



Constructing wetlands within reservoirs to improve fisheries

Creating habitat diversity in hydropower reservoirs with large drawdowns to increase fish biodiversity, productivity and improve livelihoods

THE CHALLENGE

Increased fish production is usually promoted as an important secondary benefit of reservoirs created for hydropower, irrigation or water supply. Dam proponents present increased fishery as a benefit for local people in compensation for disruption to livelihoods caused by dam construction. However, reservoir fisheries often fail to live up to expectations.



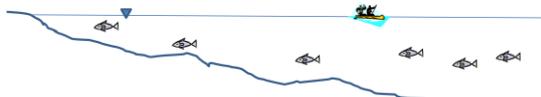
In many cases the aquatic habitats that develop behind a dam are less diverse and less productive than the original river, especially for steep-sided, deep reservoirs with large drawdown.

Often an initial boom in fish production in newly created reservoirs as decaying vegetation provides a surplus of nutrients, is followed by a decline in catches over the next few years. Fish diversity often decreases and there is a tendency for relatively large-bodied and valuable top predators to be replaced by smaller less valuable fish. Fishing effort has to increase and returns often reduce. Large drawdown in storage reservoirs creates an ugly scar on the landscape, with more than 10 or 20 m of barren shoreline exposed and unproductive at the end of the dry season.

THE SOLUTION

Without wetlands

Wet season: reservoir full

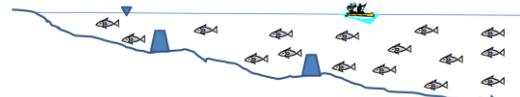


Dry season: reservoir drawn-down

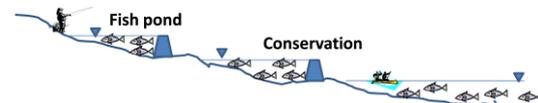


With created wetlands

Wet season: reservoir full



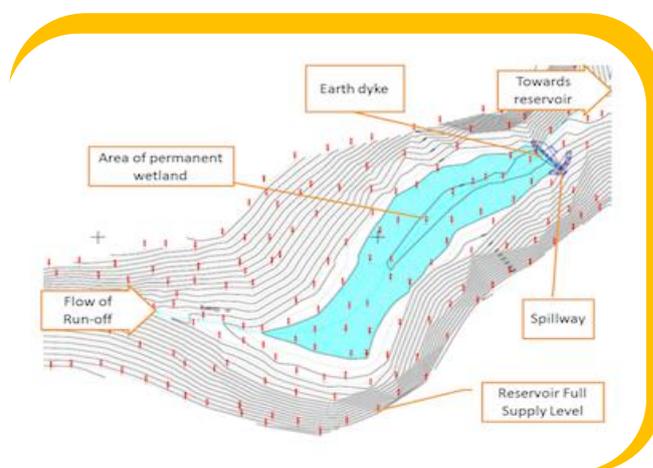
Dry season: reservoir drawn-down



Creating areas of permanent wetland within the drawdown of the reservoir would enhance the diversity of habitats and productivity. Fish are provided with refuges, spawning and nursery grounds. This will lead to greater fish production within the reservoir, reduced fishing effort, increased catches, improved returns and greater livelihood benefits. Local people living in the vicinity of the reservoir will benefit in a direct and tangible way. Planted aquatic vegetation would break up the scar of the draw down. These wetlands may also have conservation benefits in providing safe access to water for wildlife when reservoir levels are low. This idea developed out of collaboration between ICEM and IWMI through the CGIAR Challenge Program on Water and Food in the Mekong together with the Theun Hinboun Power Company, Lao PDR.

THE APPROACH

The construction of wetlands within the reservoir drawdown need not be very complicated or expensive. A simple earth dyke with a spillway may be built across a small seasonal stream, or terraced wetlands constructed along the contours. This is similar to a conventional check dam, but the dyke, spillway and wetland would be underwater when the reservoir is at Full Supply Level (FSL). As reservoir water levels fall the dyke would retain water, creating a wetland area behind it. During early rains the wetland would receive water from run-off, and if there is a storm, excess water would flow over the spillway.



The dyke and spillway would need to be designed to survive complete inundation for part of the year. The wetlands would also trap sediment, a bonus for dam operator. The wetland would eventually mature into a productive marsh.

“Ecosystem design and management of reservoirs for more than hydropower alone deserves the attention of developers and government. The creation of wetlands within reservoirs to improve the environment, increase fish diversity and support local livelihoods, is a design option that should be considered.”

COSTS & QUESTIONS

How much do these dykes and spillways cost? Initial design estimates show that 5 earth dykes and spillways on Nam Gnuang using local labour and materials would cost less than 30,000 USD or 1,000 USD per ha of wetland.

How much water will be trapped and not available for hydropower? The water trapped is small compared to the active volume of the reservoir. 3.1 ha of wetlands would trap about 22,000 m³ of water - less than 0.001% of the active storage in Nam Gnuang reservoir. The theoretical loss in value to hydropower would be about 1,300 USD.

How much will fish production be increased? The increase in fish productivity depends upon the character of the reservoir. If the wetland is used for low input aquaculture during drawdown, 3.1 ha of fish pond could yield as much as 3 t of fish a year. If the wetlands are used to “seed” fish in the reservoir, production could be greater.

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