



Norwegian Ministry
of Foreign Affairs

Hydropower Sustainability Forum

New Frontiers in Sustainable Hydropower Development

**What I have Heard
(Power pointing you to death!)**



Hans Olav Ibrek

Half Full or Half Empty?



Theory - practice

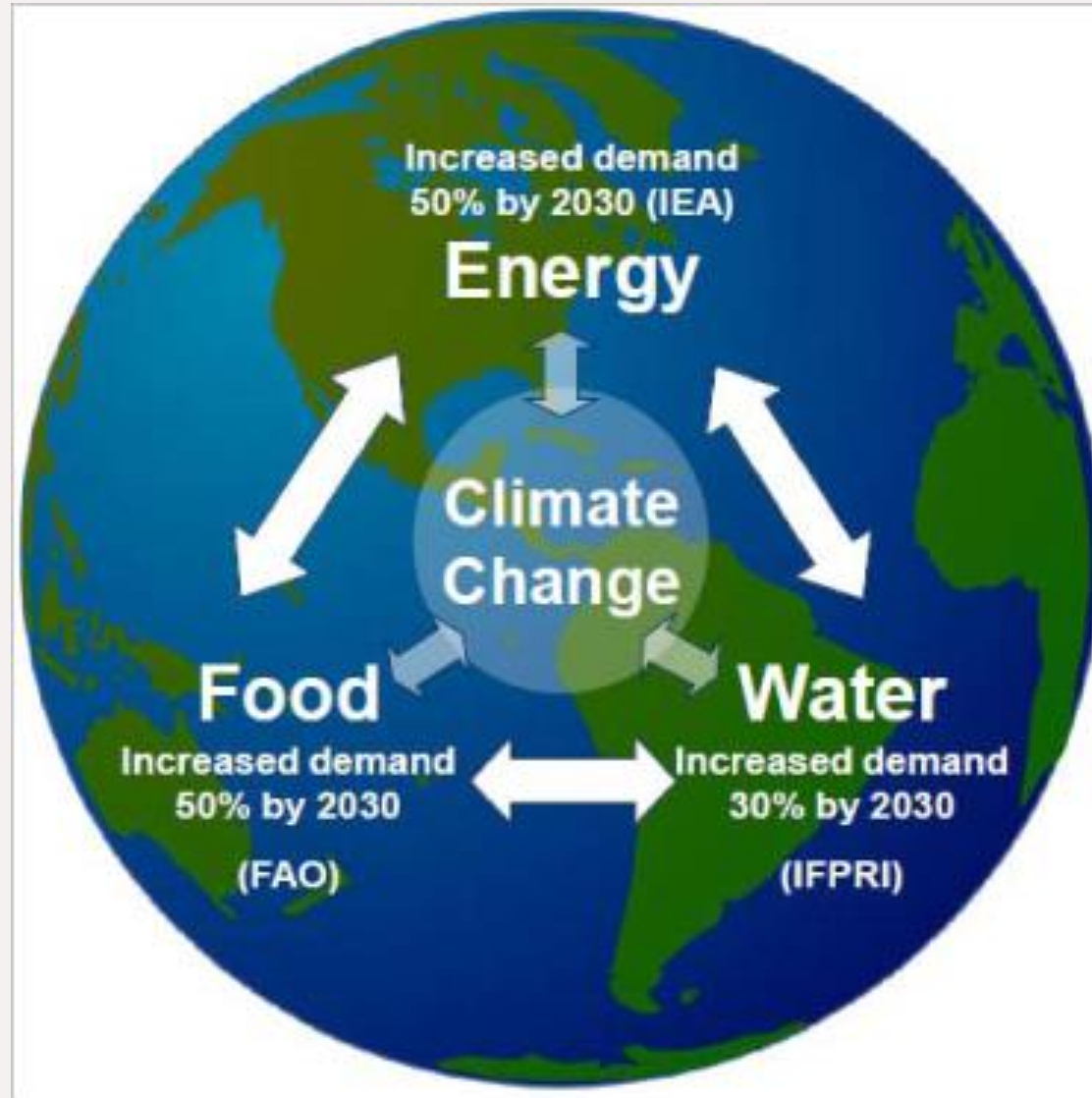


Setting the Stage

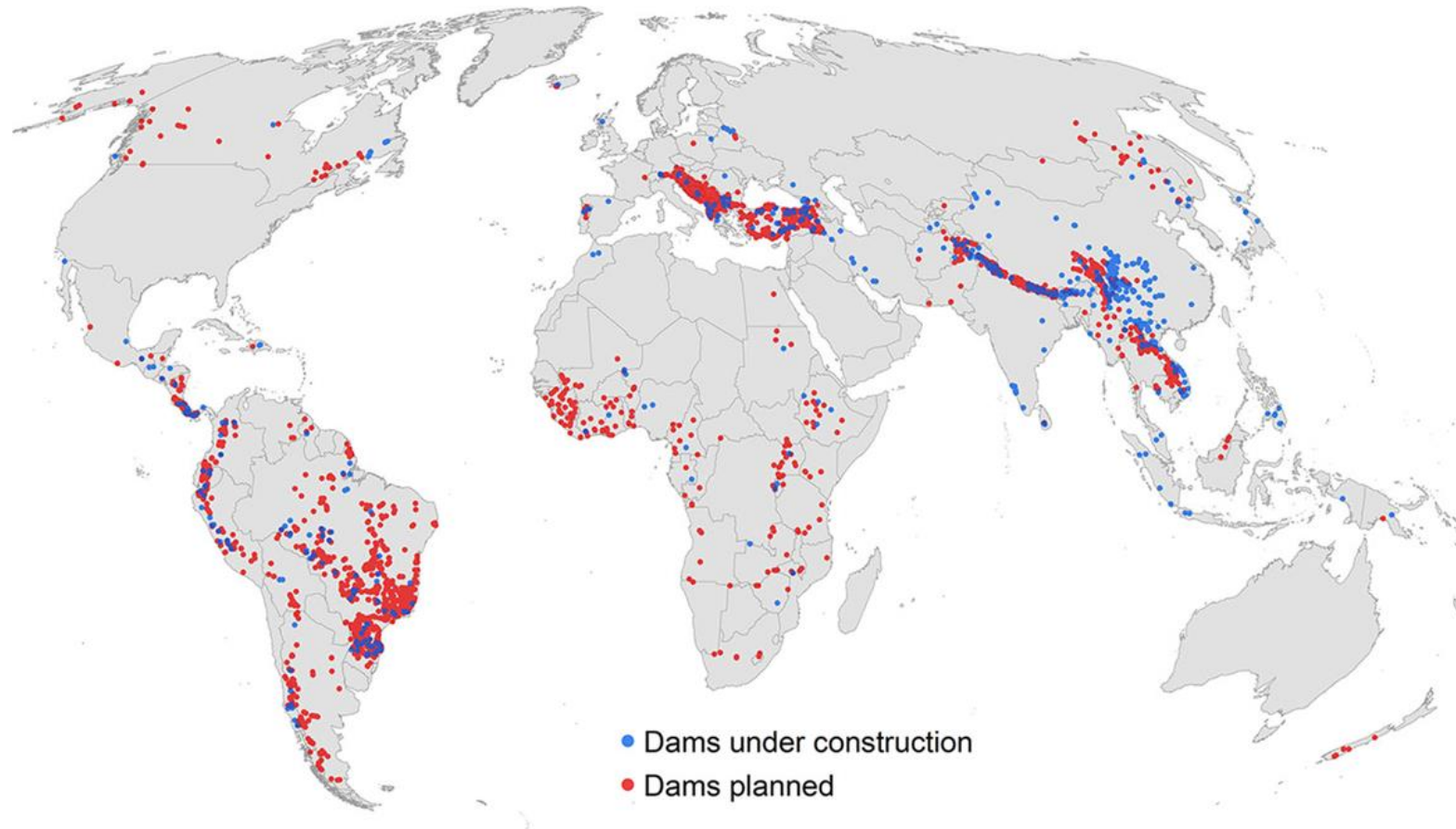
- **Sustainable Development Goals:**
 - SDG 7 – Sustainable Energy for All
 - SDG 6 – Sustainable Water for All
 - Paris agreement
- **Keynote - Professor Pete Loucks**
- **Mekong – «the Mother of Water»**
 - Nile, Danube; Orange, ++
- **Sustainable hydropower**
 - Sound basin and water resources management
- **But – what does sustainability look like?**



