frontiers | Frontiers in Environmental Science

EDITORIAL
published: 04 April 2022
doi: 10.3389/fenvs.2022.874065

Editorial: Reconciling Small Hydropower and Ecosystem Services in River Basins

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Keywords: small hydropower, hydropeaking, habitat preference, multi-criteria, water allocation, hydro-ecological alteration, macroinvertebrate, ecosystem services

Editorial on the Research Topic

Reconciling Small Hydropower and Ecosystem Services in River Basins

The global proliferation of small hydropower is fostered by the international agenda and national strategies on renewable energy, its importance for rural communities not connected to centralised electricity services and its contribution towards meeting renewable energy targets (Couto and Olden, 2018). Small hydropower plants are often built in pristine river basins which can be hotspots of biodiversity, and in cascade installations with disturbances replicated along river courses. Whereas knowledge of environmental threats posed by dams informs advocacy and solutions for more sustainable large hydropower (Winemiller et al., 2016), awareness of the peculiar effects of small hydropower on hydrological and ecological dynamics is still forming (Lange et al., 2018). A better comprehension of the individual as well as the cumulative impacts of small hydropower on riverine ecosystems is one of the most important global issues for environmental conservation (Sutherland et al., 2020). Such a mechanistic understanding and the availability of tools to integrate this knowledge into spatial planning and design processes may indeed promote sustainable tradeoffs between the preservation of ecosystem functions and energy production by means of small hydropower (Basso et al., 2020). The articles in this research topic effectively showcase the multidisciplinary expertise required to achieve these goals.

Two studies examine different facets of riverine ecology. Negro et al. review the current knowledge of physical habitat preferences of more than thirty freshwater fish species which populate Italian rivers. They find scarce information for one third of them, especially for the most threatened endemic species during the critical spawning period. An exemplary application of the collected information by means of a mesoscale habitat simulation model demonstrate their value for predicting fish distribution in a hydropower impacted river reach. Aksamit et al. experimentally analyze the response of drifting and benthic macroinvertebrate communities to consecutive hydropeaking events generated by a small hydropower installation. Unexpectedly, they find that macroinvertebrate abundance and composition do not vary between peaks, but considerable differences in the drift were found between pools and riffles. Their findings stress the danger linked to direct application of results from flume investigations and call for more on-site experiments and monitoring.

Two further studies document how the selection of alternative methodological approaches and multi-criteria assessment tools can lead to different conclusions regarding design and development of small hydropower projects. Vassoney et al. compare several established multi-criteria decision making techniques, analyzing their strengths and weaknesses, assessing the robustness of their rankings to varying weighting coefficients and evaluating how the choice of a specific methodology may affect the final decision. Perona et al. investigate the hydro-ecological and energy efficiency of variable environmental

OPEN ACCESS

Edited and reviewed by:
Angela Helen Arthington, Griffith University, Australia

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Specialty section:
This article was submitted to Freshwater Science, a section of the journal Frontiers in Environmental Science

Received: *11 February 2022*
Accepted: *25 February 2022*
Published: *04 April 2022*

Citation:
Basso S and Bakken TH (2022) Editorial: Reconciling Small Hydropower and Ecosystem Services in River Basins. Front. Environ. Sci. 10:874065. doi: 10.3389/fenvs.2022.874065

flows, signaling that the choice and aggregation method of different hydrological and fish habitat indicators strongly affect the overall performance of water allocation policies. Their study also emphasizes the specificity of small run-of-river vs large hydropower with reservoirs, revealing that the unquestioning adoption of widely-accepted methodologies to quantify hydrological alteration developed for the latter leads to biased selection of optimal distribution policies for small run-of-river hydropower.

The complex nature of the alterations induced by small hydropower on riverine dynamics and the intricacy of identifying effective solutions which accounts for manifold objectives demand for the joint contribution of several disciplines to improve environmental performance, which will further affect public perception (Venus et al., 2020) and acceptance of this form of renewable energy production.

AUTHOR CONTRIBUTIONS

SB drafted the manuscript and TB contributed to its revision. Both authors made a contribution to the work and approved the final version of the manuscript.

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Conflict of Interest: The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.