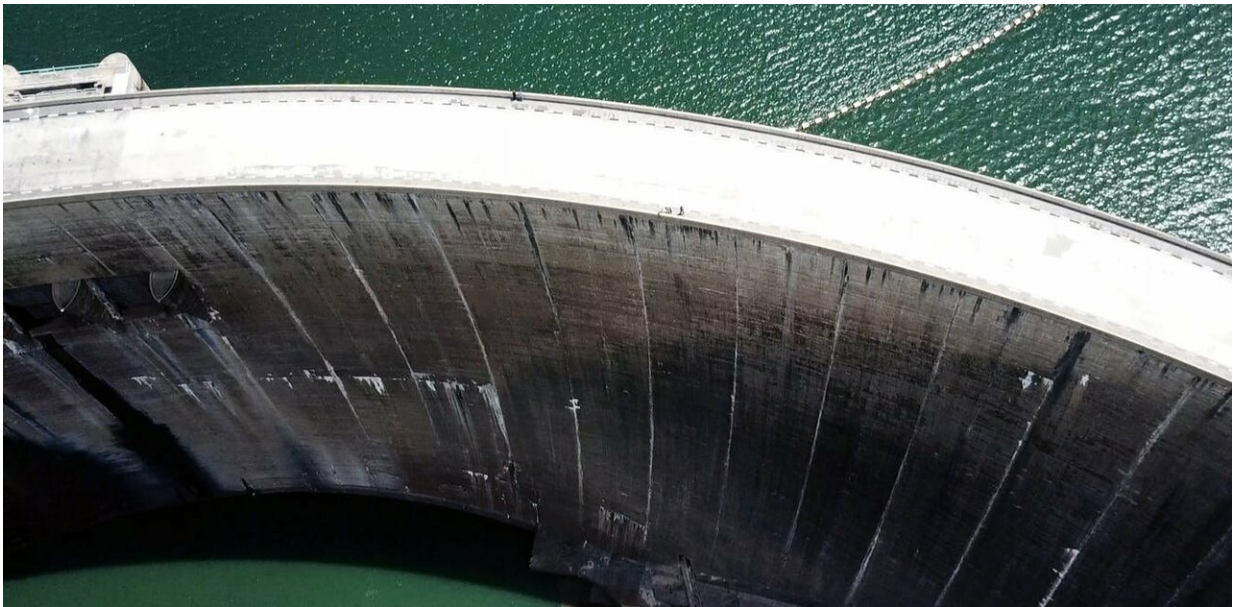


# Dams can mimic the free flow of rivers, but risks must be managed

February 12 2019, by Matthew McCartney And Fritz Kleinschroth

---



Dams, like the Kariba between Zambia and Zimbabwe, regulate flow for irrigation, hydropower and water supply. Supplied

In recent decades, humans have built many dams. These are designed to regulate flow for irrigation, hydropower and water supply. Most major rivers in the world [are dammed](#).

But there are detriments to damming rivers. Many people depend on the natural ebb and flow of unrestricted rivers that swell with [water](#) in the

[rainy season](#) and wane in the dry season. When the natural flow is changed, people and ecosystems are affected: globally, [an estimated 472 million people](#) living downstream of dams have suffered adverse effects from changes to the rivers' flows.

Free flowing rivers bring huge benefits. Fishermen benefit from healthy fish populations that need flooded areas to spawn and feed. In dry regions, livestock keepers often depend on rivers spilling out over the floodplains to maintain grasslands for grazing cattle. Farmers and ecosystems depend on naturally high flows that transport and deposit sediment along the river, leaving important nutrients that enrich soil and boost crops.

Dams that regulate water flows reduce all these benefits. In exchange they provide water for hydropower and domestic supply. It's a trade-off in which some people gain and some lose.

More and more, national legislatures, governments and [donors](#) that finance dams have started to [demand mitigation measures](#) to try and minimise losses. One option is to establish so-called "environmental flows". This involves releasing water from dams in a way that mimics some of the natural highs and lows of water flow in an undammed river. This variance in flow creates many benefits for fisheries, agriculture and biodiversity.