Water Equation - Does it Add Up?



Need Dams - Daming Rivers – Worldwide



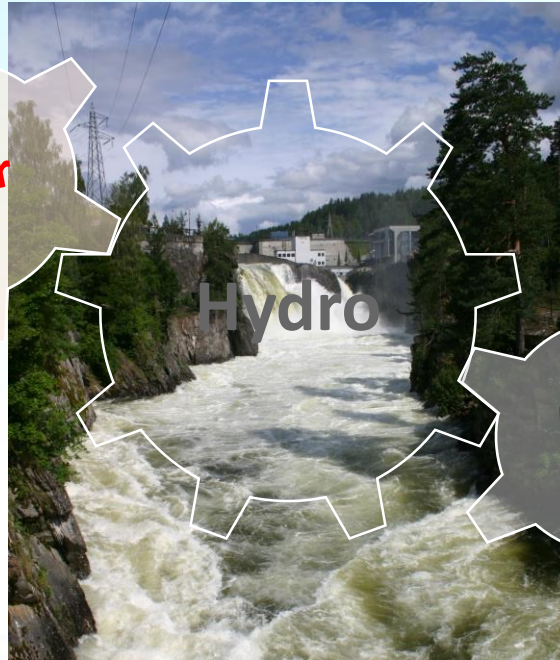
> 57,000 existing large (15m+) dams worldwide.
3,700 dams (1,700 GW) planned or under construction

Source: Zarfl et al. (2015),
Aquat. Sci.





Hydropower – Supporting other Renewables



New role for hydropower - still need for environmental design!



ICT?

Batteries



Stanford – Jacobson:

Conventional hydropower
~ 16.3% of the world electric
power supply; 1.058 TW

Average capacity factor 42.0%

Capacity of hydropower is
assumed to be the same as in
2015.

No new dams needed

Increase capacity factor – up to
50%



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100% IN 139 COUNTRIES

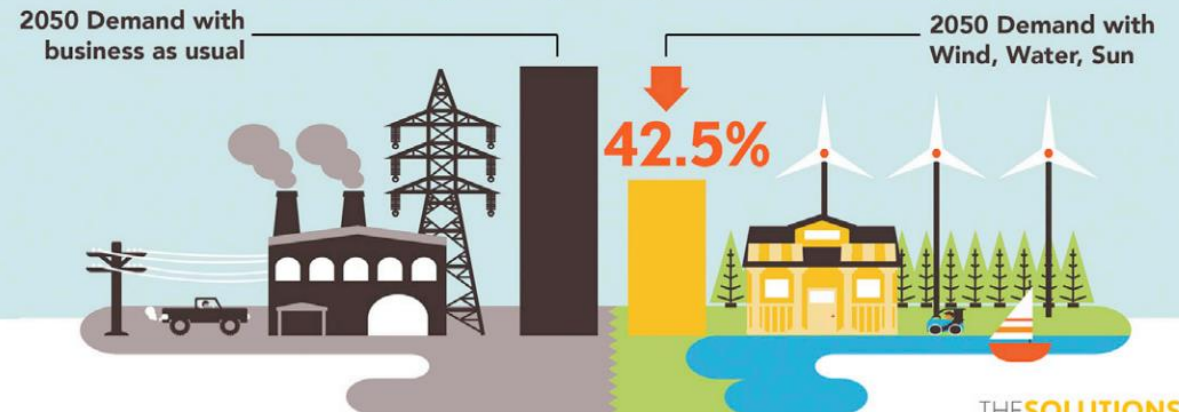
Transition to 100% wind, water, and solar (WWS) for all purposes
(electricity, transportation, heating/cooling, industry)



