Meeting climate and energy goals without compromising the health of rivers and the communities that depend on them

A CASE FROM THE PERUVIAN AMAZON

Climate change poses a crucial challenge for the world, and a rapid transition away from fossil fuels is one of the most urgently needed solutions. However, some investments to achieve that transition risk undermining other national or global goals, including those focused on ensuring that development is equitable and sustainable for communities and consistent with healthy ecosystems. In short, while the transition must be rapid, it should also strive to be as careful as possible.

Hydropower currently provides about half of the world's renewable electricity and can play a key role in low-carbon power systems. But hydropower can also have significant negative impacts on rivers and the communities that depend on them. Hydropower dams are the leading cause of river fragmentation that has contributed to an 80% global decline in the size of migratory fish populations, which are essential to fisheries that feed hundreds of millions. The reservoirs behind dams have trapped more than one-quarter of the sediment carried by rivers, leading to accelerated erosion of many of the world's deltas - highly productive agricultural regions that are home to 500 million people. In turn, these impacts to water and food security, as well as coastal subsidence, can exacerbate climate risks and erode climate adaptation investments.

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Thus, solving the hydropower challenge is key to any rapid transition that is also careful and climate resilient. There are considerable examples that demonstrate low-carbon power systems can be developed in ways that minimize hydropower's impacts on rivers, while remaining cost competitive. **Due to the renewable revolution—the dramatic (and ongoing) drop in the cost of solar, wind and batteries, along with innovations in grid management—wind and solar have become the dominant renewable technologies (>95% of newly installed capacity in recent years).** Research in countries across three continents has demonstrated that low carbon and low cost power systems can be built while avoiding new hydropower dams with large environmental and social impacts, such as those that displace people, are located in, or impact, protected areas, or that fragment major free-flowing rivers.

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The challenge of hydropower's impacts—and the promise that low-impact solutions can be found—are now extremely relevant for the countries of the Amazon Basin. For example, Peru has committed to cut its emissions by 40% by 2030 and has also committed to global biodiversity targets of protecting 30% of its lands, waters and ocean by 2030. Some projections of power system expansion for Peru include several potential dams on Amazon tributaries that still remain free-flowing. Although these rivers have considerable hydropower potential, large dams on Amazon tributaries would capture a significant portion of the sediment and nutrients needed for downstream wetlands and floodplain forests, which are among the most productive and diverse habitats in the Amazon basin. Further, dams would alter river flow patterns and block movement of migratory fish, which comprise more than 90% of the basin's fish harvest. They would also block the movement and result in habitat loss for keystone species like the Amazon river dolphin, Giant river otter and Dorado Catfish.

To address this challenge, The Nature Conservancy and WWF collaborated with the Brazilian energy modeling firm PSR to explore the potential for low carbon and low cost power systems that avoided these major impacts. We found that a 2050 net-zero power system that avoided new hydropower dams in the Amazon would have a total cost that was only slightly higher (approximately 5%) than a net-zero option that included Amazon hydropower.

We intend to expand this research, including exploring additional technologies that could further reduce costs of future power systems that avoid Amazon hydropower. But these **preliminary results indicate that Peru can likely meet its climate and energy goals without compromising the health of Amazon rivers and the communities that depend on them.**

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Building from these findings and similar research around the world, as we create the path to achieve net-zero, we call on Parties and institutions to:

Policy and financing

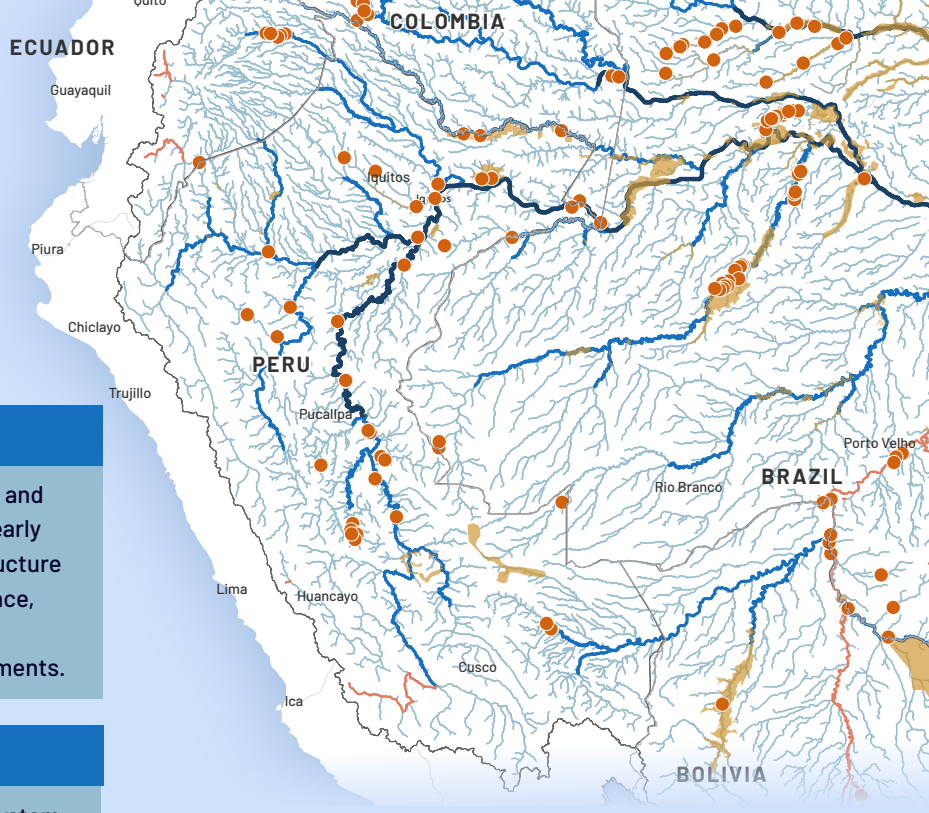
Ensure climate mitigation financing, policy and legislative frameworks, including NDCs, clearly and carefully reflect climate risks, infrastructure life cycle costs (commissioning, maintenance, decommissioning), and relative social and environmental costs of hydropower investments.

Planning and evaluation

Evaluate all hydropower investments at a system-scale and alongside lower-cost and lower-impact climate solutions, including solar, wind and battery storage.

Conservation

Conserve connected and free-flowing rivers to support climate adaptation, halt biodiversity loss, and sustain community fisheries and ways of life. This includes avoiding new hydropower facilities with large environmental and social impacts, such as those that displace people, are located in or impact protected and conserved areas, or that fragment major free-flowing rivers.



- Fishing monitoring and/or management areas
- Free flowing rivers
- Non Free flowing rivers

Grill et. al. 2019.Mapping the world's free-flowing rivers. Nature 569:215-221.
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Silva et. al 2025. Mapping fisheries and management activities. The Nature Conservancy.