

Hydropower, innovations and avoiding international dam shame

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This dam in the Brazilian Amazon is the third largest in the world at 11 GW in 2016. Credit: Laura Castro-Diaz

For sweeping drama, it's hard to beat hydropower from dams—a renewable source of electricity that helped build much of the developed

world. Yet five scientists from Michigan State University (MSU) say that behind roaring cascades is a legacy of underestimated costs and overestimated value.

The developing world can—and must—turn to better ways to generate hydropower for industry and livelihoods. The case is outlined in "Sustainable hydropower in the 21st century" in this week's *Proceedings of the National Academy of Sciences*.

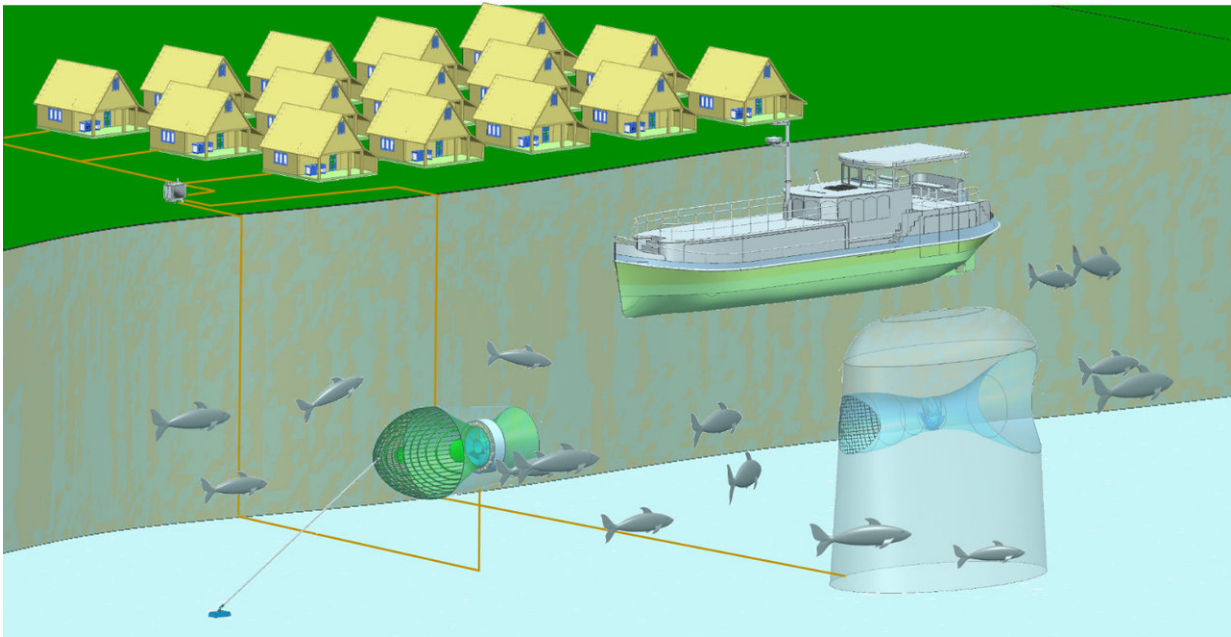
"This article identifies that for hydropower to continue to make a contribution to sustainable energy it needs to consider from the outset the true [costs](#), social, environmental and cultural that may be involved, and include those in the pricing of the infrastructure, including the eventual removal of the dam, rather than pass those on to the public in 30 years," said Emilio Moran, John A. Hannah Distinguished Professor of Geography, Environment and Spatial Sciences.

"The benefits of energy from dams no longer outweigh the social and [environmental costs](#) that damming up rivers brings about."

From 1920 to 1970, dams were a boom in North America and Europe. Yet nowadays, more dams are being removed in North America and Europe than are being built.

Turns out dams had a dark side. They disrupt the natural ecology of rivers, damage forests and biodiversity, release large amounts of greenhouse gases, as well as displace thousands of people while disrupting food systems, water quality and agriculture.

And to top it off, the power generated often doesn't go to the places bearing the ecological burdens.



This in-stream river turbine can generate power for a community without the major disruptions that come with traditional dams Credit: Prepared by Raul Quispe-Abad and Norbert Müller

The MSU team—geographers, social scientists, hydrologists and engineers—examined how the needs of a changing world can be better met than damming more rivers. Yet they note that an estimated 3,700 dams that produce more than one megawatt are either planned or under construction primarily in developing countries.

The danger: a large-scale destruction of the natural world, one likely exacerbated by looming climate change.

"The human costs of [large dams](#) are no less important," the paper notes. "The social, behavioral, cultural, economic, and political disruption that populations near dams face are routinely underestimated."

Moreover, dams typically have a finite lifespan—usually around 30 years, making them fall short as a long-term sustainable strategy.

The group notes that it's not that the rivers aren't a valuable source of power. The potential is there to be released in less intrusive technologies. Innovative technologies that don't require damming a river or resettling populations stand to transform the hydropower sector. The technologies, they say, would need to be accompanied by both environmental and social impact assessments with teeth—meaning damning assessments could stop a dam.

One option is instream turbine technology , a less intrusive way to tap into hydropower without the major disruptions of dams.

"Our team is working on alternatives to hydropower generation, such as in-stream turbines that do not involve damming up the river, but produce energy for local communities, maintain a healthy river ecology, and does not involve resettlement and other social costs," Moran said. "Our goal is no less than transforming the [hydropower](#) sector."

More information: Emilio F. Moran et al., "Sustainable hydropower in the 21st century," *PNAS* (2018).

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