JOBS CREATED 52 MILLION

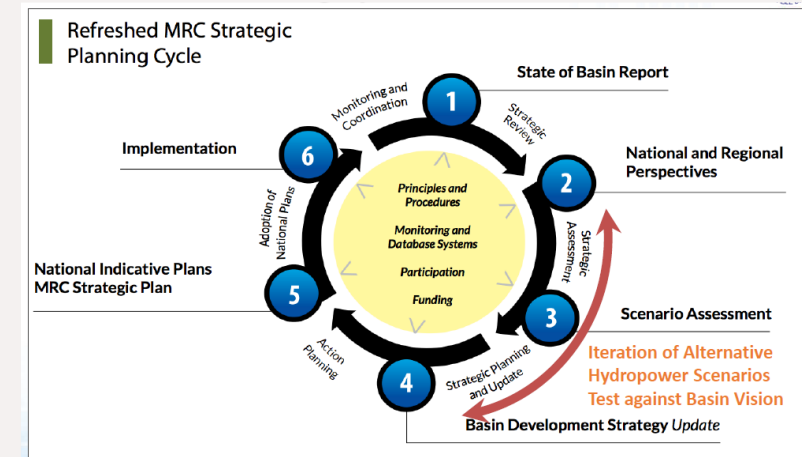
JOBS LOST 27.7 MILLION

Using WWS electricity for everything, instead of burning fuel, and
improving energy efficiency means you need much less energy.



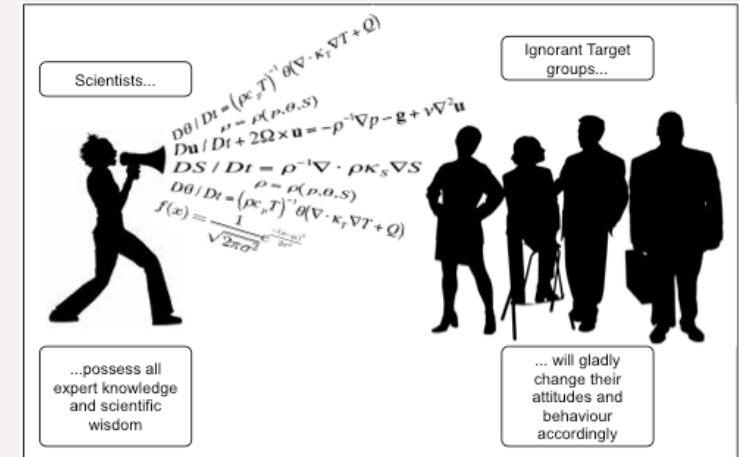
Promising Tools - Reflections

- Not project by project approach
- Complex matter
- Many similar terms!
 - We all have our pets, acronyms and lingo!
- Integrated Water Resources Management
 - Water – food – energy nexus
 - Easy to talk about – challenging/difficult to implement
 - Governance – sectorially oriented – difficult to think across sectors
 - Cuts across administrative boundaries at all levels
 - No country has designed administrative boundaries based on river basins!
- Strategic Portfolio Planning
- Process intensive – many stakeholders involved
- Political economy of water



From Science to Decision Making

- What does sustainability look like?
- Communication
 - Lead to behavioural change
 - Build confidence and trust
 - Developers need a communication strategy
 - Engineer – not a politician!
 - Heard this several times!
- Biased media:
 - Fake news
 - Fake science!
- Scientists have to be bolder!
 - Don't always focus on uncertainty – what you don't know
 - Focus on what you know
 - Better to be approximately right
 - Decisions have to be made!
- Will never get all data we need
- How to make the case?



