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IMPLEMENTATION COMPLETION AND RESULTS REPORT

TF -15774

ON A

GRANT
FROM THE GLOBAL ENVIRONMENT FACILITY TRUST FUND

IN THE AMOUNT OF US$5.98 MILLION

TO THE

THE REPUBLIC OF TANZANIA

FOR THE

KIHANSI CATCHMENT CONSERVATION AND MANAGEMENT PROJECT

June 29, 2020

Environment, Natural Resources & The Blue Economy Global Practice
Africa Region

CURRENCY EQUIVALENTS

(Exchange Rate Effective December 31, 2019)

Currency Unit =	Tanzanian Shilling (TZS)
TZS 2,298.01=	US$1

FISCAL YEAR
July 1 - June 30

Regional Vice President:	Hafez M. Ghanem
Country Director:	Mara Warwick
Regional Director:	Ede Ijjasz-Vasquez
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Task Team Leader(s):	Jane A. N. Kibbassa
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ABBREVIATIONS AND ACRONYMS

AF	Additional Financing
CAS	Country Assistance Strategy
CPF	Country Partnership Framework
EFA	Environmental Flow Assessment
EMA	Environmental Management Act, 2004
EWA	Environmental Water Requirements Assessment
FFS	Farmer Field School
GDP	Growth Domestic Product
GEF	Global Environmental Facility
GoT	Government of Tanzania
IDA	International Development Association
IRI	Intermediate Results Indicator
IUCN	International Union of Conservation of Nature
IWRM	Integrated Water Resource Management
KST	Kihansi Spray Toad
KEPA	Kihansi Environmental Protected Area
LGAs	Local Government Authorities
LKEMP	Lower Kihansi Environmental Management Project
LKHP	Lower Kihansi Hydropower Plant
M&E	Monitoring and Evaluation
MNRT	Ministry of Natural Resources and Tourism
MoWI	Ministry of Water and Irrigation
NEMC	National Environment Management Council
PAD	Project Appraisal Document
PDO	Project Development Objective
PS	Permanent Secretary
RBWB	Rufiji Basin Water Board
SUA	Sokoine University of Agriculture
TAC	Technical Advisory Committee
TANESCO	Tanzania National Electric Supply Company
TAWIRI	Tanzania Wildlife Research Institute
TEDAP	Tanzania Energy Development and Access Project
TFS	Tanzania Forest Services
UDSM	University of Dar es Salaam
WRCS	Water Resources Classification System
WUA	Water Users Authority

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DATA SHEET

BASIC INFORMATION

Product Information

Project ID	Project Name
P126361	Kihansi Catchment Conservation and Management Project
Country	**Financing Instrument**
Tanzania	Investment Project Financing
Original EA Category	**Revised EA Category**
Partial Assessment (B)	Partial Assessment (B)

Organizations

Borrower	Implementing Agency
MINISTRY OF FINANCE	National Environment Management Council

Project Development Objective (PDO)

Original PDO

The proposed Project Development Objective (PDO) is to enhance biodiversity conservation in the Kihansi catchment. The project will complement as well as assist on-going efforts of key resource regulatory authorities to conserve critically endangered and highly endemic plant and animal species and their habitat in the Kihansi catchment.

FINANCING

	Original Amount (US$)	Revised Amount (US$)	Actual Disbursed (US$)
World Bank Financing			
TF-15774	5,980,000	5,964,640	5,964,640
Total	**5,980,000**	**5,964,640**	**5,964,640**
Non-World Bank Financing			
Borrower/Recipient	18,300,000	0	0
Total	**18,300,000**	**0**	**0**
Total Project Cost	**24,280,000**	**5,964,640**	**5,964,640**

KEY DATES

Approval	Effectiveness	MTR Review	Original Closing	Actual Closing
26-Sep-2013	02-Dec-2013	06-Jun-2016	31-Dec-2018	31-Dec-2019

RESTRUCTURING AND/OR ADDITIONAL FINANCING

Date(s)	Amount Disbursed (US$M)	Key Revisions
23-Jun-2017	3.33	Change in Results Framework Change in Components and Cost Change in Loan Closing Date(s) Change in Implementation Schedule

KEY RATINGS

Outcome	Bank Performance	M&E Quality
Moderately Satisfactory	Satisfactory	Substantial

RATINGS OF PROJECT PERFORMANCE IN ISRs

No.	Date ISR Archived	DO Rating	IP Rating	Actual Disbursements (US$M)
01	30-Jul-2014	Moderately Unsatisfactory	Moderately Unsatisfactory	.05
02	06-Apr-2015	Moderately Satisfactory	Moderately Satisfactory	.93
03	27-Oct-2015	Moderately Satisfactory	Moderately Satisfactory	1.42
04	27-May-2016	Moderately Satisfactory	Moderately Satisfactory	2.07
05	27-Dec-2016	Moderately Satisfactory	Moderately Satisfactory	2.67
06	30-Jun-2017	Moderately Satisfactory	Satisfactory	3.33
07	27-Dec-2017	Moderately Satisfactory	Satisfactory	4.03
08	25-Jun-2018	Moderately Satisfactory	Satisfactory	4.83
09	19-Dec-2018	Satisfactory	Satisfactory	5.12
10	19-Jun-2019	Moderately Satisfactory	Moderately Satisfactory	5.60

SECTORS AND THEMES

Sectors

Major Sector/Sector	(%)
Agriculture, Fishing and Forestry	**82**
Other Agriculture, Fishing and Forestry	82
Water, Sanitation and Waste Management	**18**
Other Water Supply, Sanitation and Waste Management	18

Themes

Major Theme/ Theme (Level 2)/ Theme (Level 3)	(%)

Urban and Rural Development	**10**
Rural Development	10
Land Administration and Management	10
Environment and Natural Resource Management	**90**
Renewable Natural Resources Asset Management	65
Biodiversity	65
Environmental policies and institutions	5
Water Resource Management	20
Water Institutions, Policies and Reform	20

ADM STAFF

Role	At Approval	At ICR
Vice President:	Makhtar Diop	Hafez M. H. Ghanem
Country Director:	Philippe Dongier	Mara K. Warwick
Director:	Jamal Saghir	Ede Jorge Ijjasz-Vasquez
Practice Manager/Manager:	Magdolna Lovei	Iain G. Shuker
Project Team Leader:	Jane A. N. Kibbassa	Jane A. N. Kibbassa
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I. PROJECT CONTEXT AND DEVELOPMENT OBJECTIVES

A. CONTEXT AT APPRAISAL

Context

1. A large ecologically diverse country, Tanzania is home to large forests and woodlands, freshwater lakes, a variety of flora and fauna, and ecosystems, as well as various endangered species of plants and animals. At appraisal the economy, which is highly dependent on the country's abundant natural resources, saw a growth rate of about 6.4 percent in 2012 with the main drivers being manufacturing, the service sector and agriculture. While the macroeconomic outlook was favorable and growth rates projected to be stable in the short-term, poverty rates were not following the same trend. With 30 percent of the population living below the poverty line and income 40 percent less than the average in sub-Saharan Africa, it was apparent that the gains from natural resources benefitted only a few. Tanzania sought to address these shortcomings through its MKUKUTA II, a five-year growth and poverty reduction strategy towards meeting Tanzania's Development Vision 2025 (TDV 2025) and the Millennium Development Goals. The project was consistent with the Country Assistance Strategy's objective of promoting "Inclusive and Sustainable Private Sector-Led Growth" and specifically as it related to "enhanced sustainability and improved management of natural resources".[1]

2. Water resources remains of critical importance to Tanzania as a main supporter of industry growth, but its use has had repercussions for the environment. Located within the Rufiji River Basin, the Kihansi catchment was one such area where different sectors competed for water use. The Kihansi Catchment and Conservation Management Project (KCCMP) was designed on the heels of the Lower Kihansi Environmental Management Project (LKEMP), which was implemented from July 2001 to June 2011, as a continuation of key initiatives undertaken to strike a balance between the use of freshwater resources for energy and environmental needs, as well as to harmonize policies surrounding energy, water and the environment. The need for this intervention dated back to the construction of the 180MW Lower Kihansi Hydropower Plant (LKHP) which began in 1994. The power plant's importance lay with its capacity to generate about 35 percent of the hydropower produced nationally and about 15 percent of the country's electricity. During construction, an ecological impact assessment revealed the existence of five endemic plants and animals including the Kihansi Spray Toad (KST), which resided in the four spray wetlands (less than 2 hectares). These wetlands relied on the spray generated from the waterfall in the Kihansi Gorge, and were impacted when the Kihansi river was diverted with the construction of the dam for the LKHP. Early attempts at protecting the KST were successful, however in 2003/4, the population's sudden collapse was thought to be as a result of chytrid fungus[2], and pesticides. In 2009, the International Union for Conservation of Nature (IUCN) declared the KST extinct in the wild. Thus, the Kihansi catchment's ecological importance lay with the high number of critically endangered and endemic plant and animal species

3. Over the ten-year period of implementation, LKEMP supported the strengthening of the regulatory framework for water resources management including through support to the Environmental Management Act, enacted in 2004. It

[1] World Bank. 2011. *Tanzania - Country Assistance Strategy (CAS) for the period FY2012-2015*

[2] Though the means by which the fungus was introduced to the gorge is unknown, it is hypothesized that it could have been carried by human movement through the area.

also supported the preparation of key regulations which led to a comprehensive water policy that integrates environmental flow assessment in water allocation for cross-sectoral use. An updated Environmental Management Plan (EMP) for LKHP was also prepared. In terms of biodiversity conservation, LKEMP pioneered the restoration of the extinct-in-the-wild KST population and established two breeding facilities – one at the University of Dar es Salaam (UDSM) and another at the Tanzania Wildlife Institute (TAWIRI) station in Kihansi. It supported the restoration of the affected wetlands through the installation of a spray irrigation system and the establishment of the Final Water Right which institutes a minimum flow requirement of 1.5 - 2.0 m^3/s. This would eventually allow for the reintroduction of the KST to the gorge.

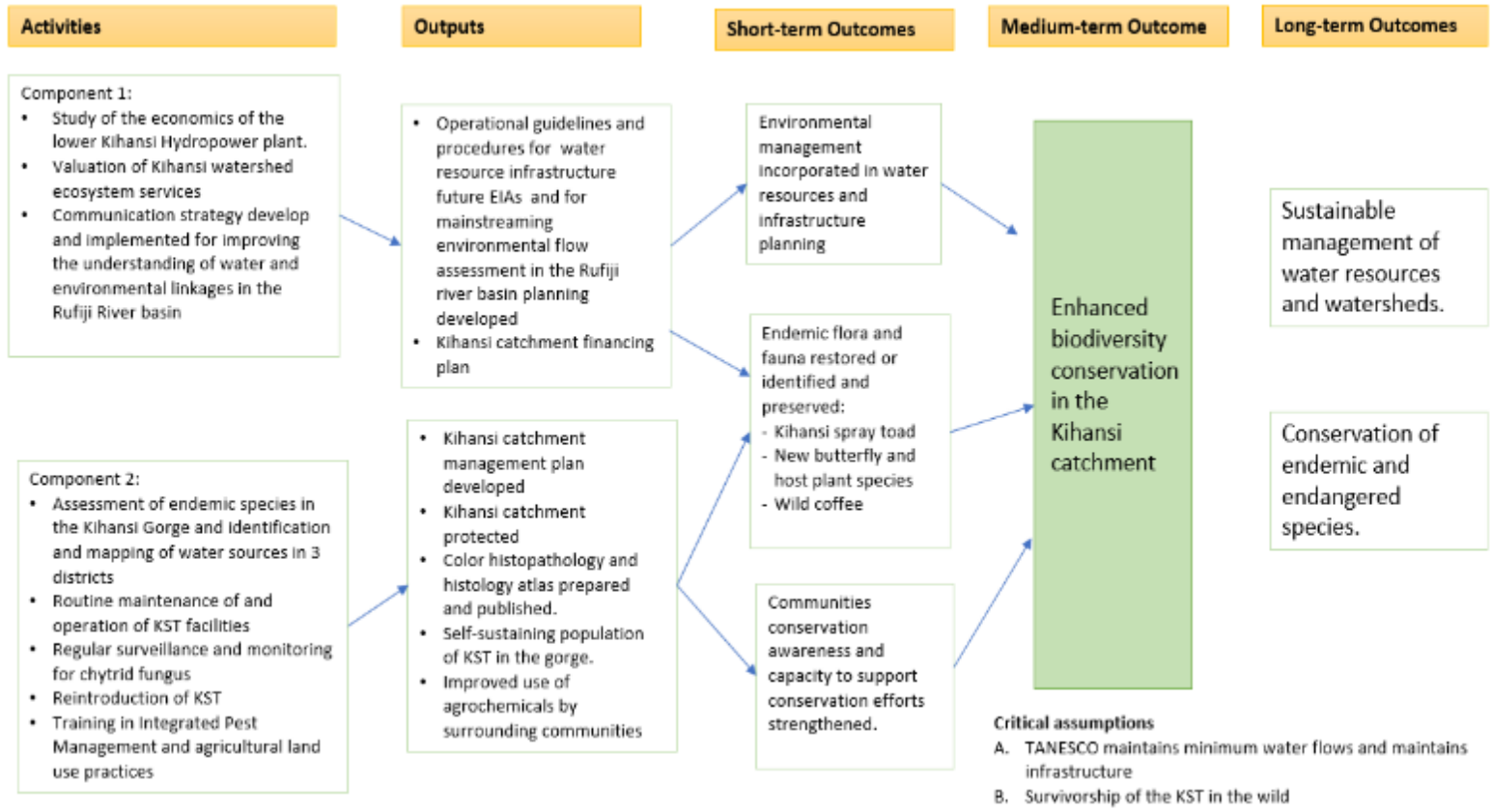
4. Despite these achievements there was still more to be done. While the legal and regulatory framework was strong, operationalization of the policies was weak. The Government needed to have a plan for long term sustainability of the Kihansi catchment including institutional and fiduciary arrangements and designation as a conservation area to protect the integrity of the environment. KST reintroduction had just begun when LKEMP ended, but the Government of Tanzania (GoT) needed additional support to put measures in place to ensure a self-sustaining population. Additionally, the government needed to do more research into other endemic and endangered species in the ecosystem. Water quantity and quality needed to be maintained and this involved identifying water sources and educating upstream and downstream communities on environmentally friendly agricultural practices.

