

An Analysis of the Mphanda Nkuwa Dam Project Against the World Commission on Dams (WCD) Guidelines

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Abstract

The World Commission on Dams (WCD) was a global multi-stakeholder review evaluating the impacts of large dams.¹ Basic guidelines in the form of seven strategic priorities, intending to decrease the common risks and problems associated with large dams, were developed. These seven strategic priorities were used in analyzing the proposed Mphanda Nkuwa Dam project on the Zambezi River in the Tete province of Mozambique.

Based on the feasibility study and available documents,² the Mphanda Nkuwa project fails to fully adhere to any of the seven strategic priorities. Needs assessments indicate a clear need for rural electrification, a necessity the project does not intend to provide. Affected communities are not involved in the decision-making process and have unacceptably low levels of information. The options assessment only includes other possible dams, and no alternative options such as solar, wind, geothermal, natural gas or demand side management (DSM) are mentioned. The project does not address the problems caused by existing dams and further exacerbates these problems. In the case of sustaining rivers and livelihoods it is clear that the project will further damage the already ecologically fragile lower Zambezi River system and delta.

There is also a clear economic risk linked to the project. South Africa is to be the main consumer of the electricity in the region. However it has a projected surplus until 2007. This figure does not include projects currently in the pipeline. Energy savings through demand side management (DSM) alone are calculated to be well over 7000MW. This surplus in the region could be further exacerbated if the plan for a Southern African Power Pool (SAPP) supplied by 39 000MW of power from the Grand Inga project on the Congo River is realized.

The Mphanda Nkuwa project has to be reassessed using WCD guidelines in order to decrease the apparent risks. At present there is no significant compliance with the WCD report. The costs of the proposed Mphanda Nkuwa Dam are far too high for the projected benefits and the major problems, such as rural electrification, are not being addressed.

Introduction

The WCD was an independent body whose 12 prominent members represented different perspectives involved in the large dams debate. The Commission conducted the first-ever comprehensive evaluation of the impacts of large dams. The WCD report

¹ For the full report, *Dams and Development: A New Framework for Decision-Making*, see <http://www.dams.org>.

² Publicly released documents of the proposed Mphanda Nkuwa Dam, including the 1999 feasibility study, are available on the government website at <http://www.utip.org.mz>.

recommends that all water and energy projects should be based on a balanced assessment of needs and options; that all decisions to build dams should have the agreement of dam-affected communities; and that optimizing existing water and energy facilities should have priority over building new projects.

The implementation of the WCD guidelines is of vital importance in decreasing the risks imposed by large dams and is a vital tool for highlighting the risks, strengths and weaknesses of a given project.

The Mphanda Nkuwa hydroelectric Dam is to be built on the Zambezi River in Mozambique, 70km downstream from Cahora Bassa Dam. It is to cost the Mozambique government around US \$2 billion and produce a maximum of 1300 MW of electricity. The project is presently at the investigative studies stage (stage 2a), which includes needs assessment (stage 1) and selecting alternatives (stage 2). In this report, we analyze the project using the WCD's seven strategic priorities, relative to these stages.

WCD Strategic Priority 1: Needs Assessments

The WCD calls for a “needs assessment” to validate the requirements for electricity or water at a local, regional and national level. “In countries where a large proportion of the population does not have access to basic services, a key parameter in the validation process should be the extent to which basic human needs will be met.”

In the case of Mphanda Nkuwa, public verification of the needs for energy services at the national or local level is not known to have taken place. Currently there is no national need for so much grid-based power (the dam is expected to produce 1300MW). The Mphanda Nkuwa feasibility study touches on the needs for electricity at the local level through its description of the area's economic and social situation. The situation in Mozambique is that less than 5% of the population has access to electricity, and most of these are rural people far from the national grid. It is clear the Mozambique needs to emphasize decentralized rural electrification rather than large-scale grid-based power.