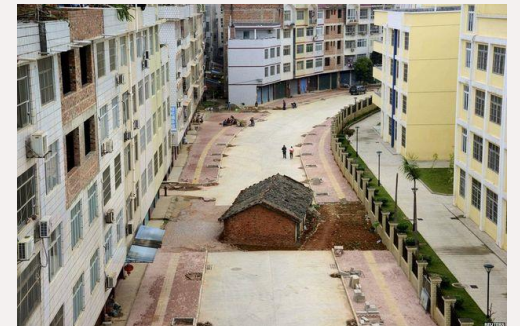
Policies, Guidelines and Planning

- **Integrated river basin approach – only way forward**
- **But how?**
 - From science to policy and decision making
- **Sustainability?**
 - Have to accept that the river will change – can't mitigate 100%
 - Social sustainability
- **Do we lack guidelines and standards?**
 - IHA Protocol; IFC/WB; WCD - Acceptability by stakeholders?
 - Guidelines for Sustainable Hydropower Practice
 - Mekong – a wide variety of studies, guidelines and tools – new being developed
 - Danube – no HP guidelines/standards (EU Directives)
 - Technical or political question?
 - Trade-offs required (Pete: Kill the birds!)
- **Performance standards rather than prescriptive design**
- **Compliance monitoring and adaptative management**
- **Allows developers the flexibility to propose the best solutions**



Sustainable Hydropower Design and Operation

- **Key vulnerabilities in the Mekong:**
 - Advanced fish passage system – can the fish use them?
 - Sediments and water quality
- **Possible solutions – restore connectivity:**
 - Natural bypass; Sub-divided projects – smaller head; Seasonal storage
 - Barrage - Energy impacts – could loose 30%
 - PPA implications – pay for available power (MWs not kWh)
 - integrated river basin optimisation
 - adaptive environmental management for fish, water quality and sediment
 - View of system operator?
- **View of the developers:**
 - Water = Energy = Revenue
 - Return on investment (15-20%) - legal requirements and compliance with standards
 - Multi-purpose – often a scary term for developers!
 - Resettlement – local communities
- **Cascade operation**
 - Need for a basin organization – operating rules
- **Climate change – new risk factor**
 - HP more profitable in Norway and Tanzania



Governance, Cooperation and Practice

- **Integrated basin-wide approach**
 - Capture benefits by cooperating – benefit sharing
 - Data and information sharing - Complex systems - Need for modelling
 - Climate change – water scarcity – reinforces the need for cooperation.
- **Transboundary water agreements – commissions**
 - Good examples: MRC; Danube; ORASECOM
 - Convening platform
 - Reasonable and equitable use / Prior notification – UN convention on transboundary waters
 - Upstream hegemon
 - Regional, economic cooperation
 - Lack of trust and lack of willingness to co-operate
 - TK5 changed relations between ETH and SUD
 - Still a long way to go....
 - Track II cooperation/negotiations
- **Political problem – not technical**
 - Political science
 - Role of external actors – excellent story from the Mekong
 - Water as entry point for cooperation.
 - Often ‘mushroom’ of other cooperation platforms
- **Role of government – set the rules**
 - Private sector likes and needs rules!



Climate Change

- **New opportunity – and risk**
- **Climate resilience**
 - Investors-driven
 - Security of supply threatened
 - Risks increasing
 - Mitigation – adaptation
 - Spillway design floods; Flexible operating range; Turbine re-sizing; Basin planning scale; Sustainability assessments; CC resilience – IHA Protocol
 - Tools available for modelling reservoir emissions (G-res tool)
- **Need for more reservoir capacity due to:**
 - population growth
 - climate change
 - transition to renewable energy systems (HPP dams for storage and balancing)