Theory of Change (Results Chain)

5. The theory of change is presented in Figure 1 and reflects the project's objective of "enhancing biodiversity conservation in the Kihansi catchment." Given its association with cross-sectoral challenges related to water allocation for energy, environment and livelihoods, the project proposed to incorporate environmental considerations into water resources management and planning through operational guidelines that reflected and enforced the existing legal framework. The Kihansi catchment would receive support for ecosystem restoration through the expansion of the spray sprinkler system. It would be designated as a protected area to ensure long-term protection and would identify, record and research critically endangered and endemic species of plants and animals. It would pilot the first reintroduction in the world of an extinct-in-the-wild amphibian species, and the *in situ* control and mitigation of chytrid fungus, which was largely responsible for the collapse of the KST population in 2003. A part of this holistic approach to conservation included sensitization of and coordination with, upstream and downstream communities to adopt agricultural techniques and practices that would reduce their pressure on resources including impact on water quality. These communities would be trained through farmer field schools in integrated pest management and land use practices and would be given support for alternative livelihood activities.

6. The main assumptions were that infrastructure and minimum water flows necessary to restore and sustain the ecosystem would be maintained and by the end of the project the GoT would have a clear plan, inclusive of fiduciary and technical responsibility of the respective Ministries and agencies, which would be mainstreamed in sector plans and budgets, for ensuring environmental sustainability in the long-term. Since the reintroduction of the KST was the first of its kind, it would rely heavily on measures to prevent the recurrence of chytrid fungus in the gorge, experimental methodologies for reintroduction and the presumption that restoration of the gorge to its pre-diversion state would augment the survivorship of the KST in the wild.

Figure 1 Theory of Change



Project Development Objectives (PDOs)

7. The project development objective was *to enhance biodiversity conservation in the Kihansi catchment.* "Enhance was defined in the project appraisal document (PAD) as the provision of "long term sustainability of species and institutions".[3] In so doing, the project sought to support government efforts to conserve endangered and endemic plants and species, and to protect their habitat.

Key Expected Outcomes and Outcome Indicators

8. At approval, the project had two PDO level indicators

i. landscapes that incorporate biodiversity consideration as per IUCN classification criteria for protected areas are conserved
ii. operational guidelines for conducting environmental flow assessment and a sustainable financing plan for Kihansi catchment are developed and mainstreamed

Components

9. The project had three components:

11**. Component 1**: **Institutional capacity building for the management of the Kihansi catchment** (Planned US$1.07m; Actual, US$1.07m). This component had two sub-components:

(i) ***Operational guidelines for conducting Environmental Flow Assessment*** (Planned US$0.68 million, Actual $0.68M): which focused on the development of operational guidelines for conducting environmental flow assessment with a view to incorporate into the Integrated Water Resource Development and Management Planning; and

(ii) ***Sustainable financing plan for the Kihansi catchment*** (US$0.39m; Actual US$0.39M): with the aim to develop a sustainable financing plan for the Kihansi catchment to ensure conservation and management in the long-term.

12. **Component 2**: Conserve endangered species in the Kihansi catchment (Planned US$4.61m; Actual US$4.60m). This component had two sub-components:

(i) ***Species and Habitat Conservation*** (Planned US$3.12m; Actual US$3.10M): which supported conservation of key species and habitats, specifically monitoring and reintroducing the Kihansi Spray Toad (KST), mapping and monitoring of other endangered species namely wild coffee and butterfly species, and development of a Kihansi Catchment Management Plan (KCMP) that would gazette and protect priority biodiversity hotspots and important water resources areas.

(ii) ***Community Conservation and Livelihoods*** (Planned US$1.49m; Actual US$1.50M): which supported community conservation and livelihood activities aimed at improving use of resources and introduction to alternative livelihood activities. This included training of key sector staff in ecological monitoring and sharing of best practices in endangered species conservation with local and international civil society organizations (CSOs). Training in Integrated Pest Management (IPM) and land use practices to enhance water quality and quantity in the Kihansi catchment would be provided to upstream and downstream villages in three communities.

[3] KCCMP Project Appraisal Document, page 5

13. **Component 3**: **Project Management** (Planned US$0.30m; Actual US$0.30m). This covered project management including financial management, procurement, monitoring and evaluation and safeguards monitoring.

B. SIGNIFICANT CHANGES DURING IMPLEMENTATION (IF APPLICABLE)

Revised PDOs and Outcome Targets

14. The PDO remained the same, however the outcome target for PDO indicator 1 was revised from 5,500 ha to 4,000 ha as described in Table 1.

Revised PDO Indicators

15. There was one restructuring of the project which was approved in June 2017. This restructuring resulted in a change of wording of the PDO indicators for clarification. A supplemental PDO indicator was also added to reflect the conservation outcome and another one revised and moved to the intermediate level. See Table 1 for a description of these changes.

Revised Components

16. Component 1 was updated to include the activity “to develop guidelines for rivers and riverbanks management.”

Other Changes

17. The restructuring also revised intermediate indicators and extended the closing date.

i. Revised intermediate indicators: three intermediate indicators were dropped, and six new were added to reflect factors affecting the survival of the species being monitored.
ii. Extended closing date: the project was extended by one year and target dates updated to reflect the new closing date. Indicator targets remained the same.

Rationale for Changes and Their Implication on the Original Theory of Change

18. The project was restructured to improve the indicators to allow for better assessment of project outcomes and to strengthen the link between the project activities and the results framework. An extension of the closing date from December 31, 2018 to December 31, 2019 was also necessary given implementation delays in the first year of the project. (see section III. B). The theory of change was not impacted by these changes.

Table. 1 – Changes to the Results Framework

Indicators	Changes	Rationale
PDO Indicator 1: Landscapes that incorporate biodiversity considerations as per IUCN classification criteria for protected areas are	**Revised** - 'Total area in the Kihansi catchment protected for biodiversity conservation (ha)'.	The indicator was revised for clarity and to be better aligned with the PDO. It is measured by area protected and maintained for KST habitat, mapping and distribution of coffee plants and host plant for

conserved.		butterfly and water quality.
	New: Endemic species conserved within the Kihansi catchment. 1/Endemic species of KST, *Nectophrynoides asperiginis* conserved within the Kihansi catchment. 2/Endemic species of wild coffee, *Coffea kihansiensis* conserved within the Kihansi catchment 3/Host plants of a new butterfly, *Charaxes mtuiae* conserved within the Kihansi catchment.	Indicator added to reflect conservation outcome. It was broken down into 3 sub-indicators for the target species. While unit of measure (ha) remained the same, the indicator's baseline and targets were changed. Original: baseline = 0; target = 5,500 Revised: baseline = 9,080; target = 13, 080
PDO Indicator 2: Operational guidelines for conducting environmental flow assessment and a sustainable financing plan for the Kihansi catchment are developed and mainstreamed.	**Revised and moved** to intermediate level: Operational guidelines for conducting environmental flow assessment developed and approved by National Environment Management Council and Ministry of Water and Irrigation.	This indicator was moved to the intermediate level because of the overlap with an existing intermediate indicator. It was revised to include NEMC and MoWI as the approval authority.
Intermediate Indicators:		
Global environmental issues mainstreamed into the integrated Water Resource Development and Management Planning Framework for the Rufiji River Basin	**Dropped**	This indicator was dropped as it was redundant with the original PDO indicator 2.
Sustainable financing plan developed and options for implementation agreed	**Revised:** Sustainable financing mechanism established based on payment for ecosystem services (Yes/No)	This indicator was revised for clarity and to focus on the main aspects of sustainable financing.
Factors limiting survival of the reintroduced KST and the new coffee and butterfly species are identified and controlled	**Dropped**	This indicator was replaced by six new intermediate indicators which allowed for project monitoring in relation to the limiting factors (see Annex 1)
14 Integrated Pest Management Plans in the Kihansi catchment developed and adopted	**Dropped**	This indicator was dropped as the new indicator on villages using pest management better captured the use of pesticides.

II. OUTCOME

A. RELEVANCE OF PDOs

Rating: Substantial

Assessment of Relevance of PDOs and Rating

19. Given the strong linkage between Tanzania's growth sectors and the environment, the project's PDO "to enhance biodiversity conservation in the Kihansi catchment" was substantially relevant. Specifically, it supported the objectives of the current Country Partnership Framework (CPF) FY18 - FY22 (Report No. 121790-TZ) through objective 1.3. "Manage Natural Resources for Resilient Economic Growth" under Focus Area 1: "Enhance Productivity and Accelerate Equitable and Sustainable Growth" by strengthening the knowledge and use of natural resource management at the institutional level to incorporate environmental considerations in planning and development particularly as it related to biodiversity conservation in the management of water resources. It developed a management framework and operational guidelines through which entities and the wider communities can operate within and around protected areas without negatively impacting the environment. Communities were encouraged to improve agricultural practices to reduce pressure on natural resources, while increasing production of crops and diversifying income sources. The project was also aligned with CPF objective 3.1 "Strengthen Public Sector Accountability and Financial Efficiency in Delivering Services" through the development of a financing plan for the Kihansi Catchment, which served to inform government of financial resources needed to maintain the ecological integrity of the protected area and obligations of the various institutions.

20. In addition, the PDO was developed to support the existing national legislation and priorities, namely the Environmental Management Act Cap 191, Tanzania Development Vision (2025), the National Strategy for Growth and Poverty Reduction (NSGRP), the National Five Year Development Plan (2011/12-2015/16) to provide an avenue through which these policies could be operationalized. It was well aligned with the NSGRP's aim of "ensuring food and nutrition security and environmental sustainability and climate change adaptation and mitigation." Consistent with the GEF-5 Biodiversity Strategy Objective 2 "Mainstream biodiversity conservation and sustainable use into production landscapes/seascapes and sectors", and the GEF-7 biodiversity focal areas to: "mainstream biodiversity across sectors as well as landscapes and seascapes"; "address direct drivers to protect habitats and species"; and "further develop biodiversity policy and institutional frameworks", it supported the harmonization of approaches across water, energy and natural resource management sectors to reduce current and future impacts on habits for endemic and endangered species. Tanzania is also party to several related international conventions including the Convention on Biological Diversity, the United Nations Convention to Combat Desertification and the United Nations Framework Convention on Climate Change.

B. ACHIEVEMENT OF PDOs (EFFICACY)

Rating: Substantial

PDO: to enhance biodiversity conservation in the Kihansi catchment.

Even though the PDO level indicator was revised, a split evaluation was not applied as indicators, additional information and analysis in this section form a holistic approach to biodiversity conservation and are thus all taken into account to arrive at a single efficacy rating.

Assessment of Achievement of Each Objective/Outcome

***PDO Indicator**: Total area in the Kihansi catchment protected for biodiversity conservation. (Target: 13,080 ha Actual: 12,152.66 ha Achieved 93%)*

21. Activities were designed around and built on experiences from the LKEMP project. They were a natural progression and continuation of the previous project's interventions and served to achieve the objectives by (i) providing the government with the institutional capacity to incorporate biodiversity conservation at the planning level and a reasonable estimate of costs associated with conserving the Kihansi catchment, (ii) building awareness in the surrounding communities on the importance of conservation and protection of resources and teaching them biodiversity friendly practices through livelihood activities, and (iii) broadening the knowledge base and monitoring of endangered species within the catchment. The 93 percent achievement represents hectares demarcated for protection within the Kihansi catchment through co-management plans which are at an advanced stage of approval, the area identified and mapped for important water sources, the KST habitat and area occupied by the new butterfly and wild coffee species.

Institutional strengthening through operational guidelines and procedures

22. Critical to improving institutional capacity, ensuring best practice and building on one of the lessons learned from LKEMP, the project supported the development of key guidelines and procedures to enable the sustainable management and use of water resources and their surrounding environments. This included (i) the operational guidelines and procedures for conducting environmental flow assessment (EFA), (ii) the financing plan for the Kihansi catchment and (iii) guidelines for river and riverbanks management.

23. During the initial delay in implementation of KCCMP, MoWI went ahead to prepare the wider Environmental Water Requirements Assessment (EWA) guidelines[4] which elaborated on the Water Resources Classification System (WRCS) Regulations and includes EFA for rivers and water requirements for surface water bodies. As a result, the aim of the EFA guidelines supported by the project (*Intermediate Results Indicator [IRI] 5*) was modified to test the adequacy of the EWA guidelines and suitability of the WRCS for the Rufiji Basin and the Kihansi catchment. While the guidelines were approved by NEMC and the MoWI early 2019, they were still awaiting formal approval by the Minister of Water and Irrigation at the time of ICR preparation. Nevertheless, they were successful in establishing an environmental water requirement of the Kihansi Gorge and highlighted the need to develop EWA guidelines specific to gorge environments, which were not sufficiently covered by existing guidelines. The WRCS regulations and EWA guidelines have been used to guide the establishment of ecological reserves in ongoing Integrated Water Resource Development and Management Planning for Wami-Ruvu and Lake Victoria Basins and to guide EIA studies of water related projects including the Mwalimu Julius Nyerere Hydropower Project (formerly known as the Stiegler's Gorge Hydroelectric Power Station). Technical capacity to carry out and assess EWA has been strengthened within the respective basin offices and MoWI.

24. In preparation of and to inform the financing plan for the Kihansi catchment (*IRI 1*), a valuation of ecosystem services was completed in 2017 and an economic analysis of the Lower Kihansi Hydropower Plant's (LKHP) water use

[4] Prepared under the Water Sector Development Program and supporting World Bank Water Sector Support Project.

was undertaken in 2017 and completed in January 2018. A financing plan was produced late 2019, however the quality of the report was found to be sub-optimal and was not sufficiently focused on specific financing options. This activity was ongoing after project closure and the financing plan had not yet been finalized, however the government has confirmed that financing for the catchment, as informed by the completed studies, has been agreed with the relevant institutions and will be formalized through memoranda of understanding (MOUs).

25. The third set of guidelines to be support by the project, river and riverbanks management, was introduced during implementation. These guidelines seek to address valley bottom cultivation (*vinyungu*)[5] in the Kihansi Catchment and Rufiji Basin, and will define human activities permitted along and across rivers and lakes including enforcement[6] of the 60 meters buffer zone to prevent agricultural encroachment. The guidelines have been drafted and are pending further stakeholder consultation before submitting for approval to the Minister of Environment, under the Vice President's Office. Consultations were further delayed due to the coronavirus pandemic and related restrictions.

