing projects. 	<p>Evidence of strengths and areas where criteria are fully met:</p> <p>Summary of key gaps:</p>

<ul style="list-style-type: none"> Capacity building plans exist to address gaps. 	
Topic 1.3: Water and energy sector integrated planning	
<p>A. River basin planning:</p> <ul style="list-style-type: none"> RBO's, national and provincial water resource agencies and water user groups exist and are consulted in hydropower planning studies, impact assessment studies and the design and implementation of mitigation plans and operating rules for projects. 	<p>Evidence of strengths and areas where criteria are fully met:</p> <ul style="list-style-type: none"> <i>Thailand has RBO at 5 levels; National, Basin, Provincial, Sub-district, and Village level</i> <hr/> <p>Summary of key gaps:</p> <ul style="list-style-type: none"> <i>Need input on how formal and how often the committee at each level meet as no minutes of the meeting of RBO at some level was found.</i>
<p>B. Energy / power sector planning and regulation</p> <ul style="list-style-type: none"> Trade-offs and synergies between water and energy sectoral plans in the basin are identified in power development plans and addressed in the ranking of development options. Hydropower operating rules are institutionalized into water allocation policies and procedures in the basin. 	<p>Evidence of strengths and areas where criteria are fully met:</p>
<p>C. Hydropower Projects:</p> <ul style="list-style-type: none"> Hydropower projects are represented in river basin planning and management processes and share data and information at all project stages. Hydropower projects collaborate with other basin stakeholders on IWRM including environmental and social management and monitoring programs for the basin. 	<p>Evidence of strengths and areas where criteria are fully met:</p>
<p>D. Regulatory and Governance:</p> <ul style="list-style-type: none"> Regulatory and planning frameworks include the allocation of roles, responsibilities and mechanisms for integrated water and energy planning for hydropower, including requirements for co-operation, consultation and information sharing. Mechanisms exist to ensure policies and plans made by energy and water ministries and RBOs are aligned. 	<p>Evidence of strengths and areas where criteria are fully met:</p>

Topic 4: Equitable sharing of cost and benefits

Topic 4.2: National to local benefit sharing	
<p>A. River basin planning:</p> <ul style="list-style-type: none"> Basin wide planning includes provision for distribution of hydropower costs and benefits across sectors and communities in the host sub-basin. Specific plans exist for women, ethnic groups and other sub-groups to access benefits. The development contribution of benefits is monitored at the local level, using disaggregated data and is publicly disclosed. 	<p>Evidence of strengths and areas where criteria are fully met:</p> <ul style="list-style-type: none"> <i>The monetary benefit sharing scheme has been done through the Power Development fund</i> <i>Approved subsidies money in 2015 goes to women group</i>
	<p>Summary of key gaps:</p> <ul style="list-style-type: none"> <i>No data disaggregation is publicly disclosed.</i> <i>Not applicable on the ethnic group</i>
<p>B. Energy / power sector planning and regulation</p> <ul style="list-style-type: none"> Monetary and non-monetary benefits from hydropower are distributed across sectors within a national to local policy and budget allocation framework. Communities in areas where hydropower projects are located are prioritized for rural electrification. 	<p>Evidence of strengths and areas where criteria are fully met:</p> <ul style="list-style-type: none"> <i>Have national framework but not much involvement from the community (community can propose the project to get sponsorship but no right to make decision)</i>
	<p>Summary of key gaps:</p> <ul style="list-style-type: none"> <i>No issue on rural electrification (100% cover)</i>
<p>C. Hydropower Projects:</p> <ul style="list-style-type: none"> Project benefits and forms of benefit sharing are assessed and selected in consultation with beneficiaries. Project level commitments for additional benefits and benefit sharing arrangements are funded and implemented over agreed timeframes. Hydropower projects have maximized opportunities to benefit communities in proximity to the project area, including through training, employment and capacity building programs. 	<p>Evidence of strengths and areas where criteria are fully met:</p> <ul style="list-style-type: none"> <i>Being done through PDF and EGAT CSR programmes</i> <i>As dam is a multi-purpose dam prioritising irrigation</i>
	<p>Summary of key gaps:</p> <ul style="list-style-type: none"> <i>No data about the local employment of the dam construction</i>
<p>D. Regulatory and Governance:</p> <ul style="list-style-type: none"> Project agreements and regulatory mechanisms secure national revenues and provide for consistent distribution of socio-economic benefits from hydropower projects. Policy and planning approaches include provision to maximize local level benefits in hydropower sub-basins. 	<p>Evidence of strengths and areas where criteria are fully met:</p> <ul style="list-style-type: none"> <i>PDF is the main function</i> <i>Sub-district committee, notified committee and ERC committee</i>
	<p>Summary of key gaps:</p>

