

Concurrent Thematic Session (Industry): Do green policies ensure green projects?

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Title: ‘When Green is not Green: A case study of the proposed Malagarasi Hydro Power Project

Authors: Vanessa Hovland, Charlotte Bingham and Jonathan Nash¹

The proposed Malagarasi Hydro Power project, an 8MW, run of river facility in a remote location of northwestern Tanzania was one of several energy-related projects included in the 2008 grant financing agreement between the Government of Tanzania and by the Millennium Challenge Corporation (a US aid agency). It was chosen, in part, because, MCC considered the project to be a "green" and sustainable alternative to meet local energy needs, based on available information. However, initial environmental analysis showed that several aquatic species endemic and unique to the hydropower site could be at risk. This paper provides a summary of the intense investigations and deliberations that were undertaken to determine if and under what conditions the project could proceed with donor financing. The case study presented here raises several wider questions applicable to a range of projects which are discussed in this paper, such as;

- Is the risk of biodiversity loss worth the gain of clean, renewable energy?
- How should donors weigh the risk of biodiversity loss against social development needs in communities that are poor, have no reliable electricity, and need power for development?
- What level of information and assessment is required in the case of unique, endemic species to make an informed decision?

In addition to the questions raised above, this case study illustrates how a robust ESIA with relevant terms of reference is essential to identifying issues early in the development process. A well-executed ESIA is invaluable to making good decisions and can mean a project with highly adverse consequences does not go forward.

Background

The United States of America, acting through the Millennium Challenge Corporation (MCC), and the Government of Tanzania (GoT) signed a Compact (grant agreement) in February 2008, to provide funding of up to \$698 million to the GoT. The Compact includes projects in the transport, energy and water sectors that are designed to reduce poverty through economic growth by increasing productivity and raising incomes. The Millennium Challenge Account-Tanzania (MCA-T) is the GoT agency tasked to execute the program.

One of the energy projects proposed was an 8MW run-of-river hydropower plant on the Malagarasi River along with transmission lines to supply more affordable and reliable electricity to Kigoma and surrounding towns of Kasulu and Uvinza in north western Tanzania. The proposed project, located at Igamba Falls (see Figure 1) is the first of three proposed hydropower plants located over a 10km stretch of the Malagarasi River designed to generate a total of 24 MW of electrical power. MCC agreed to fund the Igamba Falls plant because of its potential to benefit an area suffering from a lack of reliable and cost effective electricity, which was impeding economic development, and also because it was viewed as an appropriate “green project” investment.

Figure 1 Malagarasi River – Tanzania, RBA Survey Locations

¹ Vanessa Hovland is an Environmental Consultant at Mott MacDonald, UK. Charlotte Bingham is the former Senior Director for Environmental and Social Assessment at MCC and currently a consultant. Jonathan Nash is Director of Environmental and Social Assessment at the Millennium Challenge Corporation (MCC).



In recent years there has been resurgence in funding of hydropower projects by international lending agencies. As a relatively small run of river scheme, the project risks were thought to be manageable (both in terms of project completion and potential environmental and social impacts). However, information that came to light in 2008, after the Compact was signed, revealed significant constraints to developing the project at all, and certainly as a “green” solution in accordance with MCC environmental and social guidelines. MCC discovered that a group of scientists led by Dr. Ellinor Michel of the Natural History Museum, London, had conducted a biodiversity study of the Malagarasi River, including Igamba Falls in 2004. As a result of the study, several new aquatic species were discovered, some of which were believed to be endemic to the Igamba Falls area, namely two fish species (a catfish and a cichlid), and a snail.

As with all MCC Compacts, the Tanzania Compact has a five-year time constraint for completion. Thus, because all the investments must be completed by September 2013, there was a significant time constraint in executing the Malagarasi Hydro-power investment. For this reason, MCC needed to make a decision whether to follow through on its commitment to the GoT to provide funding for the Malagarasi investment by November 2009 (the date by which bidding documents for construction needed to be released in order to complete the project by 2013).