Species and habitat conservation

PDO supplemental indicator: Endemic species (Nectrophrynoides asperiginis, Coffea kihansiensis, Charaxes mtuiae) conserved within the Kihansi catchment. (Target: 3 species, Actual: 3 species Achieved 100%)

26. The central focus of the reintroduction of the KST was to establish a self-sustaining population in the Kihansi Gorge spray wetlands. This included breeding a sufficient number of toads in captivity and releasing them into their natural habitat, making small infrastructural improvements[7] to easily access the natural environment and prevent the recurrence of chytrid fungus, and by maintaining water quantity and quality. The methodology for restoring the KST population had been successfully established under the previous LKEMP project and KCCMP naturally continued these arrangements with the view to have a self-sustaining population of 1,000 KST in the gorge by project closing. To supplement efforts at the two captive breeding facilities in Tanzania, Kihansi and UDSM, KST continued to be bred at the Bronx and Toledo Zoos with bi-annual shipments to Tanzania planned (Table 2 provides the actual number of KST transferred from US facilities). The Toledo Zoo, which had the larger population of KST in the US, also provided training to staff as well as vitamins and antiparasitic medication for the toads. At project closing there were a total of 5,742 KST in the facilities in Tanzania and 6,293 in the US facilities. As populations in the facilities have been growing at a stable rate despite a few setbacks later discussed, the captive population is somewhat greater than at the start of the project when the facilities in Tanzania recorded 1,079 KST and the facilities in the US recorded 3,386.[8] Both facilities in Tanzania were supplied with equipment to support functioning such as essential parts and supplies including pumps, lighting, transformers, vitamins, and drugs.[9]

[5] Valley bottom cultivation or v*inyungu* is an agricultural practice in Tanzania that utilizes the wetlands and river-banks for farming. Farming in these areas have been commonplace due to the higher availability of water especially during the dry seasons and poses a risk to the environment because it destroys wetland vegetation and contaminates water sources.
[6] NEMC would be the authority enforcing distance from buffer zones.
[7] This includes the installation of ladders, hanging bridges, footpaths, and sterilization baths (see Annex 1b)
[8] Data as at May 2013. Toledo zoo had approximately 2,186 and approximately 1,200 in the Bronx zoo. UDSM captive breeding facility had 459 adults and the Kihansi facility had 620 adults.
[9] The UDSM facility also received 10,000 liter backup water storage tank, a new backup electrical generator, new shelving for Drosophila rearing and KST terraria. The Kihansi facility also received a microwave to sterilize cricket substrate, a refrigerator to preserve food items for the crickets, an incubator for hatching cricket eggs, and a new water purification system.

Table 2. Transfers from facilities in Toledo and Bronx Zoos

	Number of KST transferred	
	Toledo	Bronx
January 2015	500	1,000
August 2016	1, 100	
November 2016		1,000
May 2017	600	
March 2018	1, 000	
December 2018	846	
May 2019		1, 000
Total	**4, 046**	**3, 000**

27. Since October 2012, 18,213 KST have been reintroduced in the Kihansi Gorge and of that number 14, 713[10] were reintroduced since KCCMP approval, significantly lower than the 4,000 – 5,000 planned annually (see Annex 7 for release schedule). A few factors, some of which were outside the project's influence, contributed to the variation including insufficient numbers at breeding facilities and delays in shipments from the US (see section III B). While reintroduction had commenced shortly after LKEMP closed, the methodology used under KCCMP benefitted from lessons learned in that first phase. Elastomer tags were introduced to better track the toads and monitor survivorship. Enclosures[11] were constructed during implementation to (i) reduce the potential impact of predation on the KST; (ii) increase the likelihood that individuals could find mates by reducing the maximum potential dispersal distance within the release zone; (iii) increase the probability of detecting the KST during post-release surveys; and (iv) allow the KST to acclimate to the Kihansi Gorge.[12] Given the size of the toad and dense vegetation, quantitative assessments of the population living outside the enclosures have been challenging and time consuming. The last quantitative survey of the KST population outside of enclosures was conducted in March 2018. Nevertheless, with the help of the elastomer marked individuals it was found that a small population (~ 50-100 individuals) comprising of adults, gravid females, and juveniles have persisted outside of the enclosures for at least seven years in the Upper Spray Wetland. The individual marking of KST also revealed that survivorship in enclosures did not vary by the source population (Toledo, Bronx, UDSM, Kihansi) and is influenced by the number and timing of treatments of KST for nematodes. Despite its help with monitoring, the elastomer marking of KST was discontinued in September 2018 and monitoring of those KST marked continued to August 2019. More recent cage experiments in the enclosures have revealed that babies have a higher survival rate than adults strongly indicating the future releases of KST into the gorge should focus more on releasing babies and juveniles. Adult and sub-adult populations of the KST in the

[10] The actual amount up to project closing was 11,295, however there were three hard releases after project closing between January and June 2020 for a total of 3,418 toads being released in less than 6 months, closer to the anticipated 4,000- 5,000 per year. The last hard release was on June 17, 2020.

[11] The three large enclosures (10 m × 6 m × 2m, length × width × height) were installed in the Upper and Lower Spray Wetlands between October and November 2016. Two of these enclosures were placed in the Upper Spray Wetland and one was placed in the Lower Spray Wetland.

[12] Details of the effectiveness of the enclosures can be found in Tanzania Journal of Science 45(4) 2019: Reintroduction of the Kihansi Spray Toad *Nectophrynoides asperginis* Back to its Natural Habitat by Using Acclimatizing Cages

enclosures have declined rapidly during the first 3 months[13] and then more slowly thereafter, following all releases in the enclosures. At project closing it was estimated, based on the March 2018 survey in the Kihansi Gorge, that a self-reproducing population of approximately 445[14] toads may exist in the wild, a number significantly less than the targeted 1,000. This could be attributed in part to the less than expected number of releases and the age class of the released animals, although the accuracy of the estimates of the KST population in the wild is further compounded by the decision to discontinue the marking of KST and the decision to discontinue intensive surveys of the KST population outside of the enclosures. Population monitoring continues to be carried out at night by counting animals in the cages.

28. The project prioritized additional support to three main research areas, disease, nourishment of the KST, and documenting the status and distribution of the new indigenous wild coffee and new butterfly species with outstanding results. Observations are documented in a series papers published in the Tanzania Journal of Science (see Annex 6). Through Sokoine University of Agriculture (SUA), the project supported continued research and mitigation of chytrid fungus which was a main contributor to the KST extinction in the wild and continues to be a threat to many amphibian species worldwide. To facilitate this research, the University's labs were supported and provided with the necessary equipment for a the designated KST biological control experimental room to study chytrid fungus. From this research the University was able to sequence the genome of the fungus and has identified strains of bacteria that could help to build KST immunity to the fungus by inhibiting its growth, however their effectiveness has not yet been confirmed. A histopathology atlas[15] was produced to aid practitioners in the diagnosis of amphibian diseases and is being used as a teaching aid for undergraduate students at the University. Manuscripts on diseases and pathology were also produced (see Annex 6). Additionally, SUA assessed the impact of nutrition on the KST's survivorship by experimenting with different feeds (such as wild crickets, fruit flies (*Drosophilia)* and vitamin supplements) and water quality (pH, temperature and nutrients). It was found that a diet of wild crickets and vitamin supplements enhanced newborn births and survival. Training was provided to toad keepers at the captive breeding facilities on biosafe practices and procedures to prevent exposure of the KST to fungi and other pathogens. Six footbaths were installed at the entry points to the gorge and the three spray wetlands as well as both facilities to reduce the possibility of the toads being infected by chytrid fungus (*IRI 7*). Signs were installed informing of sterilization procedures in English and Kiswahili. To date there has been no evidence of chytrid fungus in the gorge.

29. Research of the wild coffee (*Coffea kihansiensis*), native to the gorge, was supported by the project and initiated in 2017. The studies document the population size and structure, genetic diversity of the species, propagation and domestication methods, and the potential to improve disease resistance, quality and yield of other cultivated species. There are currently 21,000 wild coffee plants in the gorge with about a third of the population located in the lower Upper Spray Wetland. After a few attempts SUA scientists have been able to successfully cultivate the coffee outside of the Kihansi Gorge. Studies have found a caffeine content of 6.12 percent, or 3 – 4 times higher than Arabica and Robusta coffees produced locally. SUA researchers believe there is a potential for strengthening resistance to

[13] Ibid. The caged experiments revealed that about two and a half months after their release, KST population declined by about 50%, likely due to predation and disease and to a lesser degree inability to adapt to the new environment. Treatment for gut parasites resulted in a reduction in the rate of decline.
[14] This number is based on a qualitative assessment of the KST within enclosures. It is believed that about 3 percent of the KST released have survived.
[15] Histopathological Diagnosis of Diseases Affecting Amphibians Inhabiting Kihansi Gorge, Tanzania *https://www.ajol.info/index.php/tjs/article/view/192323*

diseases such as coffee berry and leaf rust in other varieties through hybridization.[16] This work continues through collaboration with the Tanzania Coffee Research Institute (TACRI). SUA is in the process of acquiring a patent for the *Coffea kihansiensis.*

30. At the time of preparation, knowledge of the conservation and taxonomic status of the *Charaxes mtuiae,* a new species of butterfly native to the Kihansi Gorge, was inadequate. The project supported the identification and description of the new butterfly species as well as an identification and mapping of its host plant, *Diospyros natalensis*. Research began in April 2017 and included the use of butterfly traps and sweep net surveys and intensive searching for caterpillars and pupae. In September 2018, a caterpillar and three pupae cases were found, the first sightings since 2006. The caterpillar was reared until it became an adult butterfly. The research noted that the butterfly's host plant, its only food source, was abundant in the gorge, with 890 stems recorded. There were no immediate threats to the host plants survivorship particularly given the ample water supply, though wildfires including from valley bottom cultivation could be an issue. The studies also identified 102 other species of butterfly of which 28 of these other species are *Charaxes*.

31. To overcome challenge of invasive species as agreed in midterm reviews for gorge, TANESCO set aside budget and implemented construction and repairs as well as expansion of the spray sprinkler system to support restoration of the ecosystem. TANESCO was provided with the equipment to construct two sprinkler lines along the eastern and southern perimeters of the Upper Spray Wetland, thereby extending the sprinkler system from 2,900 sqm to 3,350 sqm and expanding the area of coverage to 2 ha (*IRI 4*). This was particularly important for reintroduction and survival of the KST. The vegetation significantly improved over the period of implementation and invasive species of flora that had flourished with the reduced water levels, receded. A new suspension bridge was constructed over the Kihansi River to allow gorge attendants to easily access spray irrigation systems for monitoring and maintenance. The project provided TANESCO with enough spare parts to maintain the sprinkler system for several years. It also supported the repair of solar equipment for the research facility as well as repairs to several sections of the building due to damages caused by a tree falling through the roof in early 2013.

32. While the project was successful in developing the Kihansi Catchment Management Plan (KCMP) (*IRI 3*), long term protection of biodiversity for the catchment was a little more challenging. The KCMP was approved by the Rufiji Basin Water Board (RBWB) in 2017 and was developed as a guide to sustainable conservation, protection and use of the resources in the Kihansi catchment. As envisioned, it provides a mapping of biodiversity rich sites[17], vital water sources, harmful land use practices and illegal use of water. The plan was developed through a consultative and participatory process. Following its approval, awareness campaigns were conducted in the 22 villages by NEMC and RBWB. Residents were introduced to the management plan and were made aware of existing legislation and policies. With the help of Water Users Associations, a total of 901 water sources had been mapped, 96 percent of which were perennial and 4 percent of which were seasonal (IRI 9).[18] The mapping exercise revealed that 77 percent of the perennial water sources and 62 percent of the seasonal water sources were not protected underscoring the need for gazettement of the catchment. There were no significant changes in river flow but an average reading of water quantity at 15.7m^3/s from 2006/2007 to 2018/2019 confirms consistent and acceptable levels. In terms of quality,

[16] Morphological Diversity of Wild Coffee (*Coffea kihansiensis*) a Potential Coffee Species for Genetic Improvement *https://journals.udsm.ac.tz/index.php/tjs/article/view/3257/3178*

[17] The Project Appraisal Document refers to these as sites with unusually high numbers of plant and animal species.

[18] Aide Memoire implementation support mission May 21-30, 2018.

tests revealed the presence of coliform bacteria in water sources but no pesticides. The Kihansi catchment was also the first in the country with water sources identified, mapped and demarcated.

33. In 2016, the decision was made by the project steering committee to establish long-term protection of the Kihansi catchment by designating it as a protected area (*IRI 2 and IRI 6*). This involved an extensive stakeholder consultation process led by a task force of experts and in January 2017 the task force concluded that the catchment should be gazetted as the Kihansi Environmental Protected Area (KEPA) in accordance with EMA CAP 19. The process of gazetting KEPA got as far as defining the boundaries and completing stakeholder consultation before the Tanzania Forest Services recommended maintaining the status of the Njerera, Udzungwa Scarp East and Ihangana Forest Reserves in the catchment.[19] The steering committee finally decided on a co-management modality in October 2019, whereby the existing status of the Njelela Forest Reserve would be enhanced through a General Management Plan to cover the Kihansi Catchment.

34. All 22 upstream and downstream villages in the three districts of Mufindi, Kilolo and Kilombero received training in (i) integrated pest management (IPM) – including application and timing of pesticides; (ii) land use practices including terracing, intercropping, and mulching; and (iii) alternative livelihood activities through farmer field schools (FFS) (*IRI 8*). The IPM guidelines were adopted by the Ministry of Agriculture for application in similar environments nationally, a testimony of the high quality of packages produced. Alternative livelihood activities included cultivation of traditional and non-traditional crops, tree planting/raising tree seedlings and honey production. Crops included traditional maize, Irish potatoes, rice, and tomatoes; and newer crops such as the Hass variety of avocado which has been very well adopted by the farmers due to ease of cultivating and income potential. Some farmers were trained in avocado grafting and avocado/tree nurseries so that they could provide seedlings for sale. Farmers reportedly doubled yield as a result of FFS. The Mufindi District reported maize production increased from 10-12 bags per acre to 16 – 17 bags and bean production from 2-3 bags per acre to 3 to 4.[20] Beekeeping was another highly successful activity with the project providing equipment, gear and training including on how to build the beehives. The Kilolo District reported a strong attraction to beekeeping with 4 bee apiaries and 139 beehives constructed in three villages.[21] Villages in Mufindi saw an increase in honey production from 5-7 liters to 8-12 liters per beehive. Villages in the Kilombero District were less successful due to delays in disbursement to the local government authorities. Even though activities started later than in the other districts they were completed before project closing and villagers confirmed the benefits of the project interventions though they were more skeptical of pest management initiatives being able to control the prevalence of rats in paddy fields. They did, however, confirm that there was an increase in yield. Though the project did not conduct a beneficiary survey, villagers interviewed during the ICR mission in the Mufindi and Kilombero districts confirmed that they were happy with the results of the project and would not revert to previous agricultural practices. All districts reported the added benefit of placing beehives strategically for water sources protection from valley bottom cultivation.

