



**Climate Change:
Adaptation, Resilience and Valuation of Hydropower Services**

Rio de Janeiro, Brazil, December 2019

Representatives from authorities, industry and research organisations of the international hydropower communities met to discuss the role of hydropower in providing climate change adaptation and resilience with a focus on flood control and drought management.

Hosted by the International Energy Agency Technology Collaboration Program on Hydropower (IEA Hydro), the meeting focused on **the value hydropower and reservoirs bring to society** by providing flood control and drought management. Representatives noted that while there are different characteristics to each region, hydropower and dams protect society and provide services outside the main purpose of generating electricity. These services have been an embedded part of many hydropower projects, and it is expected that future climate change impacts together with population growth and economic development, will lead to increased need for flood control and drought management.

For hydropower to be fully recognized for its role in **providing climate change services**, a greater understanding of several issues is needed including:

- Investigating how hydropower plant characteristics and hydrological regimes affect the level of adaptation and resilience to climatic changes of its services from the viewpoint of business, security and socio-environmental issues
- Investigating the role of hydropower for managing water resources in different countries in today's and future climate scenarios
- Assessing the value that hydropower provides in minimising or mitigating risks associated with a changing climate
- Investigating how hydropower design and operation can best be adapted to minimize or manage climate change challenges

Several **case studies** from Brazil, Norway and the USA were presented at the workshop. They all show how hydropower reservoirs and operation have contributed to different climate changes services including reduced flood damage and provision of water in times of droughts.

Key topics identified in the workshop include:

- Water security is often assessed at the local level and it is in many cases limited to the catchment, whereas energy security tends to be assessed at a regional or national scale
- Allocation of costs and benefits is a key element. Should they be evaluated the same way?
- The inter-relationship between floods and dam safety is of particular importance
- Drought is also about water quality, water temperature, ecosystem damage and socio-economic vulnerability
- Assessing the value that hydropower brings to the long-term control of floods and management of droughts
- Assessing the value of protecting against the impacts of floods and droughts
- It is useful to separate benefits and costs at local, regional, national and global scales, as well as for the owner and operator of hydropower and dams

- Land use changes and changes in water uses may have an equal or even stronger impact than climate change on the ability of hydropower to provide flood and drought mitigation services
- What is the baseline for assessing the value from hydropower? Should we compare to a catchment without hydropower or to a catchment without a dam? The ownership and mission of the hydropower dam might influence the baseline.

Key topics for **further research** were also identified at the workshop:

- How can hydropower reduce risks or enhance opportunities associated with climate change?
- What are the ways that hydropower dams and reservoirs provide resilience to withstand the effects of climate change?
- What is the value existing hydropower assets can provide for flood control and drought management in a changing climate?
- Is it possible to compare the value of inundated area due to the reservoir with the area downstream where reduced flood and drought risk is achieved?
- Hydropower operation includes some flood control and drought management as operators want to avoid spilling of water or ending up with an empty reservoir. How to separate operation and management for power generation from operation for flood and drought control?
- How can different needs for water and energy security be met today and in the future?

IEA Hydro is working cooperatively with the industry and authorities to document how hydropower has contributed to flood control and drought management, and how the need for these services will be under future climates. We are now working to produce a report with examples and case studies of how hydropower has contributed to these climate services. The next step is to see how the needs for such services will change in the future, and to analyse how hydropower can continue and increase the services of flood control and drought management.



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