Environmental Studies and Assessments

An initial environmental and social impact assessment (ESIA) had been undertaken for the project in 2007-2008 by an international consultant on behalf of the national electricity operator TANESCO. This ESIA (August 2008) was found inadequate by the National Environment Management Council (NEMC) in Tanzania. MCC and MCA-T had reached similar conclusions prior to the formal NEMC rejection. By the end of 2008, MCA-T had contracted a different international engineering consultant whose contract included detailed feasibility studies, conducting a baseline aquatic survey at Igamba Falls and producing a comprehensive cumulative Environmental and Social Impact Assessment (ESIA) for the project in line with MCC environmental and social guidelines and GoT requirements.

The objective of the new ESIA was to provide a robust assessment of the Igamba Falls hydro project as well as consider the cumulative impacts associated with the full development of the other two proposed, but yet to be funded hydro plants on the Malagarasi River. MCC considered the examination of cumulative impacts to be critical, given that the development of Igamba Falls project together with transmission and distribution and associated infrastructure would reduce the risks and costs of the two other hydro projects to any future developers, making their development more likely. Regrettably, the terms of reference of the cumulative ESIA contracted for in late 2008 had not called for the extensive surveys and analyses necessary to a scientifically sound examination of impacts on endemic species (in particular new species found at Igamba Falls) and development of appropriate mitigation.

MCC determined in early 2009 that key biodiversity questions raised as a result of Dr. Michel’s findings required specialised expertise. This led to the decision to separately fund (outside the compact agreement with GoT) a Rapid Biodiversity Assessment (RBA). The RBA scope was to provide a baseline assessment of the three new species (target species) discovered by the Michel study within the lower Malagarasi River and to answer the questions, did these species exist anywhere else, were they unique to Igamba Falls and, if so, could they survive the building and operation of a hydropower facility?

The key objectives of the RBA were to establish:

- the presence/absence of target species outside the Igamba Falls area;
- target species distributions within the lower Malagarasi River; and
- the relative importance of Igamba Falls site to viability of populations of target species.

To gain a holistic ecological perspective, aquatic insects would also be sampled (specifically dragon- and damselflies) and tissue samples of a range of aquatic fauna taken in the field for genetic and isotope analyses. The genetic analyses would provide a more detailed perspective on the biodiversity within the Malagarasi and an insight into population separation in the recognized species. The isotope analyses were expected to contribute to an understanding of the functioning of the Igamba ecosystem and provide insights into potential impacts on target species and the challenge of mitigating those impacts. The execution of the RBA faced several constraints;

- limited time frame within which MCC had to make an informed decision on their continued funding of the hydropower project;
- remote location of the site and difficulty of access; and
- requirement to wait for dry season river flows (August) to undertake surveys

Significant preparation lasting approximately three months was needed prior to commencing field work; this included purchasing and shipping scientific equipment and camping supplies, arranging permits to undertake field work and export specimens, and arranging suitable transportation. This preparation plus adding a medical doctor to the investigation team was essential given that the field work had to be undertaken over a brief period of one month covering 150 km of river, walking and diving within the river, visiting some locations by helicopter, and setting up camp, including a field lab, in several locations. Because the field work was pushed back to the latest date possible to allow river flows to reduce to a safe level, while at the same time meeting MCC's deadline for decision making, there was no room for extending RBA survey or returning to undertake additional work.

