Restoring the Kafue Flats
A partnership approach to environmental flows in Zambia

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Abstract
The establishment of environmental flows and the management of flood releases from existing dams is a complicated process involving numerous stakeholders. Whilst the benefits of environmental flows have been demonstrated in many parts of the world, there is much less experience with managed flood releases from reservoirs. In this paper, we will present the experience of a WWF sponsored project in Zambia aimed at restoring floods in the Kafue Flats. In the Kafue Flats, part of the Zambezi River Basin, the operation of two dams built in 1971 and 1978 has altered the natural flooding regime of this internationally important wetland, with large impacts on wildlife and on local livelihoods. WWF has worked in partnership with the Zambian Ministry of Energy and Water Development and the Zambian Electricity Supply Company to change the operational regime of the Itezhi-tezhi and Lower Kafue Gorge dams to replicate the natural flood patterns to restore freshwater and floodplain ecosystems and to enhance food security in the Kafue Flats. This has required extensive modelling work and the re-establishment of hydrological monitoring stations. The new flow regime is now in operation but the work continues through a detailed monitoring programme to ensure that a clear picture of the costs and benefits emerges. The project shows the importance of consensus about the nature of impacts caused by dams, the contribution made by hydrological modelling and the value of establishing positive working relationships with all key stakeholders.

Keywords
Environmental flows, managed floods, dam operation, partnerships, food security

INTRODUCTION

Many dams have been built without sufficient attention to environmental impacts and mitigation measures, often resulting in severe negative impacts on ecosystems and livelihoods. With over half of the world's large river systems affected by dams (Nilsson, 2005), environmental flows are increasingly recognised as an important concept in freshwater conservation. Definitions of environmental flows vary, but in general recognise that a sufficient amount of water is left in rivers to ensure that downstream environmental, social and economic functions are sustained. Natural flow regimes in rivers vary over different time scales, from hours and days to seasons, years and longer cycles (Poff et al, 1997) and the establishment of an environmental flow regime seeks to emulate the natural flow regime as much as possible within the constrictions of human modifications to river systems. In many river systems floods are a regular, seasonal occurrence that is lost when rivers are dammed. One tool within environmental flow management that deals specifically with floods is the managed flood release from reservoirs. This is defined by Acreman (2000) as a controlled release of water from a reservoir to inundate a specific area of floodplain or river delta downstream to restore and maintain ecological processes. There have been a number of different attempts in developing managed flood releases, primarily in Africa and including the Logone floodplain in Cameroon (Loth, 2004), but experience has shown the complexities surrounding managing floods and successes have been limited.

The World Commission on Dams (WCD, 2000) concluded that at existing dams opportunities exist to optimise benefits and to strengthen environmental mitigation and restoration measures. The

Commission recommended that opportunities for mitigation and restoration are recognised, identified and acted on, including establishing environmental flows and managed flood releases. One of the first dams at which managed flood releases were considered at the design stage is the Itezhi-tezhi dam in Zambia, which was completed in 1978 with additional storage capacity to allow for extra water releases. The operating rules for Itezhi-tezhi allowed for a release of water, a so-called freshet, for the specific purpose of flooding the downstream Kafue Flats for the benefit of fisheries. Besides a minimum flow of 40 m^3/s the rules proposed a discharge of at least 300 m^3/s over four weeks, usually in March. It is not clear however to what extent these freshets were released in the past and what the benefits have been.
Following severe droughts in 1991 changes were made to the operating regime of Itezhi-tezhi to take into account recurrence of droughts. In terms of flood dynamics the new rules were found to be an improvement, as a larger area is flooded in the wet season while on the other hand a larger area falls dry in the dry season. However, the regime was still far from mimicking natural flows and did not allow for a freshet release in the wet season.

The flooding regime from the Itezhi-tezhi dam is crucial to the Kafue Flats, an important wetland area directly downstream from Itezhi-tezhi. WWF has worked in the Kafue Flats for several decades and has come to realise that key to restoring the Kafue Flats is the management of water releases from the Itezhi-tezhi reservoir. Since 1997 Integrated Water Resources Management in the Kafue Flats has been part of WWF work in the flats under the Partners for Wetlands Project. This paper sets out how WWF has developed a partnership approach towards improving the water resources management in the Kafue Flats and changing the operating regime at Itezhi-tezhi dam. We will discuss lessons that can be learnt from this particular project and question what the role of WWF and other NGOs can be in promoting environmental flows and managed floods.