<ul style="list-style-type: none"> Institutions and committees are established to ensure delivery of agreed benefit sharing measures and include reporting of expenditure and monitoring performance against benefit sharing targets. 	<ul style="list-style-type: none"> <i>We don't know about the monitoring benefit realisation</i>
<p>Topic 4.3: Financing ecosystem protection and other measures</p>	
<p>A. River basin planning:</p> <ul style="list-style-type: none"> Hydropower revenue and other funding mechanisms e.g. Payment for Ecological Services (PES) contribute to ongoing funding of environmental protection, natural resource management and social development projects in hydropower sub-basins. There is adequate resources and human capacity for environmental protection and natural resource management measures in the sub-basin. 	<p>Evidence of strengths and areas where criteria are fully met:</p> <ul style="list-style-type: none"> <i>Power Development Fund (PDF) – contribute to social development</i> <p>Summary of key gaps:</p> <ul style="list-style-type: none"> <i>No data on the funding of of environmental protection, natural resource management</i> <i>Data of Human resource at local level is not found</i> <i>PES legislation? (protection of the basin) – need to get the discussion on the understanding of PES.</i> <i>Discussion of the inflow water (DWR)</i>
<p>B. Energy / power sector planning and regulation</p> <ul style="list-style-type: none"> Assessment of opportunities for innovative financing including carbon financing (within the international framework) is conducted for hydropower development in the basin. National energy policy is in place to guide the allocation and expenditure of funds derived from carbon financing. 	<p>Evidence of strengths and areas where criteria are fully met:</p> <p>Summary of key gaps:</p> <ul style="list-style-type: none"> <i>We don't know</i>
<p>C. Hydropower Projects:</p> <ul style="list-style-type: none"> Hydropower ESIA studies, management plans and financial studies assess financing options (including carbon finance) to address the financing of environmental mitigation measures and environmental off-set programs in the basin. 	<p>Evidence of strengths and areas where criteria are fully met:</p> <p>Summary of key gaps:</p> <ul style="list-style-type: none"> <i>No evidence</i>
<p>D. Regulatory and Governance:</p> <ul style="list-style-type: none"> A regulatory framework exists to secure sustainable financing from hydropower for a range of environmental off-set and watershed protection measures. Regulations are enforced; compliance and the effectiveness of measures are monitored 	<p>Evidence of strengths and areas where criteria are fully met:</p> <ul style="list-style-type: none"> <i>There are some mechanisms globally eg. CDM, renewable energy subsidy</i> <p>Summary of key gaps:</p>

<p>by responsible authorities.</p> <ul style="list-style-type: none"> Natural resource management and environment agencies have adequate financial and human capacity to deliver core functions. 	<ul style="list-style-type: none"> <i>It could be an opportunity for ecosystem service restoration in the reservoir watershed to extend the life of the project e.g. reforestation, riparian vegetation management, water quality and quantity of inflow to dam</i>
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Topic 6 Environmental management & ecosystem integrity