35. Sensitization campaigns and livelihood activities in the targeted villages went well and overall yielded expected results. This was done through study tours to the catchment to build awareness of the objectives of the project and the effects of agricultural practices on water quality and quantity which in turn impacted the ecosystem, the KST and

[19] Designation as either a Nature Reserve or Protected Area status would serve to protect biodiversity in the long-term.
[20] Confirmed based on discussions with the villagers during the ICR mission.
[21] The villages are Wangama, Mwatasi and Masisiwe as per the Kilolo District's completion report.

the hydropower plant. Training on wildfire prevention and management was also positively received. Villagers confirmed during the ICR mission their awareness of the concerns with the protection of the Kihansi catchment and understanding of their important role in its conservation.

Justification of Overall Efficacy Rating

36. The project has successfully built institutional capacity to manage the water resources, has supported key research of endemic species, and has built awareness and influenced improved agricultural practices to reduce human activity that could hinder biodiversity conservation. Though the protected area status is still pending, the government has expressed its commitment to protecting the catchment as part of the existing Forest Reserve and has set in motion the necessary steps to ensure conservation through its decision to expand coverage to the proposed KEPA and through the establishment of a co-management plan.

C. EFFICIENCY

Rating: Modest

Assessment of Efficiency and Rating

37. The economic analysis at the appraisal (PAD) was not conducted, although the project provided an assessment of the incremental/additional cost reasoning to justify GEF funding.

38. The ICR economic analysis is built on three approaches: (a) assessment of the watershed value (mostly assumptions based, considering actual area covered by the project direct interventions); (b) discussion of the project implementation efficiency; and (c) comparative analysis of project costs and incremental cost assessment.

39. Obtaining data for the analysis had some challenges, as at the time of the project baseline and appraisal. For the ex-post evaluation, assumptions are based on the several studies carried out by the project, with recommendations on funding mechanisms to ensure sustainable management and protection of the catchment ecosystem. One of the studies implemented by the project - Economic Valuation of Ecosystem Services from Kihansi Water Catchment and Potential Financing Mechanisms[22] – carried out an assessment of the Kihansi river catchment ecosystem services. According to this analysis, the total economic and environmental value of the catchment is US$ 629,087 per hectare; without accounting for the revenue generated by TANESCO the value of the ecosystem services provided by the catchment is US$3,010 per hectare.

40. Another study funded under the project (Economic Financing Plan For Ensuring The Long-Term Conservation And Management Of The Kihansi Catchment) was carried out in 2016 to develop a financing plan for the Kihansi catchment to ensure secured long-term management including the maintenance and assurance of the reintroduced KST population, biodiversity and associated infrastructure in the Kihansi Gorge. Based on the model provided in this report, environmental fee collection from input and output of products from the catchment would yield positive results on quantity and quality of environmental services and biodiversity as well as the social welfare. Specifically, results show that if imposed, an environmental fee of 1 percent or 6,528,021,140.35 TZS (total US$3,264,010 and US$55.9 per hectare) could be collected annually from the revenues of TANESCO, forest plantations, household timber production and crop production.

[22] 2016. Economic Valuation of Ecosystem Services from Kihansi Water Catchment and Potential Financing Mechanisms. Study for the Kihansi Catchment Conservation and Management Project

41. The conservative value of catchment ecosystem services was applied to assess potential efficiency of the project (based on estimated watershed values in developing countries US$27 per ha per year). Also, NPV and benefit cost ratio were calculated considering value of the environmental services (as estimated in the Economic Valuation Study) and estimated environmental fees (based on the Financing Plan Study), with and without greenhouse gas (GHG) value. A sensitivity analysis was carried out assuming discount rates scenario 5, 10 and 20 percent to test project efficiency during project life (Table 3). The cost-benefit and sensitivity analysis demonstrate that the potential project NPV at 5 percent discount rate varies at US$ 71 -147 million, with the benefit cost ratio between 10-29.

Table 3. Estimated potential project Cost Benefit, NPV assessment

	Conservative value watershed benefits estimate (US$27/ha), low carbon price			Conservative value watershed benefits estimate (US$27/ha), high carbon price			50% Benefits (Conservative value watershed benefits estimate (US$27/ha), low carbon benefits		
Discount rate, %	5	10	20	5	10	20	5	10	20
NPV, US$ mln	76.6	41.2	15.4	147.3	85.1	33.5	71.2	40.4	15.0
B/C ratio	14.9	10.2	5.3	29.3	19.7	10.3	14.7	9.9	5.2

	1% environmental fee (US$55/ha), low carbon price			1% environmental fee (US$55/ha), high carbon price			50% Benefits (estimate of Kihansi catchment ecosystem benefits value, including hydropower), low carbon benefits		
Discount rate, %	5	10	20	5	10	20	5	10	20
NPV, US$ mln	72.7	41.3	15.4	147.4	85.1	33.6	217.9	128.3	52.6
B/C ratio	15.0	10.1	5.2	29.4	19.7	10.3	43.0	29.3	15.7

Discussion of the project implementation efficiency

42. The project proved to be efficient in the use of project resources, considering the complexity of the barriers, issues project intended to address, and the technical nature of the interventions. There was one restructuring of the project, which was approved in June 2017, to improve the indicators to allow for better evaluation of project outcomes and strengthen the link between the project activities and the results framework. A no-cost extension of the closing date from December 31, 2018 to December 31, 2019 was also necessary given implementation delays in the first year of the project. Procurement of goods and services were overall consistent with expected spending at appraisal and during implementation per the annual work plans. Project management cost was below 5 percent of the grant and was not affected by the restructuring.

GEF incremental cost analysis

43. The project was aligned with the GEF Biodiversity Focal Area and was designed to contribute to the achievement of the GEF 5 Strategy Objective of Mainstreaming Biodiversity Conservation and Sustainable Use into Production Landscapes, Seascapes and Sectors (BD-2). The expected focal area outcome for this project is to increase sustainability managed landscapes that integrate biodiversity conservation (Outcome 2.1). The project continues to be relevant to the Biodiversity Focal area objective 1-1 under new GEF 7 Programming Direction, Mainstream biodiversity across sectors as well as landscapes and seascapes through biodiversity mainstreaming in priority sectors.

44. The incremental GEF Biodiversity-funded activities contributed for the long-term conservation and management of globally critically endangered species and critical habitats in the Kihansi catchment. GEF incremental support will allow for the broader integration of biodiversity conservation activities and programs into the planning and management of river basins. The project supported the development of key guidelines and procedures to enable the sustainable management and use of water resources and their surrounding environments. This included (i) the operational guidelines and procedures for conducting environmental flow assessment (EFA), (ii) the financing plan for the Kihansi catchment and (iii) guidelines for river and riverbanks management. The project prioritized additional support to three main research areas, disease, nourishment of the KST, and documenting the status and distribution of the new indigenous wild coffee and new butterfly species with outstanding results.

45. The baseline for the GEF project was the Water Sector Development Program (WSDP). The WSDP is a multi-phased long-term program to implement the National Water Policy (NAWAPO) established in 2002. It aims to strengthen water sector institutions across nine river basins in Tanzania for integrated water resource management (IWRM) and improving access to water supply and sanitation services.

46. The total cost of the GEF alternative might be higher at the time of the project closure, considering Additional Financing (AF) to the WSP approved in 2014, in the amount of US$44.9 million. The AF project provided US$9 million to the component 1 which initially served as a baseline for the GEF project. The government co-financing included the US$3.62 million in-kind contribution; the government ownership and commitment for the project were met through this in-kind contribution.

D. JUSTIFICATION OF OVERALL OUTCOME RATING

Moderately Satisfactory

47. The overall outcome rating is derived from a substantial rating for relevance and efficacy and the modest rating for efficiency. While there were a few shortcomings related to timely adoption of guidelines and the protected area status of the catchment, the project was able to identify the necessary financial support and build the institutional and operational support to sustain the management and preservation of the catchment.

E. OTHER OUTCOMES AND IMPACTS (IF ANY)

Gender

48. Consistent with the CPF's agenda to support women's productivity in agriculture, the project was successful in targeting and supporting this group. Of the 3,126 project beneficiaries, 52 percent were women. Both women and men were targeted equally in all three districts for trainings as well as for leadership roles. Within the eight villages of the Mufindi district, two para-professionals were selected in each village – one woman, one man. While for the most part male beneficiaries outnumbered female, there were a few villages were women who participated in project activities were equal to or more than men. Women like their male counterparts experienced an increase in productivity through improved agricultural practices which has translated in increased income.

Institutional Strengthening

49. The institutional arrangements resulted in tremendous capacity building for all staff working in the relevant Ministries. The project's design required constant interaction between several Ministries and agencies bringing a richer understanding of their cross-sectoral needs and the efforts that it would take to achieve their common goal. Given their experience many of the staff previously working on the complexities of the Kihansi catchment from TANESCO, TAWIRI, NEMC, MoWI and RBWB were assigned to work on the 2,115MW Mwalimu Julius Nyerere Hydropower Station (also in the Rufiji Basin) currently under construction. It is believed that the knowledge gained from the Kihansi experience will help to circumvent any future mishaps as far as biodiversity conservation is concerned. Even though the EFA guidelines have not been formerly approved by the Minister of Water and Irrigation, they are reportedly being used for this new power station.

50. With the equipment provided under the project for analysis of chytrid fungus and the KST, the University of SUA has expanded capacity beyond originally conceived. SUA now has the ability to diagnose other diseases common to livestock such as swine fever, *peste des petits* ruminants, bluetongue and Newcastle disease; as well as diseases affecting produce such as brown streak disease in cassava. The equipment can also be used to diagnose viruses in humans such as cholera, ebola, dengue and the novel coronavirus. The University now has the capacity to bio-archive biological samples for extended periods to allow for future analysis.

51. In building SUA's capacity to advance studies for the KST as previously discussed, amphibian studies in Tanzania has expanded to include important literature not only on the KST but on chytrid fungus and parasites. The histopathology atlas produced is already being used as training material for university students. SUA is committed to continuing its research of amphibians, including the KST, and has identified land for the construction of a laboratory that will pioneer this research in Tanzania. Findings from exploration of the wild coffee could be promising for the industry if successful hybridization and modification of existing cultivated varieties make them more resistant to disease and pests. SUA is partnering with the relevant government entities to further explore this potential.

Mobilizing Private Sector Financing

Not applicable

Poverty Reduction and Shared Prosperity

52. While the primary focus of the project was ecosystem restoration and preservation, the project did incorporate provisions for removing human pressure on resources through improved agricultural practices and alternative livelihood activities. Villagers in all three districts participating in FFS confirmed that they saw a significant increase in produce and their incomes accordingly. Interviews during the ICR mission also confirmed that after observing the positive impact of the project other villagers, who had not participated in the FFS, were eager to follow the same practices and have been benefiting from on-learning from those who had participated. Additionally, villagers now have access to additional markets which is promising for food security and income earning.

Other Unintended Outcomes and Impacts

Not applicable

III. KEY FACTORS THAT AFFECTED IMPLEMENTATION AND OUTCOME

A. KEY FACTORS DURING PREPARATION

53. **Incorporation of lessons learned:** KCCMP's design relied heavily on the key lessons and recommendations from the previous LKEMP project with activities directly building on its achievements. Key lessons incorporated in component 1's activities included (i) the need for proper EFA's to be conducted when dealing with sensitive ecosystems; (ii) the need to consider both upstream and downstream impacts in environmental impact assessments; (iii) the need to strengthen the institutional framework for environmental and water resource management; and (iv) adoption of environmental plans by respective institutions. Lessons reflected in component 2 included (i) building ownership through engagement and participation by key stakeholders, (ii) partnering with institutions including academia for advanced scientific research; and (iii) recognizing that preventing the extinction of a species was a lengthy process requiring collaborative efforts.

54. **Appropriateness of project design:** Given that the reintroduction of the KST was only just beginning, after the population in captivity had been restored to acceptable levels, and given the history of working to restore the gorge and operationalize the regulatory framework for environmental considerations in water resources management, it was imperative that the World Bank continue to collaborate with the government on these efforts. The activities supported the objectives of the project and were adequately financed to achieve them. Implementation arrangements involved coordination among several institutions but was a necessity due to the cross-sectoral nature of the intervention. Additionally, given their extensive experience working together in previous years on the initiative it was only fitting that they continue in the same vein. Baseline data was not available due to the piloting nature of the activities, such as the reintroduction of the KST and restoration of the habit which had not been done before, this would later have some impact on reporting, though was resolved to an extent with restructuring

55. **Assessment of risks:** The project was appropriately rated as substantial given the risks associated with "Delivery Monitoring and Sustainability"[23] and "Other: Exogenous factors". This included the possibility that TANESCO would not maintain appropriate water levels to sustain the gorge in the event of drought or other such occurrence, a risk that materialized briefly in 2014, but was quickly rectified; as well as TANESCO's ability to adequately monitor, maintain and repair the sprinkler system and the timely development of the financing plan. Exogenous factors had to do with the reintroduction of an extinct in the wild species- a first time for Tanzania – and *in situ* control and mitigation of chytrid fungus. Despite mitigation measures captured in the design of the project, these risks would eventually impact achievement of project objectives as discussed in efficacy. All other risks were assessed as moderate and did not pose a threat to the achievement of the project's PDO.

