The Nature Conservancy
Protecting nature. Preserving life.™

HYDROPOWER BY DESIGN

Reducing the Impacts of Dams on Nature and People

River ecosystems support a wide range of unique animal and plant species and healthy rivers can provide immense benefits to communities, including food production and clean drinking water. However, in much of the world, widespread dam development has blocked fish migrations and changed river flow patterns—the rise and fall of water that orchestrates nearly all aspects of river life — degrading the vitality of river communities and ecosystems alike.

Today, a new wave of dam development—driven largely by the demand for energy that hydropower dams can provide—threatens to inflict huge impacts on regions characterized by high aquatic biodiversity and large populations who depend upon healthy rivers. This challenge is global, urgent, and complex. To meet it The Nature Conservancy and partners are advancing a strategy called “Hydropower by Design.”

Through Hydropower by Design, we are integrating decades of experience in conservation planning and river restoration to tackle the challenge at the only scale capable of producing solutions: the *entire system* of dam planning, development and operation must be made more sustainable.

Smart Planning

For years, Nature Conservancy scientists have been developing tools and methods to reduce the environmental impacts of dams. We have been working at individual project sites and collaborating with engineers and water managers throughout the world to improve dam operations by implementing “environmental flow releases.” However, it is now clear that the scope of the challenge facing the world’s rivers far exceeds the scale of any single dam.

While environmental flows and other methods can reduce a dam’s impacts, by far the most important decision affecting the sustainability of a dam is its location. Therefore, a strategy to assure that hydropower development is consistent with healthy river systems must influence decisions about dam locations. To accomplish this, we must work at the earliest possible stage of planning for hydropower development, integrating and optimizing objectives for both energy and conservation.

Hydropower by Design

Our approach to sustainable hydropower – Hydropower by Design – involves the integration of biological and social resource values throughout the planning process for dams. This builds on two core strengths of The Nature Conservancy: conservation planning and the pursuit of collaborative water management solutions.

Conceptually, Hydropower by Design is the river-basin expression of the Conservancy's overarching strategy known as Development by Design.

Through Development by Design, plans for both conservation priorities and development objectives are integrated to identify potential conflicts, search for more optimal alternatives, and guide mitigation investments.

Key features of Hydropower by Design:

Influencing dam location. Because the location of a dam is the most important variable determining its impacts, hydropower can only be sustainable if dams are sited within a river basin in a manner that allows key ecological processes — such as the flow of water, sediments, and nutrients — to be sustained within the river basin as a whole. Thus, the Hydropower by Design process overlays information about biological and social resources with information on potential dam locations to identify alternatives that can most optimally meet both conservation and hydropower objectives.

Effective basin-scale conservation. Mitigation for dam development is often piecemeal and ineffective. Hydropower by Design produces a basin-scale conservation strategy and channels mitigation funds toward its objectives, such as the creation and management of integrated, functioning freshwater protected areas.

Benefits across stakeholders. Through Hydropower by Design, conservation organizations can greatly improve our ability to direct dam development away from the most environmentally important and sensitive areas. This process produces clear information for regulators and funders about the relative social and environmental costs of proposed dam locations. For the hydropower industry, Hydropower by Design can provide greater certainty and lower risk for projects that emerge through this process.

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Proving Grounds

The Nature Conservancy's work to make hydropower more environmentally sustainable builds from our conservation successes at hundreds of fresh water sites over the past six decades. Key locations for our sustainable hydropower work include:

On Maine's **Penobscot River** the Conservancy is part of a coalition, composed of NGOs and the Penobscot Indian Nation, which is implementing a landmark agreement, which moved beyond dam-by-dam conflicts to consider hydropower and environmental health at the scale of the entire river basin. Through the agreement several dams will be removed, dramatically improving access to migratory fish including salmon, while due to upgrades and operational changes at the remaining dams, annual energy generation will remain the same and potentially even increase.

With the Penobscot River serving as inspiration, the Conservancy is working with the Departments of Energy and Interior, the Army Corps of Engineers, the Hydropower Reform Coalition and the National Hydropower Association to develop tools and plans for achieving innovative solutions for energy and the environment in other river basins in the United States.

On the **Yangtze River** in China, the Conservancy is finding synergies between flood management and hydropower that will reduce the environmental impacts of large dams while simultaneously funding conservation of the most important freshwater areas in the basin.

The Conservancy and **Mexico's Federal Commission for Electricity** — which owns and operates all hydropower dams in the country — are launching a partnership to improve the sustainability of existing and future dams.