Topic 6.1: Assessment and management of basin wide environmental impacts	
<p>A. River basin planning:</p> <ul style="list-style-type: none"> Ongoing and systematic environmental baseline and regular monitoring is conducted in the basin to identify environmental changes and hotspots, and fill knowledge gaps associated with hydropower risks. Regular State of the Basin reporting identifies the environmental baseline condition, key pressures and trends in the basin. Environmental indicators are developed for hydropower and performance is measured. 	<p>Evidence of strengths and areas where criteria are fully met:</p> <hr/> <p>Summary of key gaps:</p> <ul style="list-style-type: none"> <i>We can't find the monitoring report and result of the Chi basin</i>
<p>B. Energy / power sector planning and regulation</p> <ul style="list-style-type: none"> Strategic and cumulative environmental assessments are conducted for power development plans and hydropower master plans. Project agreements include provision for the ongoing identification and management of cumulative environmental impacts during the project life and the need for coordination with other projects in the basin to manage current and future environmental impacts. 	<p>Evidence of strengths and areas where criteria are fully met:</p> <hr/> <p>Summary of key gaps:</p> <ul style="list-style-type: none"> <i>Need to find out if there is an EIA for Ubolratana Dam</i> <i>Is there any environmental management plan (project level versus national level)</i> <i>SEA and CIA?</i>
<p>C. Hydropower Projects:</p> <ul style="list-style-type: none"> Hydropower projects apply a systematic approach to the identification, management and monitoring of environmental impacts at all project stages, using suitable expertise. Pre-project environmental baselines are established against which future change is measured. EIA's, environmental management plans and monitoring reports are publicly disclosed and implemented in a timely manner. 	<p>Evidence of strengths and areas where criteria are fully met:</p> <ul style="list-style-type: none"> <i>Reports which is equivalent to EIA or feasibility study has been conducted since 1960s (before the dam constructed)</i> <hr/> <p>Summary of key gaps:</p> <ul style="list-style-type: none"> <i>No update or follow-up study</i> <i>we don't know if there is any environmental management plans and monitoring reports</i>

<p>D. Regulatory and Governance:</p> <ul style="list-style-type: none"> • A regulatory framework for hydropower environmental impact assessment, management and monitoring exists and is enforced in a timely manner. • Cumulative and basin wide environmental impacts, beyond individual project sites are considered in the regulatory and planning processes for hydro-power and the environmental performance of hydropower is measured at the basin scale. 	<p>Evidence of strengths and areas where criteria are fully met:</p>
	<p>Summary of key gaps:</p> <ul style="list-style-type: none"> - <i>Do we have EIA legislation and CIA</i>
<p>Topic 6.2: Biodiversity conservation and ecosystem integrity</p>	
<p>A. River basin planning:</p> <ul style="list-style-type: none"> • Basin-wide baseline data includes aquatic and terrestrial species abundance, biodiversity, habitat range, reproductive behavior, and critical habitats. • The impact of habitat modification and fragmentation and flow regulation on biodiversity is assessed. • Strategies are developed in the hydropower planning processes to site, design and operate projects to maintain ecosystem connectivity at the basin level. 	<p>Evidence of strengths and areas where criteria are fully met:</p>
	<p>Summary of key gaps:</p> <ul style="list-style-type: none"> - <i>Biodiversity baseline data and monitoring?</i> - <i>As there is no EIA thus we don't know if there is biodiversity assessment of impact</i>
<p>B. Energy / power sector planning and regulation</p> <ul style="list-style-type: none"> • Hydropower options and ranking studies aim to avoid project sites and designs that have significant negative impacts on biodiversity, environmental hot spots or protected areas. 	<p>Evidence of strengths and areas where criteria are fully met:</p>
	<p>Summary of key gaps:</p> <ul style="list-style-type: none"> - <i>As there is no EIA thus we don't know if there is biodiversity assessment of impact.</i>
<p>C. Hydropower Projects:</p> <ul style="list-style-type: none"> • Biodiversity and ecological baseline data informs hydropower EIA studies. • Project siting and design includes provisions for basin wide ecosystem connectivity and the avoidance and mitigation of significant impacts. • Biodiversity off-set programs are implemented and include the protection of areas with equivalent values to those lost. 	<p>Evidence of strengths and areas where criteria are fully met:</p>
	<p>Summary of key gaps:</p> <ul style="list-style-type: none"> - <i>As there is no EIA thus we don't know if there is biodiversity assessment of impact</i>
<p>D. Regulatory and Governance:</p>	<p>Evidence of strengths and areas where criteria are fully met:</p>