56. **Readiness to implement:** As previously mentioned, the project benefited from successful implementation arrangements under the LKEMP, which was replicated for this phase. This along with NEMC's extensive experience working with World Bank projects enabled them to be in a position to begin implementation upon approval. Financial

[23] At the time of preparation, the Operational Risk Assessment Framework was used. This was later replaced by the Systematic Operations Risk-rating Tool (SORT) and this risk was captured as Institutional Capacity for Implementation and Sustainability

management and procurement assessments found staff to be well qualified and experienced for fiduciary oversight. Safeguards staff were also appropriately skilled and experienced with monitoring World Bank projects. Project preparation took the usual 1.5 to 2 years due to timing differences in the GEF and World Bank project cycle, however the Tanzania Energy Development and Access Expansion Project (P117260) served as a bridge between LKEMP and KCCMP to facilitate a smooth transition.

57**. Other factors:** In November 2012 and January 2013, chytrid fungus outbreaks at the UDSM and Kihansi facilities underscored the need to have in place appropriate facilities and equipment to contain the spread of the fungus within the facilities and the gorge. In March 2013, heavy rains lead to two landslides in the Upper Spray Wetland, which created two 10-meter-wide gullies and damaged the sprinkler system. This emphasized the need to include infrastructure that provided some resilience to natural events or occurrences in the project design.

B. KEY FACTORS DURING IMPLEMENTATION

Adverse factors

58. **Slow start**: Project implementation had a slow start due to a freeze on disbursements across the entire World Bank portfolio in Tanzania. Consequently, as activities were limited to preparatory work such as putting in place M&E arrangements, preparation of the TOR for EFA consultancy and monitoring of the KST, implementation progress was rated moderately unsatisfactory in the first Implementation Status and Results Report (ISR). Additionally, while implementation arrangements had been ironed out prior to approval and the respective agencies had a clear understanding of their roles during implementation, TAWIRI was not at the time prepared to assume responsibility as they did not have the staff, facilities, budget nor equipment in place for the first two years of the project.[24] Once the freeze on disbursement was lifted in 2015, activities picked up and the project maintained a satisfactory or moderately satisfactory rating but not without the impact of losing momentum. The project was eventually extended to make up for this lost year.

59. **KST transfers**: Transporting the KST from Zoos in the US, was not as straightforward as anticipated and impacted the frequency with which the KST was transported to Tanzania and tangentially the frequency of which the KST were released in the gorge. At the start of the project only the Bronx Zoo had the ability to export the toads to Tanzania through a Breeding Loan Agreement with the GoT. As such, the Toledo Zoo had to coordinate shipping with the Bronx Zoo and transported the toads there, before they were shipped to Tanzania where they were received by UDSM. This was not the most efficient process and the Toledo Zoo eventually signed a separate MOU with the GoT and transported for the first time, without the Bronx Zoo as an intermediary, in 2018. Though no longer dependent on the Bronx Zoo for shipment, delays in getting permits to export both on the side of the Zoos and that of the Government of Tanzania resulted in shipments occurring less frequent than planned. The March 2018 the shipment of 1,000 KST from the Toledo zoo resulted is the highest number of KST lost in transportation. This was due to a change in KLM airline's policy ceasing the transportation of live animals. The toads were instead shipped via United Emirates which increased the travel period by 24 hours. Seventeen KST were lost during the trip from the United States and an additional 224 were lost in country. The last transfer of KST to Tanzania was in May 2019 from the Bronx Zoo. Transfers from the Toledo Zoo were expected in August and October 2019 but were cancelled because of issues on the side of the Toledo Zoo with acquiring the necessary Convention on International Trade in Endangered Species of Wild Fauna

[24] While TAWIRI was able to provide support under LKEMP, changing priorities towards the preservation of larger mammals, particularly elephants, led to the diversion of resources away from the KST.

and Flora (CITES) export permit.[25] A transfer was planned for April/May 2020 but was cancelled due to travel restrictions as a result of the coronavirus outbreak.

60. **Complications at captive breeding facilities**: Though chytrid fungus has not been identified in the gorge, it did affect the captive breeding facilities, where there were three outbreaks between 2012 and 2016. The first was in November 2012 at the UDSM facility and, the second and third in the Kihansi facility in January 2013 and April 2016 respectively with 40 toads being lost in the last instance. The outbreaks were well managed by treating the toads with the anti-fungal drug, i*ntranconazole,* and by deeply sterilizing the facilities. Fortunately for the project, these proved to be minor setbacks but reinforced the need for facilities to be kept sterile to prevent contamination. It also underpinned the importance of the project installing sterilization baths at the entrances to the gorge and spray wetlands. The facility at the Bronx Zoo had no adverse occurrences during the implementation of KCCMP, however the facility at the Toledo Zoo –with the larger of the two populations in the US – was affected by issues with water quality in 2014 due to an algae bloom in Lake Erie which resulted in a loss of about 23 percent of the population. This was later resolved by the installation of a reverse osmosis water purification system. Nevertheless, there was a significant impact on KST numbers at the facility, and it took more than a year before Toledo's population was restored. In 2014, a faulty air conditioner at the Kihansi facility resulted in a decline of the KST population by 57 percent.

61. **Delay in designation of protected area status:** As discussed further in section IV B, the government realized late in implementation that establishing the Kihansi Gorge as an Environmental Protected Area would be more complex than originally thought given that the area demarcated[26] had fragmented protection status. This resulted in extensive discussion between government agencies on whether to maintain status or designate as a protected area. One factor that contributed to this was the frequent change of Permanent Secretaries (PS) in the Vice President's Office in the latter half of the project. Between 2016 and 2019, the PS changed three times, causing delays in decision making on key elements of the project, the most impactful being the pending decision on gazettement of the Kihansi Environmental Protected Area, which was only advanced after project closing.

Favorable factors

62**. Implementation arrangements and extensive experience**: With 15 Ministries, agencies and institutions, the project benefitted from the multi-sector coordination needed to ensure all stakeholders played an important role of representing their respective interests while understanding the needs of the others to arrive at a common ground. Oversight was at a high-level and steering committee meetings[27] were chaired by the Permanent Secretary in the Vice President's Office and held routinely as envisioned. A technical advisory committee,[28] chaired by the Director General of NEMC and comprising all the implementing entities served to provide technical guidance. Having a dedicated team

[25] In order to export the KST to Tanzania, the GoT had to send a CITES import permit to the US Zoos, after which they would apply to the United States Fish and Wildlife Services for a CITES export permit. Timing issues including expiration of the CITES permit delayed exports to Tanzania throughout implementation.
[26] The 3,471 ha to be protected includes: (i) 285 ha (8.22%) of Njerera Forest reserves; about 2592.449 ha (74.68%), under TANESCO; and 593.723 ha (17.10%) of public land.
[27] The steering committee included PSs from Vice President's Office, Ministry of Natural Resources and Tourism, Ministry of Energy, Ministry of Water and Irrigation, Ministry of Finance and Planning; Regional Administrations and LGAs and TANESCO's Managing Director.
[28] Key implementing agencies included Vice President's Office (Division of Environment), NEMC, TANESCO, MoWI, Ministry of Agriculture and Food Security, Ministry of Natural Resources and Tourism, the District Executive Directors of Kilombero, Mufindi and Kilolo, SUA and UDSM.

of practitioners and experts with extensive experience working in the catchment acted in the project's favor, particularly as it related to the reintroduction of the KST. Many of the technical staff in this follow-on phase had previously been a part of LKEMP, with only a few changes including the Project Coordinator. They were familiar with the issues, had the institutional knowledge and had the capacity to effectively implement activities. As it relates to reintroduction, careful record-keeping, experimentation and detailed surveys guided decision-making. Similarly, on the World Bank side, the TTL was the same as for the LKEMP project and was based in the field along with the rest of the team.

IV. BANK PERFORMANCE, COMPLIANCE ISSUES, AND RISK TO DEVELOPMENT OUTCOME

A. QUALITY OF MONITORING AND EVALUATION (M&E)

Rating: Substantial

M&E Design

63. NEMC had adequate resources for monitoring and evaluation, and reasonable arrangements were in place with the other executing entities to capture project results. The results framework was consistent with the theory of change and included indicators that captured key activities and outputs per components. The indicators' baselines and targets were appropriate and consistent with the level of ambition and funding. Definitions were clear and detailed for the two core indicators but was lacking for the others which later brought some challenges with what contributed to the achievement of targets at the intermediate level, though some indicators were better defined with the restructuring. Data was centrally collected by NEMC who prepared and reported on these annually through routine project reports. Institutions responsible for collecting and sharing data were appropriately identified.

M&E Implementation

64. Given the research underpinnings of the project data was abundant. Keepers at all captive breeding facilities kept detailed records of feeding habits, survivorship, breeding, and parasitic infections. Keepers counted each KST individually as releases were based on a surplus of over 2,000 in the UDSM and 1,000 at the Kihansi facility, protocols that were instituted in 2017. Transfers from US zoos were also based on KST numbers and the MOU required that these numbers were shared twice per year. This was largely complied with, though the Bronx Zoo did not always share data at the agreed times. Comprehensive records were kept on the number of animals released, where and how they were released. Following a release, the KST in enclosures were monitored daily for the first week and once every two weeks thereafter for another three months before being hard released. For the livelihood activities detailed records were kept in each village of the crop type, yield and demographic. Water quality and quantity were routinely tested and found consistent and acceptable for the duration of the project. Reporting in ISRs reflected results and duly indicated the moderate limitations with fully meeting the project's objective. Progress towards meeting the GEF Biodiversity goals were captured and reported in the tracking tools updated at mid-term and completion. Despite having sufficient capacity for monitoring and evaluation, NEMC could have been more attentive and consistent with collating and sharing data. While data quality itself was first-rate, the World Bank team often received data directly from the other agencies.

65. During implementation, several weaknesses in the results framework were observed and were corrected, through the restructuring in 2017. At approval there were two PDO level indicators, but it was decided during the mid-term review to revise PDO level indicator 1 for clarity and to better align with the PDO's target area of the Kihansi catchment and to move PDO indicator 2 to the intermediate level. Revisions at the intermediate level refined the results framework to capture the limiting factors affecting endemic species, and to remove redundant indicators. This restructuring introduced new shortcomings with the repositioning of the indicator on the operational guidelines to the intermediate level and did not replace with a measure for institutional sustainability as intended in the definition of "enhance" in the PDO and thereby placing a greater reliance on the establishment of a protected area for success.

M&E Utilization

66. Progress reports were prepared regularly and informed decision -making, restructuring, and work plans, though M&E reports were qualitative making it difficult to measure and analyze impact. Much of the data collected during implementation was based on experiments conducted in the gorge and on the three species identified for research. The decision to install enclosures in the gorge to support efforts for release was based on the decline in the population soon after release. Caged release also allowed for closer observation of factors that could be impacting survivorship and permitted researchers to easily recapture toads for testing and analysis. The detailed monitoring of the facilities contributed to early detection of chytrid fungus outbreaks and rapid response. The most important gain from this experience has been documented and published in a series of papers which will be of tremendous value to the global community as it relates to the reintroduction of an extinct in the wild amphibian.

Justification of Overall Rating of Quality of M&E

67. The overall rating for M&E is Substantial due to appropriateness of the theory of change and the right level of ambition for success. The indicators were an acceptable proxy for measurement of results and impact. The project produced a high quality of data that has led to several important publications on endemic species in the Kihansi gorge and will inform reintroduction of amphibian species for years to come.

B. ENVIRONMENTAL, SOCIAL, AND FIDUCIARY COMPLIANCE

Environmental and Social

68. Based on the small works and reintroduction of the KST the project was given an Environmental Assessment Category B - Partial Assessment. The following safeguards policies were triggered by the project: Environmental Assessment (OP/BP 4.01); Natural Habitats (OP/BP 4.04); Pest Management (OP 4.09); Forests (OP/BP 4.36); and Involuntary Resettlement (OP/BP 4.12) for which a Process Framework was prepared to address sustainable livelihoods issues and implications of protection status of the catchment. Other instruments prepared were an Environmental and Social Assessment, which included an Environment and Social Management Plan, and an Integrated Pest Management Plan. The project had a functional Grievance Redress Mechanism, that could lodge complaints through either the Village Government, Local Government Authority or the PCU under NEMC.

69. For most of implementation the project was compliant with safeguards policies, however the delay with establishing the protected area status for the catchment resulted in non-compliance with OP/BP 4.12 - Involuntary Resettlement and safeguards being downgraded to moderately unsatisfactory in June 2019. As per the process

framework, the government was required to complete a community conservation management plan, but the plan could not be finalized because a decision on whether to gazette as a Nature Reserve or as an Environmental Protected Area was pending. The designation is important as it has implications on livelihoods for the surrounding villages. If designated as a conservation area the villagers could access for fuel wood, herbs and bush meats. If designated as a reserve they would not have access to forest products. The draft of the community conservation management plan was found to be acceptable.

Fiduciary

70. Overall the project was compliant with World Bank policies and guidelines.

71. **Financial Management** arrangements were found to be adequate throughout implementation as it related to planning and budgeting, accounting, funds flow and disbursements, financial reporting. Interim Financial Reports were well prepared and submitted in a timely manner. Any shortcomings were quickly identified and addressed following recommendations and agreed action plans. Audits were completed and submitted on time.

72. **Procurement** was carried out in accordance with "*Guidelines: Procurement of Goods, Works, and Non-Consulting Services under IBRD Loans and World Bank Credits & Grants by World Bank Borrowers*"; "*Guidelines: Selection and Employment of Consultants under IBRD Loan and IDA Credits by World Bank Borrowers*". It was consistent with the annual work plan and within the expected budget. Though the procurement process could be lengthy on occasion and there was some delay with contracting, it was not significant enough to impede project activities.

C. BANK PERFORMANCE

Rating: Satisfactory

Quality at Entry

73. Having had the experience of 10 years of implementation with the LKEMP project, the World Bank team had the advantage of preparing a solid project based on well understood environment and lessons learned. The project was designed with a clear objective in mind and was consistent with Tanzania's development goals. Given this prior experience the project should have been prepared in a much shorter time to quickly act on some of the accomplishments of the previous project and to take advantage of the momentum. Risks were appropriately identified and mitigated. However, due diligence at the time of preparation should have revealed the status of forest reserves within the catchment, which would have allowed the project to address this issue early in implementation.