THE KAFUE FLATS

The Kafue Flats – ecology, land use and livelihoods

The Kafue River Basin is a major subcatchment of the Zambezi River Basin and lies entirely within Zambia. The basin covers only around 20% of the total land area of Zambia, but it is home to almost half of the country's population and there is a large concentration of mining, industrial and agricultural activities. The Kafue River originates in northwestern Zambia, from where it flows south to the Itezhi-tezhi storage dam (Figure 1). At Itezhi-tezhi the river turns east and passes through the Kafue Flats. Downstream of Kasaka the river drops steeply into the Kafue Gorge, after which the Kafue joins the Zambezi River.

Figure 1: Kafue Flats

The Kafue Flats is an extensive area of wetlands and floodplains along the Kafue River between Itezhi-tezhi in the west and Kasaka in the east, covering around 6,500 km^2. The land, as the name implies, is extremely flat, with a slope of less than 5cm/km. Consequently it takes up to two months for water to pass through the Kafue Flats. The Flats are recognised as a major wetland resource in ecological terms, with rare and endemic species such as Kafue Lechwe, *Kobus leche kafuensis,* and Wattled Crane, *Bugeranus carunculatus*. The Lochinvar and Blue Lagoon National Parks are

designated as Ramsar sites (Ramsar website). The Flats are equally important in socio-economic terms, supporting local industries such as cattle grazing, floodplain agriculture and traditional fisheries. Of these, cattle grazing is the one most important to local people and in the dry season herds of up to 4000 cattle use the floodplains. In the wet season most communities retreat from the Flats to permanent villages on the edge of and outside the Kafue Flats.
Under natural conditions the Kafue Flats were subject to a distinct flooding pattern. Water levels would start to rise in December, peaking in March at Namwala and in May at Nyimba. During the dry season the floods would retreat and by October the floodplains and seasonal swamps would usually be dry.

Hydropower Development
The area's natural water regime was radically changed after the construction of two dams in 1971 and 1978. Just upstream of the confluence with the Zambezi, there is a considerable drop of the river at the Kafue Gorge (400m in just 25km), which has been exploited for hydropower production since the 1970s. The electricity is utilised within Zambia in the mines of the Copperbelt and elsewhere, and is also exported to neighbouring countries.
The Kafue Hydroelectric Scheme involved two phases of construction. During the first phase the dam at Kafue Gorge was constructed in 1971, resulting in a reservoir of approximately 1,000 km^2 at its full capacity, and a 900MW hydropower plant was installed. Because of the geography of the Kafue Flats, the storage capacity of the reservoir was insufficient and a second dam was needed upstream to ensure a steady supply of river water. To this end Itezhi-tezhi storage dam was built upstream of the Kafue Flats and completed in 1978. The Itezhi-tezhi reservoir has a surface area of about 400 km^2 at full capacity. The Zambia Electricity Supply Corporation (ZESCO) operates both dams.

Impacts on the Kafue Flats
As with all dams, there are both positive and negative impacts for people and wildlife in the area. On the positive side there have been benefits for urban populations (electricity supply) as well as for commercial farmers for whom river regulation ensures a steady supply of water. However, many of the negative impacts of the dams are primarily felt by the communities downstream of Itezhi-tezhi who depend on the Kafue Flats for their livelihoods. Observed impacts include:

- Reduction of the available surface area of grazing lands: This is due to several reasons, including changing vegetation patterns (invasion by inedible shrubs as land is no longer flooded) and permanent inundation of grassland in the western Flats.
- Reduction of available lands for crop production as a result of loss of moisture retention that would have followed floods. Water releases from the dam also affect riverbank crop cultivation.
- Increases in cattle disease have been observed and linked to increased presence of ticks, as they are no longer washed away during floods on a yearly basis. There have also been increases in other pests, most notably in the population of rats
- Reductions in fisheries, partly caused by loss of fish breeding grounds, but likely to be exacerbated by unsustainable fishing methods. It has been reported that part of the fisheries community has migrated away from the flats as livelihoods have become unsustainable.
- The population of Kafue Lechwe, an endemic species of antelope, has declined by more than half following construction of the dams from around 90,000 in the 1970's to just over 37,000 by 1998 (CEH, 2001). Part of this decline can be attributed to the dams as habitats have decreased, but it is likely that increased poaching has also contributed to the decline.