<ul style="list-style-type: none"> • Policy and regulations for environmental protection exist and are enforced. • Biodiversity conservation zones are legally protected from negative impacts. • Compliance with off-set, management and compensation plans is enforced and action is taken to address issues that arise. 	<p>Summary of key gaps:</p> <ul style="list-style-type: none"> - <i>As there is no EIA thus we don't know if there is biodiversity assessment of impact</i>
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Topic 7 Flow and Reservoir Management

Topic 7.1: Multiple water use optimization and efficiency	
<p>A. River basin planning:</p> <ul style="list-style-type: none"> • Baseline data exists on water availability, demand and consumptive and non-consumptive water use, including navigation and fisheries. • A hydrological model has been developed for the basin and addresses different water use scenarios. • The effect of climate change on future water availability and flows is assessed. 	<p>Evidence of strengths and areas where criteria are fully met:</p> <ul style="list-style-type: none"> - <i>availability of baseline data on water availability recorded by agencies like DRW, EGAT and believe that , demand and consumptive and non-consumptive water use, including navigation and fisheries are available</i> <p>Summary of key gaps:</p> <ul style="list-style-type: none"> - <i>A hydrological model has been developed for the basin and addresses different water use scenarios.</i> - <i>The effect of climate change on future water availability and flows is assessed.</i>
<p>B. Energy / power sector planning and regulation</p> <ul style="list-style-type: none"> • Multiple use projects are prioritised in government options assessment, optimisation and ranking studies. 	<p>Evidence of strengths and areas where criteria are fully met:</p> <ul style="list-style-type: none"> - <i>Purpose of the dam construction from the beginning is the multi-purpose</i> <p>Summary of key gaps:</p> <ul style="list-style-type: none"> - <i>Data is not found</i>
<p>C. Hydropower Projects:</p> <ul style="list-style-type: none"> • Hydropower feasibility studies are consultative and seek to enhance design and operational opportunities for multiple-use where feasible. • Hydropower projects co-ordinate with other agencies and water users in the operations stage to achieve agreed multiple-use objectives. 	<p>Evidence of strengths and areas where criteria are fully met:</p> <ul style="list-style-type: none"> - <i>There was a hydropower feasibility studies before the dam construction but the studies did cover the seeking of design enhancement design and operational opportunities for multiple-use where feasible.</i> <p>Summary of key gaps:</p>

<p>D. Regulatory and Governance:</p> <ul style="list-style-type: none"> • A water use framework exists in domestic legislation and international agreements that sets limits, rules and procedures for consumptive and non-consumptive water use in the basin. • Monitoring of water use is conducted. Regulatory mechanisms exist for the resolution of water allocation conflicts. 	<p>Evidence of strengths and areas where criteria are fully met:</p> <ul style="list-style-type: none"> - <i>There is a committee to oversee, regulate and monitoring water use at the provincial level</i> <p>Summary of key gaps:</p> <ul style="list-style-type: none"> - <i>Not sure how often and how formal the meeting is (refer to topic 1)</i> - <i>No data on consumption framework is not found/ not available</i>
<p>Topic 7.2: Reservoir planning and management</p>	
<p>A. River basin planning:</p> <ul style="list-style-type: none"> • Government water and energy agencies conduct integrated planning to set operational limits for hydropower operations such as, full supply levels, drawdown limits and water release requirements, to integrate with power generation requirements. • Reservoir planning, impoundment and operations are conducted within agreed water management limits and thresholds for the basin. 	<p>Evidence of strengths and areas where criteria are fully met:</p> <ul style="list-style-type: none"> - <i>Rule curve report exists</i> <p>Summary of key gaps:</p> <ul style="list-style-type: none"> - <i>Is there any actual environmental flow release plan?</i>
<p>B. Energy / power sector planning and regulation</p> <ul style="list-style-type: none"> • Projects selected for development aim to minimise the area flooded per unit of energy. • Schemes make best use of storage characteristics and operations to meet current and future electrical load patterns and other water demands in the basin. 	<p>Evidence of strengths and areas where criteria are fully met:</p> <ul style="list-style-type: none"> - <i>There is flood rule and flood protection plan</i> - <i>Irrigation is the first priority and dam is oriented to be a multi-purpose</i> <p>Summary of key gaps:</p>
<p>C. Hydropower Projects:</p> <ul style="list-style-type: none"> • Reservoirs are designed to avoid, mitigate and off-set impacts including loss of forest resources, population displacement and greenhouse gas emissions. • Reservoir filling plans addresses biomass removal, the timing of environmental and social plans and downstream impacts. • Reservoir filling and operational procedures are in place to address reservoir management issues. 	<p>Evidence of strengths and areas where criteria are fully met:</p> <ul style="list-style-type: none"> - <i>Need input from EGAT</i> - <i>Some planning</i> <p>Summary of key gaps:</p> <ul style="list-style-type: none"> - <i>Compensation model does exist</i> - <i>Not sure the method of resettlement back in 60s</i> - <i>Signification of deforestation (land conversion from forest to agriculture – now only 15% of remaining forest)</i>