Quality of Supervision

74. The project had the good fortune of having the same TTL for the LKEMP project design and supervise KCCMP, with the additional strength of being in country along with the rest of the team, and readily available to the government. This afforded close supervision especially given the sensitivities around reintroduction of the KST. The World Bank team fielded at least two missions per year and delivered training in financial management, procurement and safeguards. Regular meetings in between missions reinforced support. Aide memoires and ISRs were very detailed and provided clear guidance and action plans needed to circumvent obstacles and achieve project objectives. During the ICR mission the various agencies commended the World Bank for its support, through the GEF grant, to continue important research and providing clear guidance and support to resolving issues in a timely manner.

Justification of Overall Rating of Bank Performance

75. As described above the World Bank team played a key role in supporting the development and implementation of the project. Thus, performance is Satisfactory.

D. RISK TO DEVELOPMENT OUTCOME

76. At project closing a final decision had still not been reached on the protection status of the Kihansi catchment. As discussed earlier this would have some impact on the achievement of the project's objective as without protection status, critically endangered and endemic species remain exposed. Before project closure and as confirmed during the preparation of this ICR, the project steering committee had directed NEMC and TFS to agree on a co-management arrangement, through a General Management Plan. This was based on the decision to expand the Nature Reserve to incorporate the KEPA rather than designating as a conservation area which would avoid an overlap in mandates and accelerate conservation of the area. The steering committee will continue to oversee these activities until protection status is established. The Government has committed, through NEMC, to ensure conservation practices developed under the project will become a part of regular monitoring and planning. Additionally, the Government is currently developing a proposal to share with the World Bank and other partners on a project that could support building resilience and further protecting these species endemic to the catchment from future climate change impacts.

77. For the KST to be self-sustaining, frequent reintroductions will need to be continued over the near future. The current Breeding Load Agreement between the GoT and the Bronx and Toledo Zoos will expire June 2020 and a new agreement has not yet been negotiated, though there are plans to renew in July 2020. While the GoT is looking to have a significant portion of the KST transferred to the facilities in Tanzania, once the facilities in country are adequately prepared to receive the toads, this will take some time to be in place. The last transfer of KST planned for April 2020 was cancelled due to travel restrictions following the novel coronavirus outbreak. Releases from local facilities were also delayed, posing a risk to sustainability of the population in the wild. NEMC has confirmed that the government is committed to continuing the program in its current state for at least two years and will maintain the same coordination arrangements with other agencies as under the project to allow a smooth transition as these agencies assume ownership in their respective roles. The steering committee will remain in place, will continue to meet regularly and will continue to guide decision making. Nevertheless, there was some concern at closing that the project handover process was incomplete and agencies like TAWIRI were still unclear of their role going forward. NEMC has assured that the oversight of the steering committee and MOUs with the respective agencies will ensure accountability and fulfillment of obligations to further efforts. The MOUs have been drafted and were expected to be signed at the steering committee meeting planned for April but that was postponed due the coronavirus pandemic. Beyond this, Ministries and agencies will need to adopt the recommendations of the financing plan to ensure that conservation is adequately budgeted for.

V. LESSONS AND RECOMMENDATIONS

78. The project had important lessons of and recommendations for the reintroduction process, implementation arrangements, and community engagement and participation.

79. **Reintroduction is a long-term process that will require dedicated resources, careful monitoring and continued**

research. Pioneering reintroduction of an extinct-in-the-wild amphibian species, much of the work done under this project was a learning experience. As discussed previously, the methodology was adjusted to take into account observations and lessons learned through experiments, breeding, feeding, treating, hard releases and subsequent detailed surveys. Some notable observations are:

- Survivorship is higher in babies and sub-adults. Monitoring post -reintroduction showed that babies and sub-adults had a higher rate of survival than adults when released in the wild. This could be linked to adaptation and immunity considerations since the KST have been bred for several generations in captivity. **Recommendation:** Given the success with the babies and sub-adults one recommendation would be to release more babies, sub-adults and gravid females in the wild to improve chances of a self-sustaining population.
- More KST need to be released and more frequently in order to ensure a self-sustaining population. Considering the captive population at the time of project approval, hard releases may have started too early in the process. Perhaps there would have been greater success if reintroduction started a little later to get the population to a point where a sufficient number of toads were being bred for reintroduction. Facilities now have the perfect conditions under which the KST thrives and is reproducing, however the population remains smaller than anticipated and with the cap on the number that need to remain within the facilities, the likelihood of making an impact remains a concern. **Recommendation:** It will be important for the GoT to quickly expand captive breeding facilities to increase population and thereby increase the number of KST being released.

80. **Community engagement and participation fundamental for long-term sustainability.** Communities were actively engaged from the very beginning and had a clear understanding and appreciation for the conservation of the Kihansi catchment. They provided support to water identification and mapping exercises as well as protection to water sources through fencing and beekeeping. However, to get communities fully on board they need to see results. Their receptiveness to the training in IPM and land use practices was greatly influenced by the economic benefits of applying new agricultural techniques and new crops such as the Haas variety of avocado.

81**. A multi-sector project needs strong involvement from relevant sectors.** As mentioned earlier, one of the more successful aspects of implementation had to do with the arrangements. The project benefitted from having technical expertise of relevant practitioners and truly utilized a multi-sectoral approach for decision-making. Arrangements also allowed technicians to build expertise within their field while gaining from the opportunity to share different perspectives, to learn more about other sector priorities and to come to a unified approach that takes into consideration the various sector needs. A key factor in these arrangements was having NEMC as the PIU. Reporting to the Vice President's Office, NEMC provided a good balance to the project as it is not tied to any one Ministry. It's position also allowed for a smoother procurement process, monitoring and evaluation and overall coordination of activities.

82. **Commitment is needed at a high level to ensure ownership and accountability over the long-term**. In terms of biodiversity conservation, financing and management of the Kihansi catchment, the project has developed guidance and important research in endemic species, chytrid fungus and habitat restoration under the direction of strong decision-making and guidance at the steering committee level. However, the frequent change of the leadership in the final years of the project led to delays in making a decision on KEPA. Additionally, maintenance of the gorge and captive breeding facilities, and protection of species will need a guaranteed budget within the relevant agencies to sustain efforts.

ANNEX 1. RESULTS FRAMEWORK AND KEY OUTPUTS

A. RESULTS INDICATORS

A.1 PDO Indicators

Objective/Outcome: to enhance biodiversity conservation in the Kihansi catchment

Indicator Name	Unit of Measure	Baseline	Original Target	Formally Revised Target	Actual Achieved at Completion
Total area in the Kihansi catchment protected for biodiversity conservation.	Hectare(Ha)	9080.00 24-Nov-2014	13080.00 31-Dec-2019		12267.01 31-Dec-2019
Endemic species (Nectrophrynoides asperiginis, Coffea kihansiensis, Charaxes mtui) conserved within the Kihansi catchment.	Number	2.00	3.00		3.00
Endemic species of KST, Nectophrynoides asperiginis conserved within the Kihansi catchment.	Number	0.00 24-Nov-2014	1000.00 31-Dec-2019		445.00 31-Dec-2019

Endemic species of wild coffee, Coffea kihansiensis conserved within the Kihansi catchment	Number	21000.00 24-Nov-2014	21000.00 31-Dec-2019		21000.00 31-Dec-2019
Host plants of a new butterfly, Charaxes mtui conserved within the Kihansi catchment.	Hectare(Ha)	0.00 24-Nov-2014	200.00 31-Dec-2019		200.00 31-Dec-2019

Comments (achievements against targets):
Achieved (93%): This indicator was revised in the restructuring to better align with the project's PDO. The baseline of 9,080 ha was an area already under protection status and includes Njelela Forest and TANESCO area. 200 ha is covered by wild coffee; 1 ha is for the spray system; 663 ha is an area with important water sources; and 3,187.01 ha is the new area demarcated for KEPA/Forest Reserve. The host plant is abundant in the Udzungwa Scarp Nature Reserve hence the area protected within the Kihansi catchment is approximately 1200 ha. Within this area, 1292 stems were recorded.

Original indicator was: Landscapes that incorporate biodiversity considerations as per IUCN classification criteria for protected areas are conserved. Target:5,500 ha

A.2 Intermediate Results Indicators

Component: Component 1: Institutional capacity building for the management of the Kihansi catchment

Indicator Name	Unit of Measure	Baseline	Original Target	Formally Revised	Actual Achieved at

				Target	Completion
Sustainable financing mechanism established based on payment for ecosystem services.	Yes/No	N 24-Nov-2014	Y 31-Dec-2018	Y 31-Dec-2019	N 31-Dec-2019

Comments (achievements against targets):
Achieved (80%): The Financing Plan was informed by two studies conducted earlier in implementation: Economic Valuation of Ecosystem Services from Kihansi Catchment and Economic Analysis of water use of Lower Kihansi Hydropower Plant. The draft has been reviewed by authorities but cannot advance until a final decision has been made on the status of the Kihansi catchment.

Indicator Name	Unit of Measure	Baseline	Original Target	Formally Revised Target	Actual Achieved at Completion
Legal establishment of national protected area (gorge, catchment and water sources)	Yes/No	N 17-Jun-2016	Y 31-Dec-2019		N 31-Dec-2019

Comments (achievements against targets):
Partially achieved (75%): This indicator was introduced after the mid-term review. The decision to gazette Kihansi Environmental Protected Area (KEPA) was made in the Project Steering Committee on October 17, 2019. During implementation it was discovered the that Njelela Forest already had protection status and after some discussion with the Tanzania Forest Services, Ministry of Natural Resources and Tourism, it was agreed that the existing protection status of Njelela Forest Reserve could be enhanced through a Conservation Management Plan which would allow for co-management of KEPA. The plan has not yet been approved though it is at an advanced stage.

Indicator Name	Unit of Measure	Baseline	Original Target	Formally Revised Target	Actual Achieved at Completion
Catchment management plan developed and approved by Rufiji Basin Water Board.	Yes/No	N 17-Jun-2016	Y 31-Dec-2019		Y 31-Dec-2019

Comments (achievements against targets):
Achieved (100%): This indicator was introduced after the MTR. The Kihansi Catchment Management Plan was approved in April 2018 by Rufiji Basin Water Board. The plan was implemented under the supervision of LGAs and RBWB.

Indicator Name	Unit of Measure	Baseline	Original Target	Formally Revised Target	Actual Achieved at Completion
Area of functioning spray irrgation system in the Gorge.	Hectare(Ha)	1.50 17-Jun-2016	2.00 31-Dec-2019		2.00 31-Dec-2019

Comments (achievements against targets):
Achieved (100%): This indicator was introduced after the MTR. Spray sprinkler system was expanded from 2900 sqm to3350 sqm extending the spray area by another 0.5 ha.

Indicator Name	Unit of Measure	Baseline	Original Target	Formally Revised Target	Actual Achieved at Completion
Operational guidelines for conducting environmental flow assessment developed and approved by National Environment Management Council and Ministry of Water.	Yes/No	N 17-Jun-2016	Y 31-Dec-2018	Y 31-Dec-2019	Y 31-Dec-2019

Comments (achievements against targets):

Partially Achieved (80%): This indicator was originally measured at the PDO level. It was moved to the intermediate level during project restructuring due to an overlap with another intermediate level indicator. Guidelines were developed as expected, however it was approved by only NEMC. While MoWI has been testing the guidelines through application, they have yet to be formally approved by the Minister of Water and Irrigation.

The guidelines on rivers and riverbank management were added after the mid-term to complement the operational guidelines. The consultancy to draft the guidelines started within the latter half of 2019 too late for them to be completed before project closing.

Component: Component 2: Conserve endangered species in the Kihansi catchment

Indicator Name	Unit of Measure	Baseline	Original Target	Formally Revised Target	Actual Achieved at Completion

New areas outside protected areas managed as biodiversity-friendly (ha)	Number	9.00 24-Nov-2014	4000.00 31-Dec-2018	5500.00 31-Dec-2019	3187.17 31-Jan-2019

Comments (achievements against targets):
Partially achieved (58%): Out of 3471.66 ha already demarcated for the proposed Kihansi Environmental Protected Area (KEPA) only 285.489 ha (8.22%) is within the Njerera Forest Reserve. Following confirmation of the boundaries and the agreement reached by the project Steering Committee on October 17, 2019, the new area, which will be accorded protection is 3,187.17 ha.

The original indicator target was 4,000 ha and was revised upwards to 5,500 ha in the restructuring.

Indicator Name	Unit of Measure	Baseline	Original Target	Formally Revised Target	Actual Achieved at Completion
Chytrid disease controlled (foot sterlization baths at entry points to the gorge and spray wetlands, biological control of Chytrid).	Yes/No	N 17-Jun-2016	Y 31-Dec-2019		Y 31-Jan-2019

Comments (achievements against targets):
Achieved (100%): Foot baths installed at all entry points of the gorge and are equipped with brushes and chlorine to aide with sterilization. Signs instructing cleaning have been posted in both English and Kiswahili.

Indicator Name	Unit of Measure	Baseline	Original Target	Formally Revised Target	Actual Achieved at Completion
Villages using integrated pest management strategies (cropping, use of pesticides).	Number	0.00 17-Jun-2016	14.00 31-Dec-2019		22.00 31-Dec-2019

Comments (achievements against targets):
Achieved (157%): Indicator added post MTR. The related activity was initially intended for the 14 upstream villages in the Kilolo and Mufindi districts and later expanded to the 8 villages in the Kilombero District. The Swahili and English version of Integrated Pest Management Plan (IPM) Packages and Guideline for Maize, Potatoes, Tomatoes and Rice, which were prepared in collaboration with Ministry of Agriculture, printed and distributed to the Districts of Kilolo, Kilombero and Mufindi for disseminated to the farmers (field guides)

Indicator Name	Unit of Measure	Baseline	Original Target	Formally Revised Target	Actual Achieved at Completion
Important water sources managed in three disticts that form Kihansi sub-catchment accordig to Kihansi Catchment Management Plan.	Percentage	0.00 17-Jun-2016	100.00 31-Dec-2019		100.00 31-Dec-2019

Comments (achievements against targets):

Achieved (100%): Identification and mapping of water source was conducted in which 901 sources were identified and important sources were demarcated to reduce degradation. Following the identification and mapping of water sources in the three riparian districts, RBWB and LGAs in collaboration with the Water Users Associations have develop management plans for the important water sources. Kihansi becomes the first catchment to map water sources and develop management measures.

