Back to Africa: Post hydropower-project mitigation effects on wetland vegetation in relation to the conservation of an endemic amphibian

Author(s): Inger Elisabeth Måren, Vigdis Vandvik, Henry J. Ndangalasi, Henry J. Ndangalasi, Taplin J., Mbaga F., Jon C. Lovett

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Abstract

Developing countries are home to much of the world's biodiversity due to their location in areas of high species richness and their native vegetation has not yet been totally transformed by human activity. Enabling economic and social development to proceed whilst retaining the high environmental values is central to the principle of sustainability, but activities under these three pillars of sustainability are often in conflict. Provision of energy from environmentally sound technologies is critical for economic development in Africa and hydropower offers a reliable way of doing this. The Lower Kihansi Hydropower Project in Tanzania is a model example of the application of technology to minimise environmental impact. However, although the footprint of the project is relatively small, it is located in a biodiversity hotspot where almost any development will have negative impacts on its many restricted range species. Globally, hydropower projects have been associated with negative biological impacts of flooding of the reservoir impounded by the dam. Less attention has been paid to the immediate downstream effects of dams, such as the loss of waterfall spray zones. We analysed the effects of the mitigation efforts by the installment of a sprinkler system to prevent extinction of the Kihansi Spray Toad Nectophrynoides asperginis, which is only known from this short section of the Kihansi River. We analysed re-sampled vegetation plots in the spray wetland habitat over a period of eight years to test if the post-hydropower project mitigation has aided the vegetation composition in approaching similarity to that of the pre-hydropower project conditions, testing two hypotheses dealing with habitat responses to the mitigation measures; (i) Does the instalment of the sprinkler system alter plant species composition in the former waterfall spray zone in relation to the controls? (ii) Do the mitigation measures succeed in restoring the wetland habitat and hence facilitate the re-introduction of the Kihansi Spray Toad? The results clearly

show that the post-hydropower mitigations are successful as the vegetation cover and species composition with time approach that of the pre-hydropower project conditions. Overall, the proportion of weedy species decreased and wetland species increased with time since mitigation. However, results suggest that the wetland has not entirely reverted back to pre-project conditions and continued mitigation measures are needed. In conclusion, this positive trend in the wetland habitat development due to the mitigation measures may facilitate the reintroduction of the in situ extinct Kihansi Spray Toad in the near future.