New Frontiers

- **Basin-wide planning:**
 - How to?
 - Work with other sectors outside water
- **Innovative design and operation rules for sustainable hydropower – continued progress through multi-disciplinary approaches**
- **Social license to operate – hydropower long-term**
- **Convergence of standards – national and international (WB/IFC)**
- **Sediment management – key technical issue**
 - Use existing assets better - storage capacity is lost to sedimentation at a similar rate as new storage is created by new reservoir
 - Innovative solutions for sediment management are available at a project and basin scale
- **Full commitment and involvement from all stakeholders**
 - Track I; 1 1/2; II
 - Clarify benefits and risks
- **Value water**
 - PPA – pay for power – MW not kWh



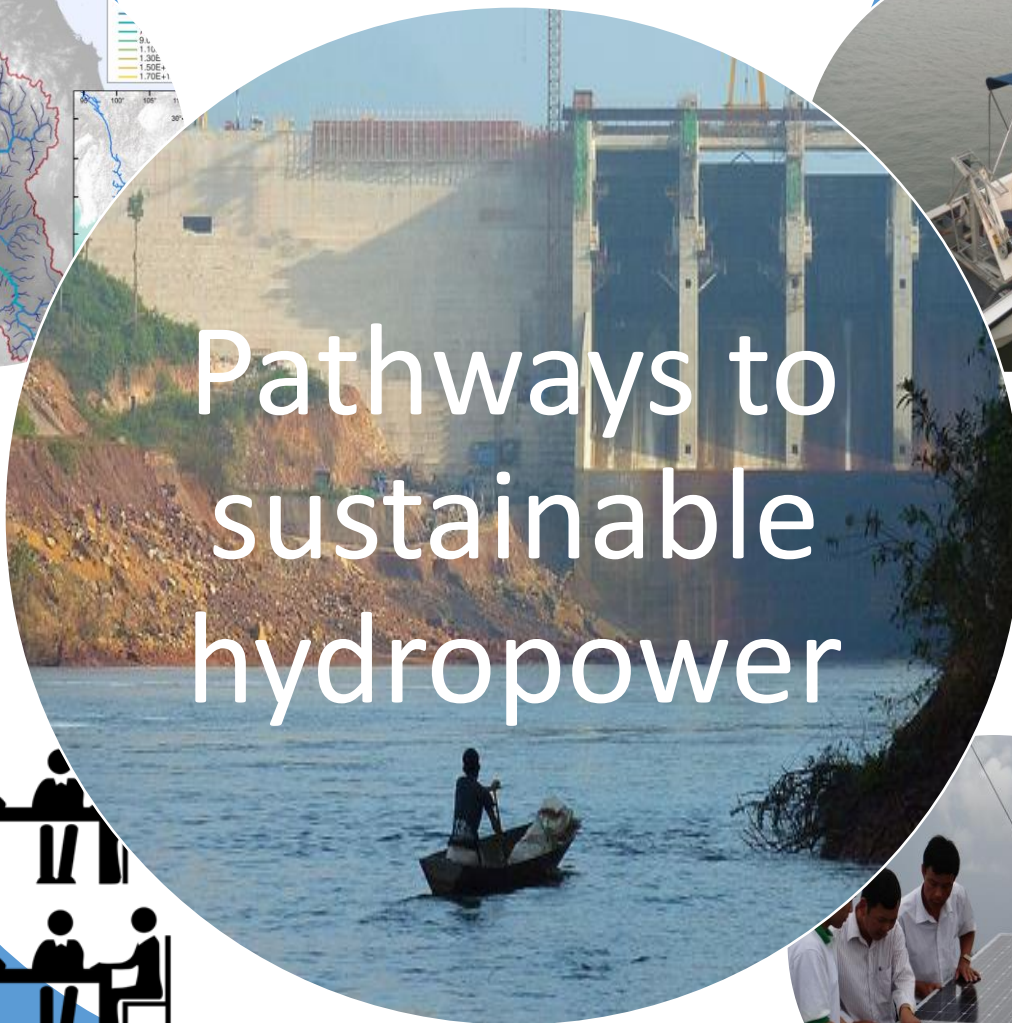
Way Forward

- **Scaling up government support to basin-wide planning**
 - Systems perspective
 - Need tools
- **Performance standards**
- **Dialogue between sectors and experts**
 - Engage with private sector
 - Outside the water sector - finance
- **Communication: translating technical solutions to policy and decision-making**
- **Stakeholder involvement – empowerment of people**
- **Make the case!**
 - Value water
 - Multi-sector benefits – need to look beyond water
 - HP in the energy system
 - Help the Minister to become PM!

