Project Name	Tanzania-Lower Kihansi Environmental (@)... Management Project
Region	Africa
Sector	Other Environment
Project	TZPE73397
Borrower	United Republic of Tanzania
Implementing Agencies	National Environmental Management Council P.O. Box 63154, Dar es Salaam, Tanzania Ministry of Natural Resources and Tourism P.O. Box 9372, Dar es Salaam, Tanzania Vice President's Office P.O. Box 5380, Dar es Salaam, Tanzania
Environment Category	C (Not required)
Date PID Updated	April 24, 2001
Projected Appraisal Date	April 9 to 11, 2001
Projected Board Date	July 3, 2001

1. Country and Sector Background

The Tanzania Power VI project was approved in 1993 (Credit 2489-TA), and has funded the construction of a 180 MW hydroelectric facility in south central Tanzania. The facility, located in the Lower Kihansi Gorge, is operated by the Tanzania Electricity Supply Company (Tanesco). The Lower Kihansi facility started producing power in December 1999, and currently, three turbines are in operation.

The Lower Kihansi Hydropower Project is a run-of-the-river operation. The scheme incorporates a 25 m high dam, which results in the inundation of about 26 ha when the reservoir is full. The dam diverts water into a long tunnel which leads to the power generating station. The project takes advantage of the change in elevation through the Kihansi Gorge, which drops nearly 900 meters over 3 km. The water is returned to the river about 6 km downstream.

An Environmental Assessment of the project was carried out in 1992, and Government agreed to prepare and implement an Environmental Management Plan. Because of the small size of the inundation area, the environmental impact of the dam was expected to be minimal. The Management Plan focused primarily on mitigating the upstream impacts on the inundation area and on the communities living in the vicinity of the project. A series of Baseline Studies and a long-term ecological monitoring program was financed by the project. By late 1995, it was concluded that -contrary to earlier views -- the diversion of water for the hydroelectric scheme would have a likely environmental impact on vegetation on both sides of the 6 km stretch of the river which passed through the Gorge. In particular, the Baseline studies demonstrated the importance of the fine spray from the Kihansi Falls for maintaining the microclimate in the Gorge ecosystem.

The Kihansi Gorge ecosystem is deceptively unique. Vegetation in the Gorge's wetlands consists primarily of a sward of herbaceous vegetation standing no more than 30 cm, and usually only 5 to 10 cm. It is dominated by

the club moss Selaginella kraussiana together with the fern Tectaria gemmifera and low-growing Panicum grasses. The spray contains a fine silt. The silt, combined with the spray, has created small boggy wetlands rich in vegetation. There are 4 primary wetlands in the gorge which cover an area no more than 2 hectares in extent.

Montane forests in the Gorge are found only along the river, and are bounded by present or past cultivation and by rocky cliffs. The only substantial forested area is on the eastern bank of the river, below the main waterfall, where forest cover extends nearly 1 km from the river bank. Montane plant species such as Aphloia theiformis and Olea capensis are found in the Gorge below their normal elevation because of cooling and other effects of the spray. The escarpment forest on either side of the Gorge is dominated by Brachystegia spp. Botanical surveys of the forests in and adjacent to the Gorge identified 66 tree species, of which 7 were found to have an extremely limited distribution. Indicating the likelihood of high rates of endemicity, otherwise characteristic of forests of this type found in Tanzania.

The Gorge is found in the Eastern Arc forests, which (along with Kenya and Tanzania's coastal forests) are one of 25 global biodiversity hotspots. Collectively, these areas cover less than 2 percent of the planet's land area, but account for 44 percent of all vascular plant species and 38 percent of four vertebrate groups. Biodiversity hotspots are identified on the basis of three criteria: the number of species present, the number of those species found exclusively in the ecosystem, and the degree of threat they face. Among the threatened species which have been identified in the Kihansi Gorge ecosystem are the Kihansi Spray Toad (Nectophrynoides asperginis) and a species of wild coffee (Coffea sp.), both of which are believed to be endemic to the Gorge and which were formally identified as new species after construction of the hydroelectric scheme had commenced. Though the distribution of the Spray Toad has not been fully confirmed, it is believed that its global habitat covers an area of less than 5 ha, in the Kihansi Gorge wetlands.

As a result of the Baseline studies launched by the project, a series of recommendations were subsequently made to mitigate the impacts of the dam on the downstream ecosystem. These included,

- identification and maintenance of minimum bypass flows through the Gorge which would be sufficient to generate essential waterfall spray characteristics;
- establishment of a schedule for intermittent bypass flows and waterfall spray production, dependent on the dams operational requirements, flow availability, and habitat requirements;
- construction of an artificial spray system in the Gorge to duplicate the conditions created by the waterfalls;
- establishment of a captive breeding program for the Kihansi Spray Toad in the event that mitigation failed adequately to protect its habitat.