As indicated above, the dams are likely to have contributed to these negative impacts, but there has been very little evidence as to how much damage is done by the dams and how much by other causes.

IMPROVING DAM OPERATION AT ITEZHI-TEZHI – A PARTNERSHIP APPROACH

Improving dam operations

Increased awareness about the relationship between the operation of Itezhi-tezhi and impacts on the Kafue Flats coincided with an increased awareness globally about the potential for river restoration using environmental flows and managed flood releases. A project by the UK Centre for Ecology & Hydrology on managed flood releases in 2000 assessed the effectiveness of the managed flood releases from Itezhi-tezhi and concluded that insufficient studies had been conducted to ascertain the extent to which the ecology of the Flats has benefited from the managed flood releases, but that it was likely that without the floods, the degradation of the ecosystem would be generally worse. It was also recommended that the operating rules of Itezhi-tezhi and Kafue Gorge dams should be reviewed and to study the possibilities to modify the operating rules to further mitigate the negative environmental and social impacts of the dams (CEH, 2001).

WWF in the Kafue Flats – from nature conservation to water management

WWF has worked in Zambia for more than 30 years and involvement with the Kafue Flats started in 1986 with the WWF Zambia Wetlands Project which was developed together with IUCN and the National Parks and Wildlife Services. The project aimed to link floodplain wetlands management with human socioeconomic development at the local and supra-local community levels (Jeffery, 1993). Project activities were integrated into the National Parks and Wildlife Service as routine functions, and handed over to government in July 1995. WWF involvement in the Kafue Flats continued though and from 1997 wetlands management in the area became part of the Partners for Wetlands project.

This project was initiated by WWF Netherlands and aims to achieve wetland conservation and restoration through the development of field projects by establishing partnerships with both traditional and non-traditional partners from organisations, business, governments and local communities. Besides the Kafue Flats, there are Partners for Wetlands projects in China, Malaysia, Brazil and the Ukraine. The Partners for Wetlands strategy is to find workable solutions for more natural wetland systems that support sustainable development of agriculture, fisheries, industry, water supply, tourism and recreation, to forge coalitions with investment partners and to communicate the results within and outside the WWF network. Through communication and dissemination, these field projects can serve as examples for magnification to other areas within or outside the region where the project is situated. Partners for Wetlands is currently in the third renewal phase, which is set to last till mid 2007.

Implementation of the Partners for Wetlands Project in Zambia started in April 2000. One of the proposed components of the project was “Integrated water management for the Kafue Flats”. The project goal for this component was described as “the establishment of a water management in the Kafue Flats, that is acceptable to all land and water users, and thus minimises threats to the environment, conserves wetlands and permits new options for development of wetlands.”

It was soon realised that the water management component was the key to the success of all conservation activities within the Kafue Flats. Thus it was decided to intensify work on this component, which is further known as the Kafue Flats Integrated Water Resources Management Project.

Building relationships for change

Dyson et al (2003) argue that to gain the necessary momentum to establish an environmental flow regime, many actors will need to be involved, ranging from high government levels to communities and businesses. This is borne out by experience of this project, which to this day engages with stakeholders at all levels. Early in the project though, the critical factor for success in modifying

water management at Itezhi-tezhi was identified as the support of the dam owner and operator ZESCO. As a conservation organisation, WWF up to then had no relationship with ZESCO.

In the first stages of the project (1999 – 2000) WWF focused attention on developing a relationship with ZESCO, whilst at the same time exploring the possibilities for Integrated Water Resources Management for the Kafue Flats. However, because of the nature of ZESCO as an organisation (profit making, focused on maximising power production) establishing a working relationship with ZESCO proved challenging. Cooperation with ZESCO was mostly with the newly established Environmental and Social Affairs Unit, which was also working on a proposal with similar objectives. To facilitate cooperation WWF Zambia chose to align their work as much as possible to ZESCO policies and expectations. This strategy appeared to bear fruit when in the first half of 2000, written consent was given by ZESCO to form a partnership with WWF on Integrated Water Management of the Kafue Flats.
By October 2000 a Draft Project Proposal on integrated water management for the Kafue Flats was completed. Both the hydrology and environment units of ZESCO were involved in the development of the proposal. This was followed by a workshop (19 October 2000) at which many stakeholders agreed on the importance of developing IWRM in the Kafue Flats. ZESCO however still had reservations about the direction of the project, and in the end could not agree with the proposals for a partnership and decided to withdraw its participation.