RBA Survey Results

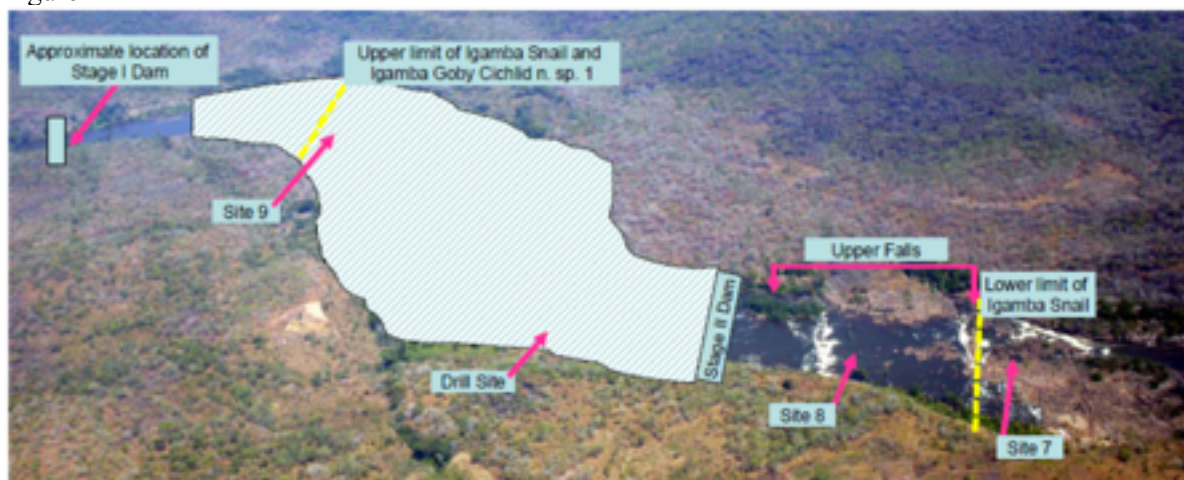
The RBA team was composed of taxonomists and an aquatic ecosystem scientist who were specialists in East African species. A number of the RBA team were also part of Dr. Michel's original survey team in 2004. This continuity of expertise with first hand experience in the area meant that the RBA was able to obtain important results in a short period of time by targeting the field work. Based on their existing knowledge of the river basin and other river basins in the area, they were able to say with certainty that certain of the target species were endemic specifically to the Lower Malagarasi, which eliminated the need to survey other rivers within the basin to confirm presence/absence of the target species.

The RBA survey confirmed the presence of 62 fish species (compared against existing taxonomic data from previous surveys of the river as well as new species not previously listed); species abundance in the Igamba Falls area was much higher than elsewhere particularly for species suited to fast flow conditions. One of the target species which the field work focused on was the Igamba Goby Cichlid (*O. n. sp.*); based on superficial morphology observed in the field, it was assumed that this species had a distribution extending outside the project area of impact. However, DNA analysis undertaken in the lab demonstrated that this was in fact two species, one of which had a distribution almost exclusively within the project area of impact. Similar results were found while completing DNA analysis for the molluscs surveyed, indicating that what was thought to be one species (*Lanistes ovum -complex*) based on observations was in fact two.. Taxonomic work is continuing for the formal description of these species. The isotope analysis proved invaluable to identifying and providing an understanding of the ecosystem processes, in particular the sources of food, which supported the species and therefore enabled a more robust assessment of likely impacts resulting from the project. Unusual plant species were also found, but their endemism has not been established.

The key conclusion of the RBA fieldwork and subsequent analysis was that Igamba Falls is unique from an environmental perspective. Its geology and geomorphology is highly unusual—fractured strata in slightly soluble calcareously bound sandstone are riddled with scour and solution holes. This phenomenon provides connections for subsurface water flow. Its fauna are unique; water chemistry in the Igamba Falls area differs from that upstream and downstream, and productivity is substantially different from any other site in the lower Malagarasi River. The RBA team findings suggested that that the physical, biological, and chemical

character of Igamba Falls would be fundamentally changed by implementing the dam proposal, and that mitigation measures had not been sufficiently specified or evaluated (see Figure 2 for illustration of impoundment).

Figure 2



The risk of extinction for at least two species (Goby Chichlid and Igamba snail) and potentially others was considered to be high. During the 3-4 month dry season, the majority of river flow (other than a compensation flow) would be impounded behind the weir and diverted on a periodic (24 hour) basis through channels to an on-shore hydropower plant. Plans called for the water to then be redeposited in the riverbed about 1/3 of a mile downstream of the weir. This would have the effect of significantly dewatering approximately 600 meter long stretch of the river, including the entire Upper Igamba Falls, during the dry season. The extent of the area would vary depending on the quantity and location of any environmental release (compensation flow) from the weir. But a sufficiently high compensation flow to ensure survival of the species at risk would have resulted in approximately 2-3 months of limited to no power generation.