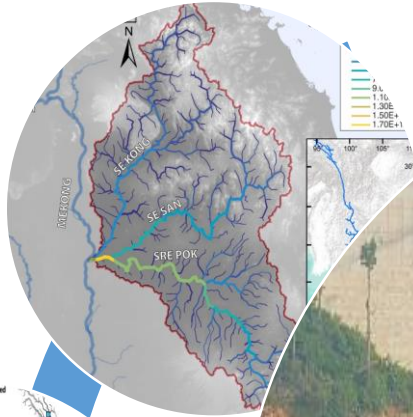


Conclusions

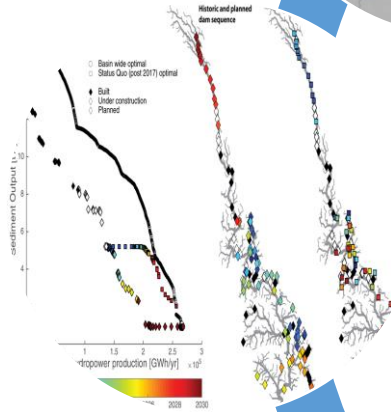
Strategic Portfolio Planning - The New Frontier in Hydropower ?



New models for river system functioning



Identifying better development pathways



Informing negotiations and decision making



DATA, DATA, DATA

The understanding of natural processes determines quality of results

IT'S NOT ONLY SEDIMENT

Considering additional indicators and ecosystem values

IT'S NOT ONLY HYDROPOWER

System scale optimization Including other renewables and transmission strategies



Utenriksdepartementet

Field visit to Glomma & Laagen


•••• N Telenor 4G 10.44 100 %

< Hunderfossen >

Tirsdag, 5. september

Ophold neste 90 minutter

kl 10 – 12

10°  2 m/s

0,3 – 0,5 mm

kl 12 – 18  10° 1,3 – 1,8 mm 2 m/s

kl 18 – 24  11° 3,3 – 4,6 mm 2 m/s

Onsdag, 6. september

kl 00 – 06  11° 2,2 – 3,8 mm 2 m/s

kl 06 – 12  11° 0,7 – 3,6 mm 2 m/s

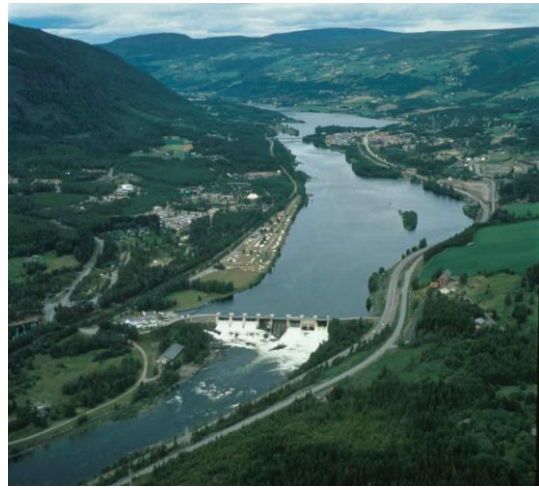
kl 12 – 18  11° 1,2 – 2,7 mm 2 m/s

kl 18 – 24  11° 2,7 – 4 mm 1 m/s

Torsdag, 7. september

kl 00 – 06  10° 1,2 – 1,8 mm 2 m/s

kl 06 – 12  9° 1,3 – 2 mm 2 m/s





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Thank you!

Especially to Leif, Maria and Palakorn