MAKING THE POWER SYSTEM MORE RESILIENT TO CLIMATE CHANGE INDUCED WATER STRESS

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Geneva, 12th June 2014





The reality (?)!

IPCC 2007, 2011



IPCC AR 5, WG 1, 2013:

Observation:

Wetter region gets more wetter and drier gets more drier since the second half of the 20th century. Extreme weather & climate events became more frequent.

Prognosis:

Some regions will become more wetter and others become more drier. Extreme precipitation events over wet tropical regions will very likely become more intense and more frequent



Where precipitation increases...

- Changing risk profiles
- Need for hydraulic infrastructure
- Need to address floods
 - - by using the infrastructure
 - - by changing operational procedures





Trends in precipitation in Norway 1950-2010







Where water availability decreases

- Freshwater scarcity*
 - Today about 700 million people
 - By 2035 about three billion people
- Need for dams creating usable water
 - Reduced precipitation and droughts expected in many regions



IPCC SREX 2011

*Source: IPCC Special Report on Renewable Energy Sources and Climate Mitigation, 2011



Allocation



Some countries give first priority to water supply and irrigation by law



In some countries flood protection is first priority. Who pays for loss of production?





Source NASA

Many possibilities for water management

45,000 large dams world wide

- ~75% built for irrigation, flood control, navigation, urban water supply schemes
- ~25% for used for hydropower alone
 or as multipurpose reservoirs

Developing countries have as little as 1% of the hydraulic infrastructure of developed countries with comparable climatic variability (WB 2004)





Multipurpose hydropower

- Services from the reservoir, creating available water
 - water supply, irrigation, flood control, navigation, recreation, tourism, etc. – and energy
- Services to the energy system
 - Flexibility and balancing securing a high penetration of variable sources (e.g. wind and solar) in a given grid





Food for thought - challenges

- The physics of MPHP
- Criteria for MPHP
 - Greenfield projects
 - Existing projects
- Priorities for water use in MPHP
 - How to set the value of the various services of the MPHP
 - Do we need a price for water/better cost-benefit tools
 - Is there a market for other services than energy
- Business models for the creation and operation of MPHP
 - Less precipitations means increased need for reservoirs collecting surface water
 - Increased need for reservoirs provides more opportunities for hydropower
 - Need incentive structure



Recommendations from the resilience report

For business

- Downscaling global climate models to a local level
- Risk-cost benefit analysis
- R&D Investments
- Pool learning, exchange best practice and share resources
- Develop new business models

For policymakers

- Include private sector in long term infrastructure planning
- Market signals and regulatory structures appropriate to local circumstances
- Support business investments in adaptation
- Adjust regulations to climate change



Recommendations for public-private collaboration

- Cross-sector collaboration for long-term infrastructure planning
- Organize mutual aid for crisis response
- Develop local forecasts over time periods relevant to business decision-making
- Organize effective pooling of technical expertise to:
 - Assess risk
 - Understanding socioeconomic costs
- Develop new business models to price and manage risk
- > Share information, especially on a local scale, to improve community resilience





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