Of these mitigation steps, only the last two have been undertaken, and there are serious questions about whether or not they will have any long term impact on conserving the unique Gorge habitat, or the species found there, unless subsequent and more aggressive conservation measures are undertaken.

The challenge of mitigating the dam's downstream environmental impacts is complicated by two circumstances. Firstly, there continues to be a lack of clarity about the rights to the water flowing in the Kihansi River. Provisional water rights granted to Tanesco during the dam's construction period focused on the need to maintain historic minimum flows through the Gorge. An application to formalize its water rights during the operating

period has not been granted, pending the development of further information about the minimum flows required to maintain the ecosystem. Secondly, in the face of a poor rainy season in late 2000, Tanzania's dependency on power from the Kihansi facility increased dramatically, arguably limiting Tanesco's ability to maintain minimum bypass flows. While this short term problem has been mitigated by recent rainfall, the challenge of balancing the need for power and for environmental protection will remain a daunting one.

In close cooperation with Government and the other donors involved in the project, the Bank launched an Environmental Review, in July 2000, of the circumstances surrounding the Kihansi project, and the steps needed further to mitigate its downstream impacts. The Environmental Review considered 3 options: to maintain the status quo despite the very high risk of extinction of endemic species; to maintain a bypass flow of between 1.51 and 1.89 cubic meters per second and to carry out further and more aggressive mitigation measures; or to maintain a higher bypass flow - 7 m3 per second (the historic minimum flow, and the level of flow provided for in the provisional water right) - as well as to carry out further and more aggressive mitigation measures. The Review strongly recommended the second option - a view which has been endorsed by Government. Monitoring of the bypass flow since the Environmental Review was undertaken has indicated that Government has kept this commitment.

The Bank subsequently received a request from the Government for support to implement the recommendations made in the Environmental Review, in particular, to focus on the question of ecological management of the ecosystem (including habitat conservation, captive breeding, and monitoring and evaluation); the determination of a final water right; updating the project's Environmental Management Plan and supporting its implementation, and institutional strengthening for water and environmental management. A subsequent urgent request to the Government's of Norway and Sweden for donor assistance has financed preliminary captive breeding efforts, further work on the spray system, and other efforts aimed at species and habitat conservation.

2. Objectives

The objective of the Lower Kihansi Environmental Management Project is to put in place a series of measures for the long-term conservation of the Kihansi Gorge ecosystem and upstream catchment areas. At the national level, the project has the objective of supporting the development of a coordinated and consistent legal and institutional framework for environmental and water resources management and strengthening of ecosystem monitoring and assessment functions of environmental institutions.

3. Rationale for Bank's Involvement

The Bank is responding to concerns raised by Government, by academics, and by environmental NGOs which have been seeking more aggressive action in reducing the downstream threat of habitat loss as a result of the Kihansi project. This support would be designed to complement on-going emergency support for short term mitigation measures which has been provided by other donors. The rationale for Bank support is derived from the value of the habitat for biodiversity conservation, and the potential - indeed, the need - for developing closer coordination in implementing national water, energy, and environmental policies.

4. Description

The proposed project is comprised of four components:

- Habitat management and species conservation
- Water rights monitoring and final water rights determination
- Updating the Environmental Management Plan
- Institutional Strengthening

(a) Habitat and species conservation and management. The project is expected to develop and launch a Kihansi gorge ecosystem monitoring and conservation program, to provide resources to follow-up on species conservation and captive breeding efforts, in particular to finance translocation studies, to assess the feasibility of, and to develop a plan for the reintroduction of the Kihansi Spray Toad to another habitat in Tanzania, if this is judged to be the most appropriate approach for the conservation of the species. Among other things, the monitoring and conservation program (which will establish a permanent monitoring station in the Gorge) would identify threats to other endemic or threatened species in the Gorge ecosystem, and would develop and implement necessary mitigation measures. These could include altering the bypass flow regime, translocation and reintroduction, or ex-situ propagation.

Drawing on the results of the monitoring program, additional measures will be undertaken with project support to develop a landscape-wide and upper catchment conservation plan, and to build national capacity in Conservation biology through training at the University of Dar es Salaam.