Modelling environmental flows
Following the setback of ZESCO's withdrawal from the process, WWF decided to intensify its efforts on the project, rather than stepping back. One possible factor contributing to the initial problems in establishing a partnership was the fact that WWF could not yet assure ZESCO that improved environmental flows would bring benefits to the Kafue Flats, without affecting the productivity of ZESCO. This knowledge gap was addressed by the development of a new model to simulate the hydrodynamic behaviour of river flow and flooding. The KAFRIBA (Kafue River Basin) model was developed by DHV consultants from the Netherlands and was based on an earlier model by DHV for the 1978-1980 Kafue Flats Hydrological Study. This model, RIBASI, simulated the hydrodynamic behaviour in the riverbed, the flooding of the Kafue Flats and overland flows. The Kafriba model is an updated version of the RIBASI model, and can predict water levels in the reservoirs and the hydrodynamic flooding patterns for different release scenarios. The model also includes a simulation of the natural situation, without the presence of the dams.
The study found that for mimicking the natural situation, more water should be released from Itezhi-tezhi during the months of January and February. Also, new operation rules should be supported with improved prediction facilities about the upper Kafue catchment and inflows into Itezhi-tezhi Reservoir.
The involvement of DHV consultants not only provided the scientific basis for continuing to pursue a relationship with ZESCO, it also constituted a new point of entry for discussions with ZESCO as the two organisations had worked together in the earlier hydrological studies in the Kafue Flats.

Developing a Basin strategy
Parallel to the modelling work, WWF together with DHV and the government developed an Integrated Water Management Strategy for the Kafue Flats. The strategy was completed in June 2002 and fully endorsed by the Ministry of Energy and Water Development (MEWD). The strategy, which was publicly launched by the MEWD, identified four main areas of concern:

- Water management issues: water quantity and supply, flood management, water quality
- Nature conservation issues: flood releases, invasive species, over-exploitation of natural resources, deforestation
- Community Based Natural Resource Management issues: socio-economic concerns, settlements and land tenure, community participation and awareness

- Legal and institutional framework issues (MEWD, 2002)

The strategy that was developed set out objectives for each of the above, as well as for monitoring and evaluation. The time frame of the strategy covered 30 years, divided in a short-term implementation (2003-2005), medium term (2006-2010) and long term (2011-2033). It was recommended that the strategy be housed within the Department of Water Affairs (DWA)[1]. In the short term, emphasis would be on creating a foundation for Integrated Water Management, rather than on large-scale investments. Important projects in this time frame would be development of baseline information and establishing sustainable water management systems.

Forming a Tri-partite partnership

During the first project stages WWF had further developed its existing relationships with the Department of Water Affairs within the Ministry of Energy and Water Development, and WWF was able to build on this relationship effectively during the next project stages. An important link between the two organisations was formed through the secondment of a DWA staff member to WWF as project leader for the IWRM project. The presence of staff with knowledge of both organisations turned out to be a very effective way to facilitate cooperation.

However, for successful implementation of the strategy, the project still needed support from the dam owner and operator. Following the successful modelling work and the development of a strategy for the Kafue Flats, WWF Zambia set out to broker a new agreement between ZESCO, the MEWD and WWF. Although ZESCO is a parastatal company, it operates to a large extent autonomously from the government. On its website ZESCO describes its relationship with the government as being at 'arms length' (www.zesco.co.zm viewed 11 August 2004).

The process of developing this so-called Tripartite Agreement was one of continuous negotiations, often done informally meaning there is little documentation of the process. These negotiations eventually resulted in the signing of a Tripartite Agreement by MEWD, ZESCO and WWF in July 2003. Under the terms of the agreement partners committed to the implementation of IWRM in the Kafue Flats, with WWF providing most of the project funding and ZESCO and MEWD contributing in kind.