## **Striking the balance with environmental flows**

Normally a dam stores water during periods of high flow and releases it in a controlled way to meet a particular purpose; often, to generate power. In these cases a dam operator will prefer to release water when the demand for power is high – and so is the price.

The environmental flows approach involves releasing water not just for

power generation, but for other reasons too. For instance, releasing a large amount of water at once in the rainy season to inundate floodplains, which in turn provide a healthy environment for fish. This will provide livelihoods for local fishermen.

But several systems must be in place to ensure this is a smooth, effective process. A good knowledge of the river system that's to be dammed, and of the communities downstream that may be affected, is crucial.

Hydrological modelling is useful: models of these river systems can help the [decision makers](#) reviewing, approving and building dams to [better understand risks and benefits](#). Crucially, [communities must be involved](#) in any discussion and planning.

Managing these realities can be complicated. But it can be done – and those financing, constructing and managing [large dams](#) have an ethical imperative to take it on before a dam is built.

## **Managing risk when flow becomes flood**

Dams hold back water and this, of course, alters the natural flow of a river or body of water: it often increases water [flow](#) during times when it used to be low and vice versa. Modifying flows often has [big consequences](#) for people, animals and ecosystems located downstream of the dam.

A [recent study](#) of the Tana River in Kenya, for example, found that though planned new dams will bring positive economic benefits, they will also have potentially serious negative effects for various stakeholders, including impoverished pastoralists, farmers and fishers living in the lower basin. This is where environmental flows have merit.

The Itezhi-Tezhi dam on the Kafue River in Zambia is one example. It was [purposely constructed](#) to be 15% bigger than necessary for power

generation so dam operators could store additional water and release it at least once a year to maintain naturally flooded grasslands in support of local livestock herders.

Yet, there's a challenge. If too much water is released, a well-intended controlled flood can quickly become a disaster. That's why dam managers may, understandably, hesitate to release high environmental flows – that is, controlled floods. They do not want to risk being accused of threatening lives and properties downstream.

The Omo River in Ethiopia illustrates this dilemma. It's [a major lifeline](#) bringing water and nutrients to the extremely dry lower Omo valley and Lake Turkana in Kenya. Local communities depend on seasonal floods to enrich the floodplains where cattle graze and people cultivate their fields. But living and working in floodplains comes with risk: in 2006 flash floods devastated large areas of the lower Omo valley, [causing many deaths](#).

Protection against floods was one of the arguments used to support the building of the recently commissioned hydropower dam, Gibe III, on the Omo River. But while this large dam might play a role in mitigating flood risks, non-government organisations have warned that ecosystems and local communities depend on the river's annual flood.

That's why it is important that the timing of a man-made [flood](#) from the Gibe III dam is reliable and aligns with the natural pattern of seasonal flooding, so that people are prepared. Flood warning systems are essential, too.

## **Making the best of dams**

Despite controversies around the construction of new dams, dams are here to stay. That's why it's urgent to find ways to better manage them to

serve surrounding ecosystems and the people who depend on them, including by planning for controlled releases of water that mimic the benefits of free-flowing rivers.

To avoid unintended consequences, all stakeholders must have a voice in the planning and management of such water releases.

We are part of [a project](#) working with stakeholders in the Omo-Turkana and the Zambezi river basins to make well-informed, science-based decisions about how to balance trade-offs between competing interests and prevent lose-lose situations stemming from ill-considered compromises. Working together across sectors and interest groups allows us to make the best of dams – to the benefit of food security, energy and ecosystems.

This article is republished from [The Conversation](#) under a Creative Commons license. Read the [original article](#).

Provided by The Conversation

Citation: Dams can mimic the free flow of rivers, but risks must be managed (2019, February 12) retrieved 24 April 2024 from <https://phys.org/news/2019-02-mimic-free-rivers.html>

<p>This document is subject to copyright. Apart from any fair dealing for the purpose of private study or research, no part may be reproduced without the written permission. The content is provided for information purposes only.</p>
--