The project's promoters, however, do not claim that Mphanda Nkuwa will be a source of significant rural electrification. Instead, the power produced is directed towards export and domestic energy heavy industries.

As for meeting local energy needs, alternatives such as solar, wind and bagasse have been shown to be more cost effective in meeting rural energy requirements and have the added benefit of being more environmentally friendly. Furthermore, Mozambique has been shown to have extensive gas reserves, another potentially viable option for rural energy.

At the national level, the Cahora Bassa Dam, located around 70 km upstream from the proposed site of Mphanda Nkuwa, already produces a large surplus, which could be used for Mozambique's urban and industrial needs. Cahora Bassa has a projected capacity of 2075 MW and Mozambique has a further 204 MW from thermal power plants of which 124 MW are dependable. This energy is more than sufficient for Mozambique's present needs and could be redirected to supply new industrial users.

Mozambique's current estimated consumption is only around 250MW, less than 20% of Cahora Bassa's production. This doesn't include the aluminum smelter, Mozal, which currently requires around 450 MW of electricity and will need a further 450 MW once the second phase is complete (the smelter is expected to be fully operational by March 2004). However this electricity is being supplied through a long-term contract with South African power utility Eskom, which is among the top three cheapest electricity utilities in the world.

Without a national market for Mphanda Nkuwa's power, South Africa apparently would be the biggest importer of hydroelectric power from Mphanda Nkuwa. However, South Africa has a projected surplus of electricity until 2007. This projected date does not include potential savings from demand side management (DSM) which have been calculated by Eskom at well over 7,000 MW. Saving energy through DSM could serve South Africa's energy needs well into the next decade.

A second possible market is the Southern African Power Pool (SAPP), which is planned to supply the whole of Southern Africa with electricity through a common grid system. However, other options have been proposed for the SAPP energy pool, which could make Mphanda Nkuwa unnecessary. The most favored option at present is the Grand Inga project on the Congo River, which is projected to produce 39,000 MW of power. This project alone would place a huge surplus on the SAPP energy pool.

The present situation of Cahora Bassa can serve as a good example of the problems of supplying a glutted market. Cahora Bassa sells its hydroelectric power to South Africa at well below the market price (2c to 3.9c South African cents, three times less than the market value of the dam's electricity). Eskom is able to keep the price so low because of its surplus of electricity. This poses serious questions about the economic viability of Mphanda Nkuwa.

WCD Strategic Priority 2: Gaining Public Acceptance

The WCD says a prerequisite for successful projects is that "stakeholders participated in the project design and the negotiation of outcomes that affect them" and recommends that "access to information, legal and other support [must be] available to all stakeholders." The WCD also gives great importance to indigenous and tribal people, stating, "indigenous and tribal peoples give their free, prior and informed consent to the inclusion in the development plan of any planned option that would potentially affect them."

In the case of Mphanda Nkuwa, all options were chosen and assessed by the project proponents without participation from stakeholders and with no mechanism for negotiated processes established. There was a baseline household and community survey in which the residents of the reservoir area participated and an investigation into mid-merit power generation (an operation regime, in this case, comprised of two turbines operating intermittently four times a day, causing large pulse releases) involved residents of the riverine area between Mphanda Nkuwa and the city of Tete.

However, communities down river from Tete also would be affected by the project, especially the mid-merit power generation aspect (which will flood riverbank gardens, disrupt navigation and harm fisheries); these people should have been included in the investigation. Furthermore, other stakeholders were excluded from the process. These excluded groups include local and downriver industries (e.g., the shrimp industry) and NGOs that have projects dependent on or linked to the Zambezi (e.g., mangrove conservation and the Zambezi delta).