Based on discussions with different stakeholders involved in the process, the following factors that contributed to achieving a Tripartite Agreement can be identified:

- Internal culture change within ZESCO: since the establishment of an Environmental and Social Affairs Unit within ZESCO in 1996, ZESCO had started to actively look into solutions to some of the environmental problems they encountered. In the period 2002/2003 ZESCO conducted a Strategic Environmental Impact Assessment of the entire Kafue Basin, which identified water management in the Kafue Flats as a key priority. The fact that the problems were flagged in a report by the electricity industry itself, helped to put the issue on the ZESCO agenda.
- Support from DWA: The relationship between WWF Zambia and the DWA predated the IWRM project. In the first phase, WWF obtained full endorsement from the MEWD and DWA for the strategy and this could be used in negotiations with ZESCO.
- Scientific Basis: In the first phase it was scientifically demonstrated that a change in operating regime that would benefit nature would not affect electricity production in the Kafue Gorge Dam. This alleviated fears on the part of ZESCO that changes would affect their priorities, and made them more open to the project.
- Personal networks of key actors: The fact that key actors in the negotiations had excellent personal contacts and networks with ZESCO and DWA respectively (as they had previously worked for these organisations) was an important factor in maintaining lines of communication.

[1] The Department of Water Affairs (DWA) is the level at which most of the co-ordination and co-operation has been undertaken. It is part of Ministry of Energy & Water Development (MEWD), which is signatory to the formal agreements.

- DHV involvement: The fact that DHV already had worked with ZESCO in the past also contributed to a successful outcome.

Implementing environmental flows

Following the Tripartite Agreement work on improving the environmental flow regime at Itezhi-tezhi accelerated. Three key areas of work have now been completed or nearly completed (MEWD, 2004).

- Review, design and implementation of the hydro-meteorological network. The IWRM project has developed data transmission, storage and processing protocols that are based on existing structures and databases. Upgrading of communication networks will allow for a quasi real time data exchange from the network on a daily basis. Resources for upgrading of the system were found by WWF, whilst DWA, ZESCO and Zambia Meteorological Department (ZMD) have made commitments in terms of staffing and monitoring.
- The KAFRIBA model was extended to include forecasts on the inflows into the Itezhi-tezhi and Kafue Gorge reservoirs. The forecasting of inflows is based on a Rainfall Runoff Correlation Analysis, using the Pitman model, which is well established and widely used in Southern African catchments.
- Improving dam operation rules in order to mimic the natural flooding pattern. A freshet mimicking the natural rising and declining curve was found to be best suited to ecological requirements. This strategy allows for a more gradual flooding and recession (rather than 'flash-like'), of an extensive duration. The freshet achieves the smallest flooded area of all considered freshet types, but it is considered that the gradual flooding and longer duration outweigh this disadvantage. The new operation rules also allow for freshets of different values, depending on the extent of rainfall in a given year. Rainfall also influences the timing of the freshet release: in a wet year the freshet can start in January or February, in an average year the freshet can start in February or March and in a dry year the freshet can only start in March.
- Institutional and legal reform. At the start of the project there was no adequate legal and institutional framework to provide guidelines for the management of water resources in the Kafue Flats sub-catchment. At the time about 13 institutions in the flats carried out functions mandated by law. Work is now ongoing on the establishment of a Sub-catchment Council for the Lower Kafue Catchment Area.

The Tripartite Agreement was extended from May 2004 to May 2005. Presently there is no formal arrangement between the partners.

Community involvement – the Dialogue Project

As high-level negotiations on improving water resources management in the Kafue Flats continued, consultation with local communities did not receive as much attention as perhaps should have been the case. At times the attitudes of local people to the project (as well as WWF) were described as hostile and suspicious (Personal communications, Nsongela, Mapani & Musiwa). The deterioration of relationships between the project and local communities led to the realisation that the IWRM project had been focusing too much on the technical and institutional aspects, overlooking the importance of building relationships with local communities. It was eventually decided to incorporate this social angle through linking in to the Dialogue on Food, Water and the Environment.

The Dialogue on Food, Water and Environment aims to improve water resources management, by bridging the gap between food and environmental sectors through open and transparent dialogues and knowledge sharing. The project is a cooperation of 10 international institutions, including WWF. The Dialogue was started in the Kafue Flats in 2003 at WWF's instigation in a response to plans to develop large-scale irrigated agriculture in the Kafue Basin. The Dialogue was aimed at increasing food security in the Flats and it was felt that this aim would be better reached by improving water management, rather than by large-scale agriculture.