Indicator Name	Unit of Measure	Baseline	Original Target	Formally Revised Target	Actual Achieved at Completion
Direct project beneficiaries	Number	0.00 24-Nov-2014	3000.00 31-Dec-2019		3216.00 31-Dec-2019
Female beneficiaries	Percentage	0.00	50.00		52.00

Comments (achievements against targets):

Achieved (107%): Project beneficiaries were measured through surveys.

B. KEY OUTPUTS BY COMPONENT

Objective/Outcome 1 **to enhance biodiversity conservation in the Kihansi catchment**	
Outcome Indicators	1. Total area in the Kihansi catchment protected for biodiversity conservation. a) Endemic species (Nectrophrynoides asperiginis, Coffea kihansiensis, Charaxes mtui) conserved within the Kihansi catchment. i) Endemic species of KST, Nectophrynoides asperiginis conserved within the Kihansi catchment. ii) Endemic species of wild coffee, Coffea kihansiensis conserved within the Kihansi catchment iii) Host plants of a new butterfly, Charaxes mtui conserved within the Kihansi catchment.
Intermediate Results Indicators	1. Sustainable financing mechanism established based on payment for ecosystem services. 2. Legal establishment of national protected area (gorge, catchment and water sources) 3. Catchment management plan developed and approved by Rufiji Basin Water Board. 4. Area of functioning spray irrgation system in the Gorge. 5. Operational guidelines for conducting environmental flow assessment developed and approved by National Environment Management Council and Ministry of Water. 6. New areas outside protected areas managed as biodiversity-friendly (ha) 7. Chytrid disease controlled (foot sterlization baths at entry points to the gorge and spray wetlands, biological control of Chytrid). 8. Villages using integrated pest management strategies (cropping, use of pesticides). 9. Important water sources managed in three disticts that form Kihansi sub-catchment according to to Kihansi Catchment Management Plan. 10. Direct project beneficiaries a) Female beneficiaries

Key Outputs by Component – Component 1 (linked to the achievement of the Objective/Outcome 1)	1. Draft EFA guidelines approved by NEMC and awaiting formal improvement by MoWI 2. Economic Financing Plan for ensuring the long-term conservation and management of the Kihansi catchment. This was informed by the following documents prepared • Economic Analysis of Water Use of Lower Kihansi Hydropower Plant • Economic Valuation of Ecosystem Services Kihansi Water Catchment and Potential Financing Mechanisms 3. Kihansi Catchment Management Plan developed 4. Draft guidelines prepared for river and riverbanks 5. Communication strategy prepared and disseminated
Key Outputs by Component – Component 2 (linked to the achievement of the Objective/Outcome 1)	1. Three large enclosures (10 m × 6 m × 2m, length × width × height) constructed in the Upper and Lower Spray Wetlands between October and November 2016 2. Six sterilization footbaths constructed at the gorge and captive breeding facilities. Benches constructed, brushes to clean boots and chlorine solution for cleaning foot baths provided at the gorge. 3. Suspension bridge, wooden ladder, wooden walkway constructed in the gorge to improve surveillance 4. Two 7-meter gabions constructed to prevent landslides 5. Sprinkler system expanded through the construction of two new sprinkler lines 6. **Captive breeding facilities**: UDSM: 10,000-liter backup water storage tank, a new backup electrical generator, new shelving for *Drosophila* rearing and KST terraria Kihansi: a microwave to sterilize cricket substrate, a refrigerator to preserve food items for the crickets, an incubator for hatching cricket eggs, and a new water purification system Both: essential parts and supplies including pumps, lighting, transformers, vitamins, and drugs. 7. Histopathology and pathology atlas produced and disseminated 8. Lab equipped with cryopreservation (e.g. freezers, liquid nitrogen containers and dry shippers) and biosafety equipment (e.g. biological safety cabinet)

	9. 11 papers published on the KST, new butterfly species and wild coffee in the Tanzania Journal of Science 10. IPM material produced and distributed (English and Kiswahili) 11. Farmer field schools established for alternative livelihood activities • Fruit tree nurseries established • Beehives constructed (some near water sources) • Seedlings provided 12. Co-management plan for KEPA drafted 13. Water users associations trained in biodiversity and conservation 14. 901 Water sources and hotspots identified and mapped

ANNEX 2. BANK LENDING AND IMPLEMENTATION SUPPORT/SUPERVISION

A. TASK TEAM MEMBERS

Name	Role
Preparation	
Jane A. N. Kibbassa	Task Team Leader
Donald Paul Mneney	Procurement Specialist
Mercy Mataro Sabai	Financial Management Specialist
Helen Z. Shahriari	Social Specialist
Ann Jeannette Glauber	Social Specialist
Supervision/ICR	
Jane A. N. Kibbassa	Task Team Leader
Raymond Joseph Mbishi	Procurement Specialist
Gisbert Joseph Kinyero	Procurement Specialist
Winter M. Chinamale	Procurement Specialist
Vida Ndilanha Nkya	Financial Management Specialist
Mary C.K. Bitekerezo	Social Specialist
Jacob Omondi Obongo	Social Specialist
Gloria Sindano	Procurement Team
Faustina Chande	Procurement Team
Grace Anselmo Mayala	Procurement Team
Esther Bea	Procurement Team
Imma Ismaily Killasama	Procurement Team
Deusdedit Samuel Kibassa	Environmental Specialist
Asha Johnson	Operations Officer
Dinara Ahkmetova	Natural Resources Management Specialist/Economist

B. STAFF TIME AND COST

Stage of Project Cycle	Staff Time and Cost	
	No. of staff weeks	US$ (including travel and consultant costs)
Preparation		
FY12	6.398	32,774.75
FY13	16.600	51,319.87
FY14	7.088	13,113.67
Total	**30.09**	**97,208.29**
Supervision/ICR		
FY14	1.300	18,793.02
FY15	2.725	32,629.46
FY16	8.475	39,812.81
FY17	1.129	25,119.97
FY18	6.100	45,774.94
FY19	3.200	33,558.60
FY20	.282	21,670.26
Total	**23.21**	**217,359.06**

ANNEX 3. PROJECT COST BY COMPONENT

Components	Amount at Approval (US$M)	Actual at Project Closing (US$M)	Percentage of Approval (US$M)
Component 1: Institutional capacity building for the management of the Kihansi catchment	1.07	1.07	100
Component 2: Conserve endangered species in the Kihansi catchment	4.61	4.60	99.7
Component 3. Project Management	0.30	.30	100
Total	**5.98**	**5.96**	**99.7**

ANNEX 4. EFFICIENCY ANALYSIS

Economic and Financial Analysis Assumptions and Approaches

1. The economic analysis at the appraisal (PAD) was not conducted, although the project provided an assessment of the incremental/additional cost reasoning to justify GEF funding.

2. The ICR economic analysis is built on three approaches: (a) assessment of the watershed value (mostly assumptions based, considering actual area covered by the project direct interventions); (b) discussion of the project implementation efficiency; and (c) comparative analysis of project costs and incremental cost assessment.

Assessment of the watershed value.

3. The Kihansi River catchment is in the southern middle Udzungwa Mountains. The catchment is 584 km2 (58,400 hectares) with upstream spreading over the Kilolo and Mufindi administrative districts and the downstream floodplain falling in Kilombero administrative district. The catchment provides a variety of ecosystem services ranging from direct consumptive use by households as well as others which goes beyond the boundaries of the catchment. The survey indicates that the catchment provides forest products and services from both natural and planted forests, wetland products and services, hydrological services and products, and habitat services to various biodiversity. It supports the production of various crops with high economic value. It is also home to a significantly large human population engaging in various economic activities[29].

4. Obtaining data for the analysis had some challenges, as at the time of the project appraisal. For the ex-post evaluation, assumptions are based on several studies carried out by the project, with recommendations on funding mechanisms to ensure sustainable management and protection of the catchment ecosystem. For example, one of the studies implemented by the project - Economic Valuation of Ecosystem Services from Kihansi Water Catchment and Potential Financing Mechanisms – carried out an assessment of the Kihansi river catchment ecosystem services. The study estimated the remarkable value of the catchment considering revenue collected as a result of crop production in the watershed and annual revenue from the hydropower production by the Lower Kihansi Hydropower Plant (LKHP) of the Tanzania Electric Supply Company Limited (TANESCO). According to this analysis, the total economic and environmental value of the catchment is US$ 629,087 per hectare; without accounting for the revenue generated by TANESCO, the value of the ecosystem services provided by the catchment is US$3,010 per hectare.

[29] 2016. Economic Valuation Of Ecosystem Services From Kihansi Water Catchment And Potential Financing Mechanisms. Study for the Kihansi Catchment Conservation And Management Project

Table 1. Total economic value of catchment ecosystem services

Type of ES	Value in TZS	Present value in TZS	Present value in USD
Crop	119,740,754,547.62	997,839,621,230.18	498,919,810.62
Vegetables& fruits	84,837,715,628.47	706,980,963,570.61	353,490,481.79
Natural forests	9,087,317,045.59	75,727,642,046.60	37,863,821.03
Planted forests	89,666,310,183.58	747,219,251,529.87	373,858,152.69
Carbon sequestration	8,637,510,000.00	71,979,250,000.00	35,989,625.00
Wetland	1,191,673,606.32	9,930,613,386.02	4,965,306.69
Water	73,149,116,121,475.1	609,575,967,678,959.00	304,787,983,839.47
Biodiversity	15,048,822,910	125,406,857,583.33	62,703,428.79
TEV	**73,477,326,225,396.7**	**612,311,051,878,300**	**306,155,525,939.2**

Source: 2016. Economic Valuation of Ecosystem Services from Kihansi Water Catchment and Potential Financing Mechanisms. Study for the Kihansi Catchment Conservation and Management Project (2016)

5. The other study funded under the project (Economic Financing Plan For Ensuring The Long-Term Conservation And Management Of The Kihansi Catchment) was carried out in 2016 to develop a financing plan for the Kihansi catchment to ensure secured long-term management of the Kihansi catchment including the maintenance and assurance of the reintroduced KST population, biodiversity and associated infrastructure in the Kihansi Gorge. The study identified four major channels for financing Kihansi River Catchment maintenance, including: (i) Revenue collection from the internal sources, (ii) Line ministries budgets, (iii) payment for ecosystem services (PES) scheme, and; (iv) Global financing channels. Based on the model provided in this report, environmental fee collection from input and output of products from the catchment would yield positive results on quantity and quality of environmental services and biodiversity as well as the social welfare. Specifically, results show that if imposed, an environmental fee 1 percent or 6,528,021,140.35TZS (total US$3,264,010 and US$55.9 per hectare) could be collected annually from the revenues of TANESCO, forest plantations, household timber production and crop production.

6. Project interventions directly contributed to the biodiversity conservation in the Kihansi catchment area, reduction of soil loss and erosion prevention. According to the study on The Economics of Ecosystems and Biodiversity (TEEB (2009)[30]) valuing intact tropical forests as US$6,120 ha per year and Pearce (2001)[31] watershed value at a range between US$15 ha per year and US$850 ha per year with the higher value for tropical forests. The World Bank estimates watershed values at US$129 per ha for developed countries and US$27 per ha per year in developing countries.

7. For the assessment of the benefits associated with the carbon sequestration in the targeted watershed (12,153 hectares) the social cost of carbon was applied following the World Bank guidance document (shadow price of carbon). Assessment of the project's net emissions reductions was made based on the data provided in the Economic Valuation Study. As recommended in the guidance document, the scenarios considered in the economic analysis were done both with and without the shadow price of carbon, to reflect the local and global impacts of the project. The World Bank guidance note recommends that the project's economic analysis uses a low and high estimate of the carbon price starting at US$40 and US$80, respectively,

[30] 2009. TEEB – The Economics of Ecosystems and Biodiversity for National and International Policy Makers – Summary: Responding to the Value of Nature.
[31] 2001. Pearce, D.W. The Economic Value of Forest Ecosystems. Ecosystem Health, 7, 284-296

in 2020 and increasing to US$50 and US$100 by 2030. Beyond 2030, the guidance note recommends that the low and high values on carbon prices are extrapolated from 2030 to 2050 using the same growth rate of 2.25 percent per year that is implicit between 2020 and 2030, leading to values of US$78 and US$156 by 2050.

8. The conservative value of catchment ecosystem services was applied to assess potential efficiency of the project (based on estimated watershed values in developing countries US$27 per ha per year). Also, NPV and the benefit-cost ratio were calculated considering the value of the environmental services (as estimated in the Economic Valuation Study) and estimated environmental fees (based on the Financing Plan Study), with and without GHG value. Sensitivity analysis was carried out assuming discount rates scenarios 5, 10 and 20 percent to test project efficiency during project life (Table 2). Cost-benefit and sensitivity analysis demonstrates that the potential project NPV at 5 percent discount rate varies at US$ 71 -147 million, with the benefit-cost ratio between 10-29.

Table 2. Estimated potential project Cost-Benefit, NPV assessment

	Conservative value watershed benefits estimate (US$27/ha), low carbon price			Conservative value watershed benefits estimate (US$27/ha), high carbon price			50% Benefits (Conservative value watershed benefits estimate (US$27/ha), low carbon benefits		
Discount rate, %	5	10	20	5	10	20	5	10	20
NPV, US$ mln	76.6	41.2	15.4	147.3	85.1	33.5	71.2	40.4	15.0
B/C ratio	14.9	10.2	5.3	29.3	19.7	10.3	14.7	9.9	5.2

	1% environmental fee (US$55/ha), low carbon price			1% environmental fee (US$55/ha), high carbon price			50% Benefits (estimate of Kihansi catchment ecosystem benefits value, including hydropower), low carbon benefits		
Discount rate, %	5	10	20	5	10	20	5	10	20
NPV, US$ mln	72.7	41.3	15.4	147.4	85.1	33.6	217.9	128.3	52.6
B/C ratio	15.0	10.1	5.2	29.4	19.7	10.3	43.0	29.3	15.7

9. One of the baseline studies supported by the project on pests and potential impacts in the Kihansi catchment area[32] found that application of synthetic pesticides was the major pest control measure, being applied by 66 percent of the respondents. Increase in pest populations, decline of biodiversity and human health effects were reported by 85 percent, 61 percent and 38 percent of the respondents, respectively, as negative impacts associated with pesticides use. Dissemination of Integrated Pest Management (IPM) packages targeting the key crops and public awareness on good agricultural practices was recommended to sustainably manage the pests and enhance crop production, human health and biodiversity in the catchment. Based on this recommendation, the Ministry of Agriculture, Livestock and Fisheries adopted IPM guidelines for application in similar environments nationally, thus contributing to enhancement of the quality of the watershed ecosystem services.