The International Crane Foundation contributed to the resolution of the environmental flow requirements in the lower Zambezi River, but their suggestions for correcting the current state of the lower Zambezi were not included in the final developmental plan of the project. Environmental flow requirements can be seen as the minimal amount of water flowing in a river system to preserve the systems ecological value and function. At present, Cahora Bassa is not meeting this requirement, causing major ecological damage. With Mphanda Nkuwa being further down stream than Cahora Bassa a large part of the responsibility for meeting the environmental flow requirements will fall on Mphanda Nkuwa.

Most studies were exclusively carried out by the project proponents and selected consultants. Stakeholders have thus far not had an opportunity to negotiate any outcomes that could potentially affect them. The feasibility study recommends additional public consultation, but does not explicitly recommend stakeholder negotiations. There has not been a timely access to information as all the available documents are in English instead of the official language (Portuguese). None of the technical documents have yet been made available to the public.

As for the indigenous and tribal groups the WCD does not clearly define the terms “indigenous” or “tribal,” making it difficult to assess which groups actually fall into this category. However, the ethnic groups that predominate in Tete province are considered tribal and are also often referred to as indigenous. The area around the study site actually has three main tribal and so-called indigenous groups, Nyungwe, Nyjanja and Sena, although Nyungwe people are most directly affected by the project.

The Nyungwe people were not included in any decision-making. Instead, all decisions thus far were made and assessed by the project proponents. The indigenous and tribal people were only informed of the project once all the main decisions were made and assessed. Fieldwork by Livaningo reveals that there is a clear lack of understanding by the indigenous and tribal people on the possible impacts of such a project. No process was undertaken by the project proponents to educate the indigenous and tribal people of the possible effects of large dams on their lives, preventing any informed and meaningful consent by the indigenous and tribal people.

WCD Strategic Priority 3: Comprehensive Options Assessment

The WCD states “a multi-criteria assessment was used to screen and select preferred options from the full range of identified alternatives.” The project should also “ensure that available alternatives, their relevant consequences and uncertainties are given full consideration” and that the “rejection of any options was explained in an open and

timely manner.” The WCD also recommends inclusion of demand-site management within the options assessed and the possible effects of flawed demand forecast for the sector. Cumulative impacts and the application of the precautionary approach are also considered vital.

Mozambique has vast gas resources, extensive sunlight and a possible geothermal potential, all of which are ignored by the feasibility study. Demand-side management options are not considered either for Mozambique or for the likely client for the project, Eskom, which is known to have major potential for DSM measures.

All six options proposed by the feasibility study were hydroelectric projects. Furthermore, the study does not prioritize the improvement of existing dams, such as the Cahora Bassa spillway enlargement, which was shown to be the most viable option among the six. As stated by the feasibility study: “Spillway enlargement, which would lead to a partial restoration of the natural flood conditions downstream during the late wet season, was preferred but it was considered that spillway enlargement was the responsibility of the present owners of the facility, HCB, rather than the present project proponents.”

This is an inadequate explanation for the rejection of the spillway enlargement option considering that other options involving the HCB (Hydroelectric de Cahora Bassa) were studied in detail. For example the Cahora Bassa North option was discussed and a joint operation of Mphanda Nkuwa and Cahora Bassa studied. Surely the construction of the north bank on the Cahora Bassa dam is also “the responsibility of the present owners of the facility, HCB”.

Even the operational options assessment is controversial with the selection of mid-merit energy production, which causes daily mini floods. This goes against the precautionary approach and underplays the cumulative impacts. The options assessments were not conducted in a multi-stakeholder manner and options chosen were done solely by the project proponents.

WCD Strategic Priority 4: Address Existing Dams

The WCD states that problems with existing dams must be addressed: “Outstanding social issues associated with existing large dams are identified and assessed; processes and mechanisms are developed with affected communities to remedy them.” Furthermore, WCD states “opportunities to improve the efficiency, environmental and social performances of existing dams and optimize their benefits **must** be taken.”