Decision Making Process

In order to ensure an open and informed discussion on the project impacts and risks, MCC established an Independent Advisory Panel (IAP), comprised of international and Tanzanian environmental scientists, to provide expert, internationally recognized, and independent environmental review and advice related to the development of the Igamba Falls Hydro Power Project. The IAP reviewed and commented on the results and findings of relevant documentation associated with the project, in particular the Environmental and Social Impact Assessment, Rapid Biodiversity Assessment, as well as hydrological data and engineering designs. The overall objective of the IAP was to focus on gaps in analysis, key issues, and recommendations regarding whether and how to proceed with the investment. A specific objective of the IAP was to recommend whether and how the project could be developed without irretrievable loss of critical natural habitat to the target species, and how mitigation measures could be designed, implemented and monitored, should the project go forward. The IAP met over a period of two days in September 2009.

The IAP deliberations and report proved to be an invaluable tool in identifying the merits / drawbacks of the project as well as highlighting the importance of different value judgements in this type of decision making. Three scenarios were considered by the IAP and recommendations and impacts of each situation addressed; 1) conditions under which the project could go ahead as planned; 2) recommendations should there be the possibility to re-conceive the project 3) implications of withdrawing funding for the proposed hydro scheme.

Thirteen likely significant impacts were identified by the IAP should the project go ahead as currently planned. Recommendations were made as to what steps and studies would be required to enable the project to move forward in a sustainable manner, with the IAP emphasising that Igamba Falls required special consideration due to its unique ecological, geological and hydrological characteristics. Over a period of two days, the IAP converged on the view that based on project design and environmental baseline data available the project should not go ahead without significant additional work, because the project would alter or destroy

critical habitat. This would have meant that the timeline within a five year Compact period could not be met and project costs would have considerably increased. For example, a different and longer construction technique would need to have been considered to allow some partial survival of the species; at least one more year of studies would be necessary to see if the affected endemic/unique species could be removed from their immediate habitat and conserved ex situ, for future re-introduced post construction within the system.

The findings of the RBA, recommendations of the IAP, and the perspectives of key GoT officials that the project should go forward despite environmental concerns were deliberated internally and presented to MCC Senior Management in October 2009. A key issue for MCC was the requirement within its creating legislation that prohibits the use of MCC funds to finance projects that are “likely to cause a significant, environmental, health, or safety hazard.” MCC management was challenged by the fact that there was no precedent for interpreting this part of the legislation or clear guidelines on what constitutes a hazard. However, MCC senior management quickly determined that it could not continue with its plans to finance the Igamba Falls hydro power project in light of the potential for the project to lead to the certain extinction of between two and five newly discovered species, and the unknown cost and efficacy of proposed mitigation measures. However, by recognizing biodiversity issues and making such a decision, it is not surprising that the decision was viewed by some in Tanzania as “snails being more important than power and development.” All the more so, because none of the species appear to have economic or cultural value. Some concluded that that development and poverty reduction were sacrificed on the altar of biodiversity.

But the decision has definitely led to consideration of more alternatives, many of which may provide additional and more reliable power at a lower economic and environmental cost. Currently MCC is exploring with the GoT other options for power development to meet Kigoma’s short and long term needs, including investments in repairs to the current power infrastructure to reduce losses and create more efficient networks, solar energy, and hydro investments in less environmentally sensitive areas.

Conclusions and Lessons Learned

The process instigated by MCC to investigate the project was partly as a result of the lack of baseline data available within the existing ESIA. Given the sites remote location and limited existing scientific knowledge in the area, this proved to be a significant hurdle in adequately assessing impacts as well as defining relevant mitigation measures. ESIA undertaken in countries such as Tanzania that are considered to be mega-biodiversity countries where little of the countries biodiversity has actually been surveyed, should specifically take into account the requirement for a number of specialists baseline surveys that would not normally be considered in other contexts. Given often short time frames available and often requirements to work within a certain season, a rapid biodiversity assessment comprising of a multi disciplinary team of specialists is an extremely productive and effective tool in obtaining a significant amount of data within a short period of time. In addition the results of the isotope and DNA analysis illustrated how field observations may only provide a small part of the picture. In especially complex environments such as that found at Igamba Falls this case study has shown that it is necessary to go further in understanding the baseline ecology in to make informed decisions and identify relevant mitigation measures.

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