Under the Kafue Dialogue a great number of activities were implemented, including:

- A simulation study to establish fish and pasture productivity under the new flooding regime brought about by improved water resources management.
- A baseline study on the socio-economic benefits of fish and pasture productivity in the Flats.
- A study on the socio-economic benefits arising from improved fish and pasture productivity under improved water resources management
- A study on the Kafue Flats Communities' view on irrigation as a strategy for attaining food security.

The studies concluded that local communities favoured small-scale community level irrigation projects rather than the planned large-scale developments. Communities feel that the flood plains should be reserved for animal grazing and welcome the restoration of the natural flooding regime (WWF, 2005). Besides the studies, large amounts of time were invested in holding dialogue meetings with communities in the flats to try and win support for the IWRM project. Today, the Dialogue is well established and people in the Kafue Flats are now much more aware of the role of water management for their livelihoods. Support for the improved regime at Itezhi-tezhi is now widespread.

Project funding

One of the major obstacles of developing a new operating regime at Itezhi-tezhi was funding. With ZESCO and MEWD able to only contribute in kind to achieving the project targets, it fell to WWF to mobilise the funds required for the modelling work, the upgrading of monitoring systems and the development of institutional frameworks. Funding for the first phases were provided by Wetlands International and WWF Netherlands and amounted to €186,000. Funding for the final phase was much harder to find as the highly technical work required substantially higher budgets, exceeding €500,000. Funding was eventually secured by WWF Netherlands and both ZESCO and MEWD have indicated that this successful fundraising by WWF has been decisive in ensuring the success of the project.

CONCLUSIONS

The project today

With the launch of the new operating regime on 28 May 2004 the second phase of the IWRM project in the Kafue Flats was officially completed. A year on from this point, work on implementing the decision making tool and upgrading the hydro-meteorological data collection is still ongoing under the Partners for Wetlands Project. Work on the Kafue Dialogue is also continuing. The first wet season following the development of the new operating regime was looked forward to with great anticipation, by the project team as well as by local communities. Unfortunately the 2004/2005 turned out to be a dry year. Subsequently no freshet has been released this year, causing disappointment all around.

At the project level work continues on upgrading the hydro-meteorological measuring systems, as well as on the Kafue Sub-Catchment Council and communication of this work to enhance management of the whole Zambezi Basin. At community level the fact that no freshet has been released is a particular setback for maintaining local support. The Dialogue had made great progress in demonstrating the benefits of the new operating rules to communities, but without the freshet actually happening there is a noticeable dip in confidence from the communities in the project. WWF is committed though to support work with ZESCO until new operating rules are fully adopted and put into practice. WWF is also involved in establishing a long term monitoring programme with a number of partners and including the University of Zambia.

Lessons learnt

The Integrated Water Resources Management for the Kafue Flats is WWF's first experience of developing a managed flood release at an existing dam in Africa. WWF has played a very proactive role in improving dam operations at Itezhi-tezhi and has worked on a multitude of levels. Broadly speaking the role of WWF consisted of two major parts: firstly as a catalyst for change, motivating stakeholders and providing incentives for implementation of change, and secondly as a mobiliser of resources, raising funds for the technical implementation.

As can be seen from this account of the project there has been a steep learning curve and a number of valuable lessons can be learnt from this experience. Most importantly:

- A clear consensus on the nature and extent of environmental and social impacts caused by the dam is needed before starting the process. Unfortunately this was not the case for the IWRM project.
- To engender support from the dam owner or operator, it is beneficial if it can be clearly and scientifically proven that a new operating regime can be implemented without affecting productivity of the dam. However, it is likely that at most other dams there may be certain impacts on productivity, and here the process will need to include an assessment of what levels of change are acceptable to the owner or operator or how a reduced output is compensated.
- Local communities should be involved from the start of the process. Care needs to be taken that community engagement and information dissemination is culturally appropriate and that the raising of unrealistic expectations is prevented
- The technical aspects of developing a flooding regime are very costly. Although in this case WWF was able to mobilise resources, it is not likely that NGOs will be able to secure funding of this scale for many future project. However, once the improved regime at Itezhi-tezhi is demonstrated to achieve the expected environmental, social and economic benefits, this may make it easier in the future to raise funds.

And finally, the process of improving dam operating rules to benefit livelihoods and the environment is a long one and requires commitment of staff time and resources over an extended period. This project has taken 6 years sofar and over the next 2 years WWF will stay involved to see the new practices fully incorporated within ZESCO.

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