One of the well-known existing dams in Mozambique is Cahora Bassa, around 60km upstream from the study site. The Cahora Bassa Dam has had significant detrimental

downstream impacts all the way to the Zambezi delta and is considered by experts to be one of the least studied and most environmentally destructive large dams in Africa.³

Many of the outstanding problems from Cahora Bassa Dam are known and some were evaluated by the Mphanda Nkuwa feasibility study. Both past studies (e.g. SWECO) and new studies from independent stakeholders (International Crane Foundation) were included in the ecosystem baseline studies and maintenance needs of the river system. The results from these studies indicate the need for prescribed releases in order to restore the downstream ecosystems that have been damaged by regulated flow from Cahora Bassa Dam.

However, this knowledge was neither included into the needs assessment nor the development plans of the project and no provisions have been made for resolving outstanding social and environmental impacts. In fact, the development plans prevent Mphanda Nkuwa from resolving these problems through dam-regulation, for as the feasibility study states “Mphanda Nkuwa is a run-of-the-river scheme dependent upon the release of water from Cahora Bassa (Feasibility Study 8)... There is no storage capacity in the reservoir to alter seasonal flow” (Feasibility Study 7.5).

This means Mphanda Nkuwa does not have enough storage capacity to operate independently, preventing it from correcting the impacts of Cahora Bassa’s present release scheme. In fact, it may serve to make outstanding impacts irreparable. If Cahora Bassa Dam was to change its release scheme to prescribed releases in order to restore downstream conditions, the Mphanda Nkuwa project would be negatively impacted. According to the Mphanda Nkuwa feasibility study, “prescribed releases would reduce the total energy produced by the project and therefore, its economic viability.” Mphanda Nkuwa will not only fail to solve present problems from existing dams, but will place further obstacles in the way of solving them.

WCD Strategic Priority 5: Sustaining Rivers and Livelihoods

Because dams pose so many risks (and especially to those who do not stand to benefit), the WCD states that risks must be fairly analyzed and publicly discussed. “[Risks] must be identified, articulated and addressed explicitly. Most important, involuntary risk bearers must be provided with the legal right to engage with risk takers in a transparent process to ensure that risks and benefits are negotiated on a more equitable basis.” It goes on, “determining what is an acceptable level of risk should be undertaken through a collective political process.” The WCD also requires that “Ecosystem baseline studies and maintenance needs were assessed at a strategic level” and “an environmental flow requirement to maintain downstream species, ecosystems and livelihoods was defined” for implemented.

The social risks of Mphanda Nkuwa have not been thoroughly assessed and could have devastating consequences. There are clear economic concerns, considering that dams

³ Bernacsek, G.M. & Lopez, S. (1984). Investigations into fisheries and limnology of Cahora Bassa Reservoir seven years after dam closure. FAO/GCP/MOZ006/SWE Field Document.

are well known for falling short of their goals and more often than not under-perform. This is signaled by the fact that Mozambique's largest dam, Cahora Bassa, finds it difficult to sell the power it produces at a fair price. Mozambique is one of the poorest countries in the world and if Mphanda Nkuwa encounters a similar problem, Mozambican citizens would pay the consequences. The environmental impacts of the project are also detrimental to the river and those whose livelihoods depend upon a healthy river. The dam's intermittent turbine operation would negatively affect the downstream ecosystem. According to the feasibility study, "intermittent turbine operation with large daily variation in flow and level would reconfigure the river channel... Reconfiguration of the channel would have significant consequences for the ecology of the river, recession farmland and in-channel activities of local residents." (Feasibility Study 7.5.1) It also states that "intermittent turbine operation with large changes in river level would adversely affect a wide range of fauna", "the leveling of sand bars would reduce the availability of nest sites for water birds", and "overall, the diversity of aquatic habitats within the channel would be reduced." (Feasibility Study 7.5.1) It would also increase the negative impacts on endangered species and ecosystems. It further states that the "two plant species of conservation concern may be at risk from mid-merit erosion..." (Feasibility Study 7.5.1) One of these is endemic to the riverbanks between the cities of Tete and Mutarara.

