EGU22-5817, updated on 20 Aug 2022
https://doi.org/10.5194/egusphere-egu22-5817
EGU General Assembly 2022

Accounting for fish habitat fragmentation in global strategic assessments of future hydropower dam portfolios

Valerio Barbarossa[1] and Rafael Schmitt[2]
[1]Leiden University, Institute of Environmental Sciences, Leiden, Netherlands (v.barbarossa@cml.leidenuniv.nl)
[2]Stanford University, The Natural Capital Project and Stanford Woods Institute for the Environment, Stanford, CA, USA

Dams contribute to water security, energy supply, and flood protection but also fragment habitats of freshwater fishes, limiting their dispersal ability and impairing fish movements to feeding and spawning grounds. This endangers freshwater biodiversity and the livelihoods and food security of people depending on freshwater fish. Globally, only 37% of rivers longer than 1,000 km remain free-flowing. Habitat fragmentation levels for fish are highest in North America, Europe, India, and China. However, the expansion in hydropower capacity driven by national plans and energy transition scenarios will increase habitat fragmentation by 20-40 percentage points in fish diversity hotspots like the Amazon, Congo, and Mekong basins, with potentially detrimental consequences for fishes. Therefore, it is paramount to understand opportunities to reconcile needs for expanding renewable hydropower while preserving habitat for fish and associated benefits for humans. Using the Mekong as a case study, we prototype a tool to optimize tradeoffs between habitat fragmentation and energy benefits for basin-level dams' portfolios based on global data sets. Such an approach can close an important gap in policy and trade-off analyses for hydropower which, because of lacking data, do not commonly include biotic impacts of dams as a metric. Based on a genetic algorithm, the approach allows identifying which dams to develop, remove, or upgrade with fish passages in order to reach the greatest benefits for future renewable energy systems with the least impact on fish populations.