(b) Establishment of final water right. The proposed project will finance a transparent process to establish Tanesco's final water right to operate the Kihansi facility on the basis of scientific inputs and representations from Tanesco, the Ministry of Natural Resources and Tourism, the National Environment Management Council, the Environment Division (Vice President's Office), stakeholders in the scientific community and NGOs. These activities will build upon the work started on an emergency basis (with Swedish and Norwegian financing). The project will finance the operations of a Multisectoral Technical Advisory Committee (MTAC) which will (a) guide further investigations into the scope for a modified environmental flow regime; (b) make recommendations to the National Environment Management Council within a period of 24 months as an input into decision making by the Rufiji Basin Water Office (RBWO) on the environmental flow regime and its implications for water rights, operating conditions and criteria; (c) support mechanisms for data collection for calibrating a hydrological model for operating the LKHP (d) make recommendations to the NEMC and the Rufiji Basin Water Office for effective monitoring and enforcement of the final water right; and (e) establish a transparent mechanism for monitoring and enforcing water right compliance. Until the final water right is established, the project will also finance interim bypass flow monitoring activities.

(c) Implementing an Updated Environmental Management Plan. In light of the discovery of threatened endemic species in the Kihansi Gorge ecosystem, there is a need immediately to prepare supplemental Environmental Assessment work, and to develop an Environmental Management Plan, which must be implemented as a condition of the final water right which is to

be granted to Tanesco to operate the facility and to account for any proposed future changes in power infrastructure at the site. In conjunction with the Habitat and Species Conservation and Management component, the project will establish an environmental monitoring center based at Kihansi to complement the measures to be undertaken in the updated Environmental Management Plan. The project will finance establishment and operation of this center until long-term financing arrangements can be agreed.

(d) Institutional Strengthening. The national system for environmental and water resources management needs to be rationalized. Consistent with the recommendations of the Environmental Review, the project will finance preparation and implementation of a program of institutional capacity building which supports the development of a coordinated system, at the national level, of environmental and water resources management. The program will take into account and will adopt and support the implementation of the recommendations and findings of the recently completed review carried out by the Institutional and Legal Framework for Environmental Management Project (ILFEMP) which focuses specifically on improving the institutional and regulatory framework for environmental management. These activities will be complemented by a program of awareness raising, and capacity building in environmental regulation and compliance.

5. Financing

The Project is to be financed as a Technical Assistance Credit, at a cost of around US$ 6.3 million.

6. Implementation

The project is to be implemented by the Ministry of Natural Resources and Tourism and the Office of the Vice President. Other stakeholders include the Institute of Resources Assessment at the University of Dar es Salaam, the Ministry of Water, the Ministry of Energy and Mining, the Tanzania National Parks Authority (Tanapa), Tanesco, and the Ministry of Finance. Project coordination is expected to involved a multi-stakeholder Steering Committee. The Steering Committee is likely to include representatives of local and international NGOs with interests in the conservation of the Kihansi Gorge ecosystem, but this remains to be confirmed by Government. Coordination with other environmental monitoring and mitigation activities in the energy and mining sectors will be supported through the Steering Committee.

7. Sustainability

The project is expected to contribute to the long term conservation of the Kihansi Gorge Ecosystem by establishing the mechanisms for sustainable habitat management. Longer term finance options will be developed in the Environmental Management Planning process, and as part of the program of Institutional Capacity building.

8. Lessons learned from past operations in Tanzania

This project derives from experience with the Kihansi power project by responding to concerns identified during project implementation in seeking to mitigate the unexpected impacts of the investment.

9. Program of Targeted Interventions (PTI) No

10. Environmental Aspects (including any public consultations)

The project is not expected to result in any negative environmental impacts and should contribute to the long term sustainable management of the Kihansi Gorge ecosystem.

Several consultations on the Lower Kihansi Project have been held in Tanzania in conjunction with the July 2000 Environmental Review, and the subsequent followup visit in October 2000. In particular, the July Review convened an expert consultation of over 60 Tanzanian specialists and stakeholders. Various parties to these consultations are expected to be involved during implementation.

11. Contact Point

Task Manager
Peter Dewees
Senior Environmental Economist
Environment and Social Development Unit
Africa Region
World Bank
1818 H St., N.W.
Washington, D.C. 20433
Telephone: 202-473-3959
Fax: 202-614-0959

12. For information on other project-related documents, contact:
The InfoShop
World Bank
1818 H. St., N.W.
Washington, D.C. 20433
Telephone: (202) 458-5454
Fax: (202) 522-1500
Web: http://www.worldbank.org/infoshop

Note: This is information on an evolving project. Certain components may not be necessarily included in the final project.

The reservoir has a total capacity of around 1.6 million m3, and the water detention time is around 12 hours. The power project was originally designed to provide power to meet peak load demands, but is now operated in a manner which provides base load.

The Kihansi Spray Toad was discovered in 1996, and first scientifically described by Poynton et al in 1998. The genus is listed in CITES Appendix 1, as endangered. The toad is one of few which bears its young fully formed.

Poynton, op. cit.