The negative impacts of such a form of hydroelectric energy production can be shown in South Africa and is mentioned in the feasibility study: "the Orange river in South Africa, between the Gariep and Van Der Kloof dams and directly downstream, receives twice-daily flow pulses for hydropower generation has been described as 'an ecological desert' (Chutter *et al.*, 1995 in Davies and Bergh, 1999). In the case of the Zambezi system, the feasibility study acknowledges the negative effects on the submerged aquatic flora and states "rapid changes in water level would have an adverse effect on submerged aquatic plants."

It is relevant to note that the proposed Mphanda Nkuwa scheme is considered by some experts to be too close to the prehistoric Bilila-Mtakataka fault in Southern Malawi, which has been judged by its discoverers to be physical evidence of the largest known normal-faulting earthquake to strike any of the continents.

Questions around the seismic assessment have also been raised. The feasibility study only had a 42-year record to work on and estimated an "upper bound" magnitude of 6.1 on the Richter scale. Some experts are concerned about this figure considering that the two adjacent seismic zones have an "upper-bound" magnitude of 7.1 and 7.3 Richter scale (>30 times more energy). It is very unusual for such large differences in adjacent seismic zones and does not make geotectonic sense. However no concrete assessments and conclusions can be made by independent experts due to the fact that the technical report, "Joint Venture, 2001, Report 024A", is not available to the public.

Despite these risks, Mozambique citizens have not yet had the opportunity to help set acceptable levels of risk for the project. The release of studies and documents concerning the project has been slow, and the processes intended for the determination of acceptable levels of risk have not materialized.

WCD Strategic Priority 6: Recognising Entitlements and Sharing Benefits

The WCD report requires that “Stakeholders negotiated agreements for compensation, mitigation, resettlement, development and monitoring measures affecting them, including draft contracts where necessary.” The report also mentions that the project should “improve livelihoods and quality of life and affected people are beneficiaries of the project.”

No known stakeholder negotiations were done to discuss benefit sharing, mitigation, resettlement, development and compensation for the Mphanda Nkuwa Dam. All decisions were taken by the project proponents, including detailed resettlement options and plans. At present no draft contracts have been made with affected communities and no compensation for down-river communities is included.

The lack of expected benefit sharing on Mphanda Nkuwa is unacceptable considering the magnitude of such a project, which is expected to cost US\$2 billion. Effective benefit-sharing strategies were not discussed with stakeholders, but proposed benefits include a health post, a community hall, a dip tank for cattle and electricity for the health post and school. These are insignificant one-time contributions considering the size of the investment. Furthermore, benefit-sharing strategies for affected downstream communities have not been identified.

The project is expected to create only 30 permanent jobs, but it will displace 1,400 people and affect thousands more. The local residents of the Zambezi River basin would carry the costs and impacts of the project, but the benefits and development from the investment would be received exclusively by the industrial and business sectors in cities like Maputo, Beira and Johannesburg.

WCD Strategic Priority 7: Ensuring Compliance

The WCD states: “Institutional capacity to monitor and enforce commitments for social and environmental components of the project was analyzed and measures to strengthen capacity identified” and “an independent panel reviewed the assessment of impacts and the planning of social and environmental mitigation plans.”

At present there is no available compliance plan or mechanisms in which affected communities can express their concerns about the Mphanda Nkuwa project. The institutional bodies that are expected to be responsible for ensuring compliance have no experience in dealing with the magnitude of this type of project and no capacity-strengthening plan has been developed.

There are also concerns around the manner in which the project proponents have allowed for affected communities to assess and express concerns on the project thus far. Until now UTIP's concession to affected communities who want to assess the project has been to leave a copy of the EIA with Ministry for Co-ordination of Environmental Affairs (MICOA, in Maputo). This assumes that the affected communities and other stakeholders would be aware of the opportunity to consult the EIA, that they

would have the time, money and inclination to go to the MICOA office, and that they are capable of reading a technical report in English.