<p>D. Regulatory and Governance:</p> <ul style="list-style-type: none"> • Project agreements and regulations provide clear institutional arrangements for reservoir ownership, access and management responsibility. • Roles and responsibilities are allocated and there is a coordinated approach to managing compliance with reservoir management, operating rules, storage and release commitments. 	<p>Evidence of strengths and areas where criteria are fully met:</p> <p>Summary of key gaps:</p> <ul style="list-style-type: none"> - <i>Multiple agencies in charge of the Ubol Rattana Dam (Dam infrastructure – EGAT, Water in the dam – Dept of fishery, Pier – Dept of Marine, Forest – Dept of Forestry)</i>
<p>Topic 7.3: Coordinated hydropower operation</p>	
<p>A. River basin planning:</p> <ul style="list-style-type: none"> • There is allocation of responsibility and institutional arrangements in place for coordinated water management and power generation in the basin amongst multiple projects. • Hydropower operations coordinate with other water users in the basin. 	<p>Evidence of strengths and areas where criteria are fully met:</p> <p>Summary of key gaps:</p> <ul style="list-style-type: none"> - <i>Need input from EGAT on hydropower operations coordination</i> - <i>There are many agencies involve in water management both at Ubol Rattana dam and along the Nam Pong river</i>
<p>B. Energy / power sector planning and regulation</p> <ul style="list-style-type: none"> • Coordination of the power system, including hydropower cascades, makes optimal use of hydropower capability (peaking, load following) and achieves balanced and equitable water use at the sub-basin level. • Project level agreements include provision for coordination of operations amongst projects in a cascade or sub-basin and consistent design and operational mitigation measures. 	<p>Evidence of strengths and areas where criteria are fully met:</p> <ul style="list-style-type: none"> - <i>Not applicable</i> <p>Summary of key gaps:</p> <ul style="list-style-type: none"> - <i>Not applicable</i>
<p>C. Hydropower Projects:</p> <ul style="list-style-type: none"> • Projects coordinate their operations to achieve basin objectives, efficient water use and optimize electricity generation. • Design and operational environmental mitigation measures are consistent and coordinated between projects to optimize outcomes. 	<p>Evidence of strengths and areas where criteria are fully met:</p> <ul style="list-style-type: none"> - <i>Coordinating with RID for multipurpose benefit</i> - <i>Check on the environmental flow (actual)</i> <p>Summary of key gaps:</p> <ul style="list-style-type: none"> - <i>No data on environmental flow and effectiveness</i>
<p>D. Regulatory and Governance:</p>	<p>Evidence of strengths and areas where criteria</p>

