



# THE IMPORTANCE OF NATURE FOR SUSTAINABLE HYDROPOWER

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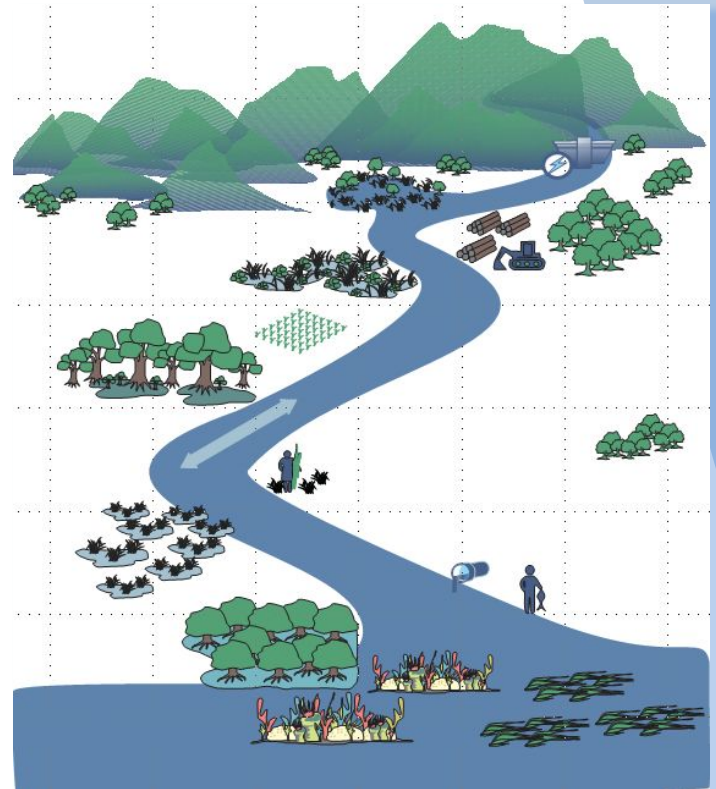
# Rivers are ...

- **Flows of and for life**
  - carbon sinks and temperature moderators
  - provide protection against flooding
  - among the bio-diverse systems on earth
  - fundamental support to people
- **Integrated and connected**
  - multiple longitudinal and lateral links
  - complex
- **Vulnerable**
  - traverse and drain vast landscapes
  - highly threatened
- **Powerful**
  - formed by erosion



# Hydropower depends on:

- Global functions
  - carbon sinks
  - temperature control
- Ecological infrastructure
  - flood alleviation
  - sediments
- Biodiversity
  - balance of species
- Public Support





# Global Functions

- Avoiding disruption of global functions, such as carbon sequestration, slows climate change and ensures the environmental sustainability of HPPs.
- Climate change-related challenges include:
  - Reduced Precipitation: Lower snowfall in 2024/5 has reduced power generation in the Himalayas<sup>1</sup>
  - Flash Floods: In 2021, a GLOF triggered flash floods that damaged several HPPs under construction in India





# Ecological Infrastructure

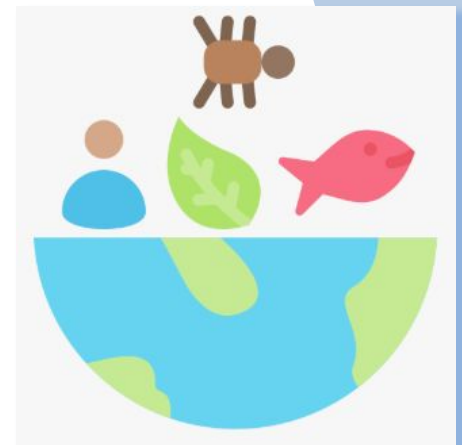
- Protecting river catchments and connectivity reduces the financial and eco-social costs of HPP
- Catchment management helps to moderate runoff and river flows and reduce reservoir sedimentation
  - Sardar Sarovar Dam , Narmada River (Kulkarni and Mahajan 2018)
- Properly designed fish passages help to mitigate impacts on fisheries:
  - Sardar Sarovar Dam , Narmada River (Kulkarni Mahajan 2018)
  - Ballard Locks, Lake Washington Ship Canal, USA (Balford and Fitzpatrick 2013)





# Biodiversity

- Understanding and respecting the balances in nature reduces unintended consequences:
  - Clogged intake screens from aquatic vegetation
    - *Nalubaale HPP, Nile River (Uganda)*<sup>1</sup>
  - Schistosomiasis outbreaks due to altered water habitats
    - *Manantali Dam, Bafing River (Mali)*<sup>2</sup>
  - Low-oxygen (hypoxic) events in reservoirs
    - *Three Gorges Dam, Yangtze River (China)*<sup>3</sup>



<sup>1</sup> NTV 2020; <sup>2</sup> Southgate *et al.* 2001; <sup>3</sup> Zhao *et al.* 2015



# Public Support

- Hydropower gains support when it protects nature, livelihoods, cultures and ways of life
- Civil society plays an increasingly prominent role in affecting decisions and operations:
  - Fishing (Nam Theun 2 HPP, Laos) <sup>1</sup>
  - Agriculture (Tarbela Dam, Pakistan) <sup>2</sup>
  - Tourism (Narmada Dam, India) <sup>3</sup>
  - Culture (Chico River Dam, Philippines) <sup>4</sup>
  - Biodiversity (Cheay Areng Dam, Cambodia) <sup>5</sup>



<sup>1</sup> EPA 2010; <sup>2</sup> Khan and Aslam 2014; <sup>3</sup> Lamba 2004; <sup>4</sup> Philippine Human Rights Commission 2010; <sup>5</sup> EIA 2017



# HPP can be part of the Solution

- Rivers have supported people and ecosystems for thousands of years — many are already under pressure
- Carefully designed hydropower projects can help reduce existing environmental impacts
- Gulpur Hydropower Project (Pakistan)
  - Modified design and operations to minimize ecological disruption
  - Relocated sediment mining away from sensitive river zones
  - Supported park rangers and local conservation efforts
  - Helped restore native fish populations
  - Boosted eco-tourism and community engagement





# Hydropower depends on Healthy Rivers

- Everything is linked — water, nature, power and people
- Protecting rivers means protecting people and energy
- Sustainable practices are not optional, they are essential
- HPP sustainability starts with location, then design and then operation
- Understanding the river and its people presents opportunities for co-operation
- Success stories show that working with nature leads to better hydropower projects



**Thank you**