As for mechanisms in which affected communities could express their concerns, the only known situation were public meetings held in Tete, Chacocoma, Chirodzi, Sanangwe, Quelimane, Beira and Maputo between February and April 2001. These meetings were of a too-general nature for participants to truly comment. No background information on dam related issues were given at these meetings, preventing adequate understanding of the costs and benefits of the project. There is a clear lack of understanding in the affected communities on the details of the project and the impacts of dams.

If this were an indication of the project proponents' understanding of adequate public participation, then any compliance plan based on this mentality would be useless. There are also concerns around the level of independence of the feasibility studies review due to the strong links of the panel to UTIP and government (e.g. MICOA).

Conclusion

This analysis reveals that Mphanda Nkuwa does not fulfill the WCD's strategic priorities. The project's feasibility study comments on areas in which the project does meet WCD guidelines. This compliance is subjective and coincidental with the majority of the compliance being in the form of recommendations in future phases of the projects (i.e. suggested not performed).

The occurrence of public participation was in the form of surveys and contributions of working papers by the International Crane Foundation. This does not comply with the WCD's definition of public participation, which demands that the public and other stakeholders participate in the decision phases as well.

The feasibility study does look into the problem of existing dams, namely Cahora Bassa. It considers joint operation and identifies some of the major ecological damage caused by the Cahora Bassa Dam and possible solutions. Although these findings are mentioned, they are not included into the project's future management plans and the project places further difficulties in correcting these problems. The strategic priority of addressing existing dams in the WCD report refers to the resolution (or at least the reduction) of outstanding problems caused by existing dams. This does not occur in the Mphanda Nkuwa project.

As for sustaining rivers and livelihoods it is clear that the project will further damage the already ecologically fragile lower Zambezi River system and delta. The livelihoods that will carry the costs will not gain the benefits from the project and the project does not address the problem of rural electrification.

However the main concern is the economic risk that Mozambique will be taking with the proposed Mphanda Nkuwa Dam. Any dam project costing around US \$2 billion is a risk in itself for a poor, third-world country like Mozambique. It is well known that dams are notorious for significant cost overruns, under-achieving projected economic targets and exhibiting poor financial cost recovery.

The Cahora Bassa Dam, just 70Km upstream, is a good example of such a case. A United Nations document found Cahora Bassa to be one of the most destructive major projects in Africa. At present Cahora Bassa is US \$2.3 billion in debt and is having problems in selling its electricity (forcing it to sell at a ridiculously low price).

Mphanda Nkuwa Dam could face similar problems due the economical characteristics of the region. Firstly, there is a shortage of strong and stable markets in the region that could consume and pay for such large amounts of electricity. South Africa can be seen as the exception in the region. However, South Africa has a projected surplus until 2007 and this does not include present projects under development or projects that are in the pipeline. Energy savings through demand side management (DSM) alone are calculated to be well over 7,000 MW.

South African power utility Eskom is among the three cheapest electricity utilities in the world. Eskom plans to develop a Southern African Power Pool (SAPP) to supply the whole of Sub-Saharan Africa. The Grand Inga project on the Congo River, which is projected to produce 39,000 MW of electricity has been suggested as a viable source to supply energy to the SAPP common grid. If this were to occur it would cause a huge surplus in the region and place economical stress on Mphanda Nkuwa.

In a poor, third world country like Mozambique, an investment such as the Mphanda Nkuwa Dam is far too risky. The project does not follow the WCD's guidelines in order to minimize these risks and ignores the seven main strategic priorities. The WCD's guidelines were developed specifically to correct common problems in dam projects and to minimize well-known risks of such projects. Furthermore, Mphanda Nkuwa does not solve the major problem of rural electrification, places further stress on the already disturbed ecosystem and fails to include all of the respective stakeholders (affected communities, NGO's, etc) in any of the decisions.