<ul style="list-style-type: none"> A regulatory framework for hydropower includes provision for multiple projects in a cascade to coordinate at all project stages for optimal electricity generation, and efficient resource use. 	<p>are fully met:</p> <ul style="list-style-type: none"> <i>Not applicable</i>
	<p>Summary of key gaps:</p> <ul style="list-style-type: none"> <i>Not applicable</i>
<p>Sub-topic 7.4: Downstream and environmental flows</p>	
<p>A. River basin planning:</p> <ul style="list-style-type: none"> Environmental flows assessment has been conducted for all river reaches affected or potentially affected by hydropower operations to establish criteria and thresholds for environmental and downstream flows. It includes assessment of wetlands and floodplains. It is consultative and informed by scientific baseline data. 	<p>Evidence of strengths and areas where criteria are fully met:</p> <ul style="list-style-type: none"> Overview study conducted by Khon Kean University in 2008
	<p>Summary of key gaps:</p> <ul style="list-style-type: none"> We don't have any data on the effectiveness
<p>B. Energy / power sector planning and regulation</p> <ul style="list-style-type: none"> Water management constraints on electricity dispatch are embedded in electricity dispatch and off-taker agreements. Compliance is monitored and publicly disclosed. Project agreements include design and operational performance criteria to deliver agreed environmental and downstream flows. 	<p>Evidence of strengths and areas where criteria are fully met:</p> <ul style="list-style-type: none"> <i>Rule curve report</i>
	<p>Summary of key gaps:</p> <ul style="list-style-type: none"> <i>We don't have data on the monitoring and publicity</i> <i>Need to find out from EGAT about the environmental flow</i>
<p>C. Hydropower Projects:</p> <ul style="list-style-type: none"> Projects conduct environmental and downstream flow assessments in feasibility stage to inform project design and operations. Project design and operation rules address commitments made for environmental flows and downstream water releases. Hydropower projects comply with environmental and downstream flow commitments. 	<p>Evidence of strengths and areas where criteria are fully met:</p>
	<p>Summary of key gaps:</p> <ul style="list-style-type: none"> <i>We don't know how environmental flow apply at the project level</i>
<p>D. Regulatory and Governance:</p> <ul style="list-style-type: none"> International agreements, national laws and basin plans relating to water allocation include provision for environmental flows. ESIA regulations and guidelines include provision for environmental flow assessment. Where commitments are made for 	<p>Evidence of strengths and areas where criteria are fully met:</p>
	<p>Summary of key gaps:</p> <ul style="list-style-type: none"> <i>Need to find information</i>

<p>environmental and downstream flows, their effectiveness is monitored at agreed sites.</p>	<p>- <i>Need to check if there is any effectiveness monitoring</i></p>
<p>Topic 7.5: Flood and drought management</p>	
<p>A. River basin planning:</p> <ul style="list-style-type: none"> • A basin flood and drought management plan includes flood monitoring and forecasting systems and planning for flood and drought response. 	<p>Evidence of strengths and areas where criteria are fully met:</p> <ul style="list-style-type: none"> - <i>Rule curve report</i> - <i>Input from Nong wai irrigation</i> <p>Summary of key gaps:</p> <ul style="list-style-type: none"> - <i>Unclear about drought management esp. when it relate to irrigation planning on year by year and season by season basis</i>
<p>B. Energy / power sector planning and regulation</p> <ul style="list-style-type: none"> • Project agreements and electricity dispatch arrangements include provision for design and operational flood and drought response measures. • Agreements include provision for flood management to be prioritized over power generation in emergency situations. 	<p>Evidence of strengths and areas where criteria are fully met:</p> <ul style="list-style-type: none"> - <i>River committee which in charge of the water management and emergency situation</i> <p>Summary of key gaps:</p> <ul style="list-style-type: none"> - <i>No civil society include in the provincial level of river committee</i>
<p>C. Hydropower Projects:</p> <ul style="list-style-type: none"> • Operating rules, project design, management plans include flood and drought mitigation measures that comply with statutory plans and are implemented. • Response to flood and drought is coordinated amongst projects in a cascade.. 	<p>Evidence of strengths and areas where criteria are fully met:</p> <p>Summary of key gaps:</p> <ul style="list-style-type: none"> - <i>Flood policy at national or provincial level?</i>
<p>D. Regulatory and Governance:</p> <ul style="list-style-type: none"> • National and provincial governments have flood and drought plans and policies in place, including allocation of roles and responsibilities. • Plans are implemented and enforced and the response to drought and flood events is managed in a coordinated manner in the basin. 	<p>Evidence of strengths and areas where criteria are fully met:</p> <p>Summary of key gaps:</p> <ul style="list-style-type: none"> - <i>Flood policy at national or provincial level?</i>