



Climate resilience for hydropower

Hydropower Sustainable Forum Oslo, Norway September 4-6, 2017

1. Background to climate resilience guidelines
 2. Decision tree framework
 3. Key steps in climate resilience assessment
 4. Management plan for implementing climate resilience
 5. Next steps for World Bank/IHA
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IHA's work on climate change mitigation, adaptation and resilience

- **Emissions:** The hydropower sector has a tool to measure the impact of a reservoir on the carbon cycle in a river basin; the G-res tool, has been developed under a joint initiative between IHA and UNESCO.
- **Mitigation:** Hydropower is a renewable energy in its own right; in addition, storage projects enable other, variable renewables (solar and wind) – and larger storage means it has greater potential to enable more low carbon energy.
- **Resilience:** Any project evaluation needs to consider the climate-change risk to the services it is intended to provide. Guidelines for decision-making under uncertainty for new and modernization projects are under development.
- **Adaptation:** Ability to store and regulate water flow may provide adaptation services, to protect against increased flood/drought frequency and intensity.



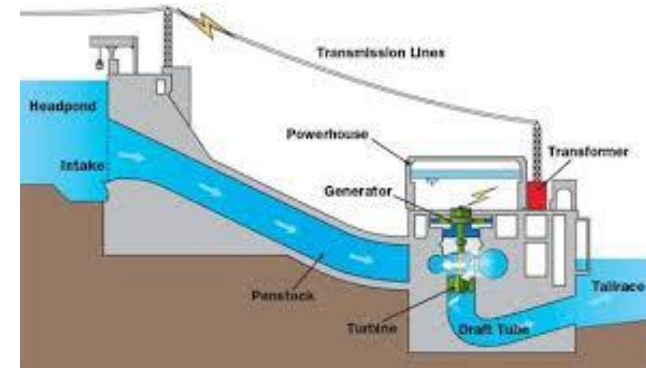
Who is engaged in checking climate resilience for hydropower projects?

- Lending agencies
- Green bond financing agencies
- Scientific community
- Utilities



Climate Resilience built into hydropower projects

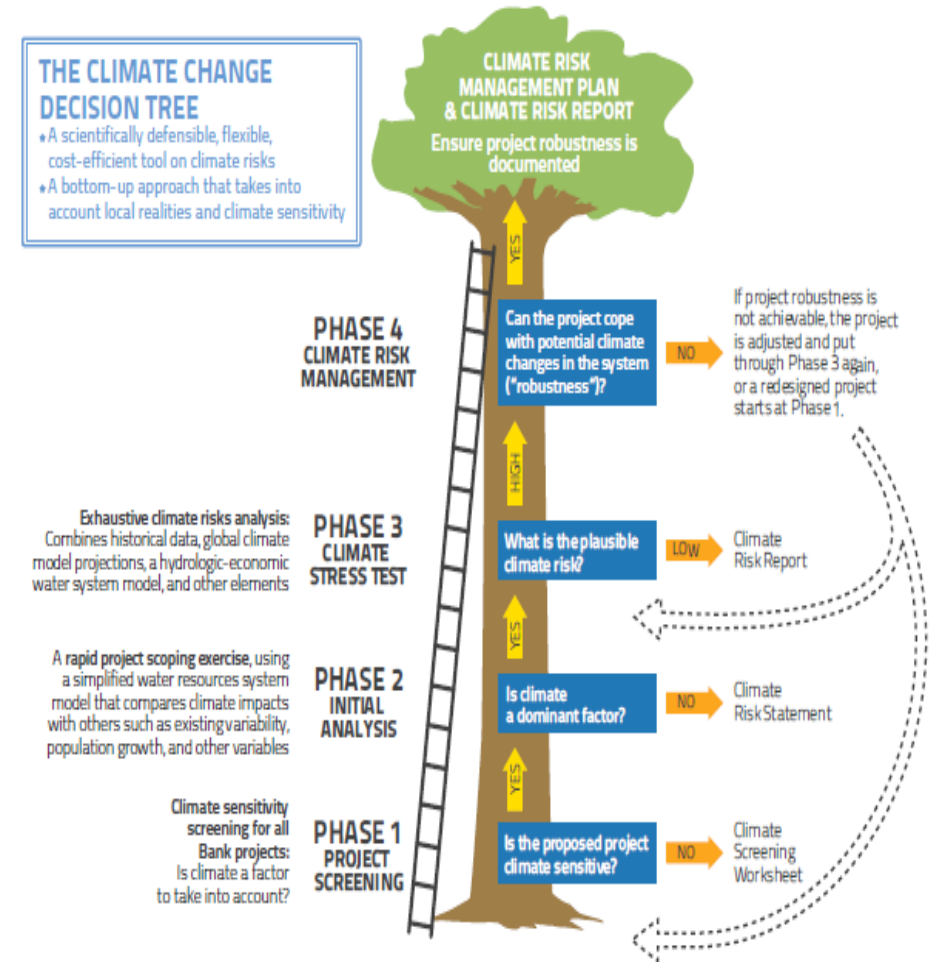
- Spillway design floods
- Flexible operating range
- Turbine re-sizing
- Basin planning scale
- Sustainability assessments



Approach to the Guidelines

- The World Bank Group requires Climate Change Resilience to be used as part of its project filtering process and is one of WBG's five strategic shifts for its climate work.
- Guidelines process therefore adapted from World Bank Decision Tree Framework with two Phases added.
- Adapted to be specific to hydropower.
- Typical engineering (pre-feasibility, feasibility, design, etc.) and ESIA stages of project analyses are shown in parallel to the six phases.
- Guidelines enhance existing hydropower design and implementation standards, manuals, protocols, bulletins, guidelines, etc.

IDENTIFYING AND MANAGING CLIMATE RISKS



Activity and phases		Key Climate Change Question	Engineering & ESIA Activities
Getting Started		What are the key climate change issues affecting this scheme?	Project conception
Phase 1	Project Screening	Is the proposed project climate sensitive?	Pre-Feasibility Study & Environmental and Social screening
Phase 2	Initial Analysis	Is climate a dominant factor?	Feasibility Study & ESIA – establishing general project characteristics with simplified climate data
Phase 3	Climate Stress Test	What is the plausible climate risk?	Feasibility Study & ESIA – refining general project characteristics with additional climate data
Phase 4	Climate and Disaster Risk Management	Can the project cope with the potential changes in the system?	Detailed stages of feasibility-level design (specific components), preparation of design drawings and tender documents, Environment & Social Management Plans
Monitoring, Reporting and Evaluation		How can resilience be tracked, monitored, evaluated, and updated?	Construction, operation & maintenance

Next steps in climate resilience and adaption work in IHA

- Final documentation of the WBG guidelines (Sept 2017)
- Develop concise climate resilience assessment criteria for:
 - eligibility in the Climate Bonds Initiative
 - climate resilience measures in the Hydropower Sustainability Assessment Protocol
- Publish industry good practice guidelines on climate resilience, applicable to existing and future hydropower projects.

Criteria for assessment of climate resilience

Analysis – What is the potential impact of climate change at the site; identified through reasonable modelling?

Scenarios – have findings of analysis been translated into scenarios at the site. Has a reasonable set of climate-change scenarios been developed and applied to project design?

Risk assessment – Have the scenarios been used to stress-test the project to identify vulnerabilities to safety (structural and societal) and the business model?

Define Adaptation Strategies or Solutions – What structural and functional measures are in place (or planned) to avoid or reduce the identified risks, based on their likelihood-impact weighting.

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Questions