[3232] 2019. Beatrice Pallangyo, K. Mdily, C. Mkondo and A. Kibola. Crop Pests, Control Measures and Potential Impacts in Kihansi Catchment Area. Plant Health Services, Ministry of Agriculture, Livestock and Fisheries. Dar es Salaam

10. As it was mentioned in the evaluation, one of the focus areas of the project was research of the new indigenous wild coffee (*Coffea kihansiensis*), native to the gorge. The studies[33] document diversity of the species, population and structure, propagation, domestication and potential to improve disease resistance, quality and yield of other cultivated species. Studies have found that with a caffeine content of 6.12 percent, or 3 – 4 times higher than Arabica and Robusta coffee produced locally, the wild coffee plant is more resilient to diseases and insects. SUA researchers believe that there is a potential for strengthening resistance to diseases such as coffee berry and leaf rust in other varieties through hybridization and continues this work with the Tanzania Coffee Research Institute (TACRI). SUA is in the process of acquiring a patent for the *Coffea kihansiensis*.

11. While the project did not prioritized assessment of the economic value of the wild coffee, other studies conducted in the region confirm the high economic value of genetic resources of coffee. For example, analysis of the breeding programs to transfer valuable genetic information of *Coffea arabica* genetic resources[34] contained in Ethiopian highland forests demonstrated high economic efficiency of these programs. Costs and benefits are compared for a 30 years discounting period and result in a net present value of coffee genetic resources of $1,458 million and $420 million, at discount rates of 5 percent and 10 percent, respectively.

Discussion of the project implementation efficiency

12. The project proved to be efficient in the use of project resources, considering the complexity of the barriers, issues the project intended to address, and the technical nature of the interventions. There was one restructuring of the project, which was approved in June 2017, to improve the indicators to allow for better evaluability and strengthen the link between the project activities and the results framework. A no-cost extension of the closing date from December 31, 2018 to December 31, 2019 was also necessary given implementation delays in the first year of the project. Project management cost remained below 5 percent of the grant and was not affected by the restructuring.

GEF incremental cost analysis

13. The project was aligned the GEF Biodiversity Focal Area and was designed to contribute to the achievement of the GEF 5 Strategy Objective of Mainstreaming Biodiversity Conservation and Sustainable Use into Production Landscapes, Seascapes and Sectors (BD-2). The expected focal area outcome for this project is to increase sustainability managed landscapes that integrate biodiversity conservation (Outcome 2.1). The project continues to be relevant to the Biodiversity Focal area objective 1-1 under new GEF 7 Programming Direction, Mainstream biodiversity across sectors as well as landscapes and seascapes through biodiversity mainstreaming in priority sectors.

14. The incremental GEF Biodiversity-funded activities contributed for the long-term conservation and management of globally critically endangered species and critical habitats in the Kihansi catchment. GEF incremental support will allow for the broader integration of biodiversity conservation activities and programs into the planning and management of river basins. The project supported the development of key

[33] 2019. Paul M Kusolwa, Faraja Makwinja, Jackson Nashon, Mayomba Marianna and Amina Kibola. Morphological Diversity of Wild Coffee (Coffea kihansiensis) a Potential Coffee Species for Genetic Improvement. Tanzania Journal of Science 45(4): 629-649, 2019

[34] 2005. L. Heina, F. Gatzweiler. The economic value of coffee (Coffea arabica) genetic resources. Ecological Economics 60 (2006) 176 – 185

guidelines and procedures to enable the sustainable management and use of water resources and their surrounding environments. This included (i) the operational guidelines and procedures for conducting environmental flow assessment (EFA), (ii) the financing plan for the Kihansi catchment and (iii) guidelines for river and riverbanks management. The project prioritized additional support to three main research areas, disease, nourishment of the KST, and documenting the status and distribution of the new indigenous wild coffee and new butterfly species with outstanding results.

15. GEF support allowed for testing and expanding the application of the payment for environmental services approaches and benefit sharing that is increasingly being applied to the conservation of watersheds and other important conservation areas.

16. The baseline for the GEF project was the Water Sector Development Program (WSDP). The WSDP is a multi-phased long-term program to implement the National Water Policy (NAWAPO) established in 2002. It aims to strengthen water sector institutions across nine river basins in Tanzania for integrated water resource management (IWRM) and improving access to water supply and sanitation services.

17. Phase one of WSDP (from 2007/8 to 2013/14) was a $1.2 billion sector-wide program supported by the GOT and numerous agencies, including $252 million IDA credit (2007-2015 Water Sector Support project and Additional Financing). The WSDP focused on establishing institutions, legislation, and regulations and putting in place integrated water resources development and management plans at the river basin level, including the Rufiji basin. The Rufiji basin covers 19 percent of the country and has an installed capacity of nearly 85 percent of the nation's hydropower generation capacity. The WSDP had three components but only the first component[35] was considered a baseline for the GEF project. From the WSDP/IDA credit, US$14.67 million was considered as a baseline for the GEF project; in addition to that US$3.62 million in-kind contribution from the Government of Tanzania (Vice President's Office) was anticipated. Overall, at the time of appraisal, the total cost of the GEF alternative was estimated at US$24.28 million, with incremental financing of US$9.6 million (from GEF and the GoT contribution) and baseline support of US$14.67 million.

18. The total cost of the GEF alternative might be higher at the time of the project closure, considering Additional Financing to the WSP approved in 2014, in the amount of US$44.9 million. The AF project provided US$9 million to the component 1 which initially served as a baseline for the GEF project. The government co-financing included the US$3.62 million in-kind contribution; the government ownership and commitment for the project were met through this in-kind contribution.

[35] Component 1: Basin Level - Strengthening of Water Resources Management Institutional Framework: The program supports strengthening of institutions for integrated water resources management through (a) development of a sound water resources management and development framework in the nine river basins in mainland Tanzania; (b) promoting good governance of water resources through empowering the water users, encouraging participatory and transparent decision making, developing ownership to the user level, and granting secure water rights with responsibilities to the water users, community groups, local government, and Basin Boards; and (c) strengthening the capacity of basin offices to address transboundary water resource issues.

ANNEX 5. BORROWER, CO-FINANCIER AND OTHER PARTNER/STAKEHOLDER COMMENTS

This ICR has been shared with the Government of Tanzania for review prior to finalization. Comments received have been incorporated.

Comments received from the Government of Tanzania

Mainstreaming and Sustainability Arrangements

1. The government of Tanzania recognizes and acknowledges the efforts made for over 20 years to ensure management and conservation of the Kihansi catchment for national and international interests. Substantial investment made by the government and donor community has demonstrated the government commitment towards conservation and economic development. Government commitment at high level to ensure ownership and accountability over long term is important and realized.

2. Therefore, after project closure in December 2019 it was decided that, the overall coordination of the mainstreaming arrangements after project closure remains under the Vice President's Office in order to ensure activities that were implemented by the project under different financing phases are taken over by institutions/ agencies according to their functions. The Steering Committee is therefore maintaining its core functions and meets quarterly to ensure smooth implementation of the activities for sustainability until it is satisfied with the progress. The institutional arrangement based on mainstreaming agenda is presented in the table below:

No.	Institution	Mandate	Key Roles/Responsibilities to be continued after project closure
1.	Vice President's Office (DoE, NEMC)	Overall coordination of the environmental matters in the country.	Overall coordination of the mainstreaming activities to ensure compliance and take enforcement measures where necessary
	Ministry of Natural Resources and Tourism	Provide policy support and guidance on species and habitat management.	• Participate in species and habitat management activities within the Kihansi catchment. • Conservation of key species that are endemic to the gorge and have disappeared in the wild.
	TAWIRI	Responsible for conducting and coordinating wildlife research in the United Republic of Tanzania.	• Operation of Environmental Center at Kihansi Station and Research Station at the gorge. • Undertaking Management of KST Kihansi Captive Breeding Facilities for KST in Tanzania. • Coordination of KST reintroduction in collaboration with UDSM, SUA and TANESCO. • Conducting Butterfly research in the Kihansi Gorge and surrounding ecosystem. • Undertaking Ecological Monitoring of the Kihansi Gorge ecosystem
2.	TAWA	Responsible for undertaking the administration and sustainable management of wildlife resource and biodiversity conservation outside National Parks and Ngorongoro Conservation Area.	• Renewal of the KST Breeding Agreements between the Government of and the Wildlife Conservation Society/ Bronx Zoo and the Toledo Zoological Society for another term of 1 year after June 2020. • Management of KST captive management at the University of Dar Es Salaam facility. TAWA staffs are fulltime based at UDSM facility since its establishment in 2010. • Participating in Ecological Monitoring and

No.	Institution	Mandate	Key Roles/Responsibilities to be continued after project closure
			Reintroduction of KST in the Kihansi Gorge. • Facilitating the importation permits (CITES) for bringing KSTs back to the country for various purposes.
	Tanzania Forest Services	Management of national forest and bee resources by ensuring sustainable supply of various forest and bee products and services, stable ecosystem and maintaining biological diversity.	• Resume the management of Njerera Forest Reserve by putting management in place and prepare General Management Plan of the Area in collaboration with key stakeholders. • Provide technical support in community conservation projects resulted from forest services and products in collaboration with local government authorities.
3.	Ministry of Water and Rufiji Basin Water Board (RBWB)	Responsible for water resources management in the country	• Continue to support activities of water resources management activities within the catchment. • Responsible for monitoring environmental flow to ensure sufficient supply to hydropower, agriculture and environment. • Implementation of the Kihansi Catchment Management Plan (KCMP) in collaboration with two formed Water User Association.
4.	Local Government Authorities (Kilolo, Mufindi and Kilombero Districts)	Oversees the operation of the local government system, providing the policy framework within which local authorities work and deliver services to the communities that they represent and serve.	• Setting funds to Implementation of community conservation activities in Kihansi catchment (alternative livelihoods activities). LGAs have been collaborating with all other key sectors in implementing various component of KCCMP within their administrative boundaries. • Supervising the implementation of environmental bylaws within their administrative boundaries.
5.	Ministry of Energy and TANESCO	Provide reliable, affordable, safe, efficient and environment friendly modern energy services to all while ensuring effective participation of Tanzanians in the sector.	• Continue to pay cost for upkeeping of KSTs in USA Zoos. • Financing the implementation of Environmental Management Plan of the Lower Kihansi Hydropower Project according to EMA 2004 and EIA and Audit regulations (2005) to address the impact caused by construction and operation of the hydro-plant. • Maintenance of the existing infrastructure for monitoring the Kihansi gorge ecosystem. • Carry out dam safety
6.	Ministry of Agriculture (MoA) and Tanzania Tropical Pesticide Institute (TPRI)	To deliver quality agricultural and cooperative services, build capacity of local Government Authorities and facilitate the private sector to contribute effectively to sustainable agricultural production, productivity and cooperative development	Overall implementation of Integrated pest Management Plan (IPM) for the catchment and ensure appropriate land use practices in the catchment to improve plant productivity.
7.	Research and Academic Institutions: University of Dar es Salaam (UDSM)	Transmit knowledge as a basis of action from one generation to another, advancing frontiers of knowledge through scientific research and meet high level human resources needs of the country	• Capacity building in conservation biology (teaching and research centers). • Participate in captive management of KST. • Participate in the KST re-introductions.

No.	Institution	Mandate	Key Roles/Responsibilities to be continued after project closure
	Sokoine University of Agriculture (SUA)		• Looking at the population dynamics of KST both in captivity and in the wild. • Ecological Monitoring following research on prevention (immunology), containment and cure of amphibian diseases (chytrid ecology and mitigation). • Exploration of potential of the Kihansi Wild coffee.
8.	Wildlife Conservation Society (Bronx Zoo) and Toledo Zoological Society	Engage in cooperative activities to promote the conservation, protection, propagation and captive management of Kihansi Spray Toad.	• Management of captive facility for KST in USA as per agreed arrangements. • Participate in reintroduction activities.
9.	IUCN	Global authority dedicated to species survival, environmental law, protected areas, social and economic policy, ecosystem management, and education and communication.	Provide technical support for reintroduction of KST back to their natural habitat in line with Kihansi Spray Toad Reintroduction Guidelines.

Protected Area Status

3. Njerera Forest Reserve (NFR) was established way back in July 05, 1957 by GN No. 230 in Iringa district, Iringa Region, by then with Job No. 318 with an area of 2,833 Ha. Since its establishment NFR has never had a formal management that implement the management plans of the reserve. During the October 2019 Steering Committee, it was decided the Njerera Forest Reserve which form large portion of Kihansi Gorge Ecosystem be managed under the protection category of the "National Forest Reserve".

4. Currently the place is managed by Tanzania Forest Services. The area forms extension of the already existing protected areas in the same ecosystem to enhance connectivity to the escarpment forests and other potential forests in the surrounding villages. These protected area network within the Eastern Arc in particular Udzungwa block starts from Udzungwa National Park, Uzungwa Scarp Nature Reserve and Njerera Forest Reserve. The Njerera forest falls under Southern Highlands Zones of TFS structure. Under the Financial Year 20/21 TFS has initiated preparation of the General Management Plan (GMP) of the area. The GMP will provide highlights as to whether the forest will maintain its status of upgraded to higher category of protection that is "Nature Reserve" in order to safeguard the critical habitat for endemic species such as KST, wild coffee and butterfly that are found within the Kihansi Gorge that forms part of the Njerera Forest Reserve. The Steering Committee is tracking progress of the implementation and TFS has an obligation to report progress to the Steering Committee quarterly.

KST Management and Reintroduction Plans

5. Tanzania has the capacity to carry on with *ex-situ* conservation of KST at its Captive Breeding Facilities (CBF) at UDSM and Kihansi, following the record of successful breeding of over 16,000 KST since 2010. As segments of the population are periodically reintroduced in the wild, up to May 2020 the two facilities were holding populations of 3,065 and 2,753 respectively. The last reintroduction was done on 17th June 2020 whereby a total of 1,200 KST were reintroduced in the wild. Since February 2020 there were plans to import KST from US zoos, but it has not been possible due to the pandemic, COVID-19. There are also three trained scientists at the University of Dar es Salaam, Department of Wildlife Sciences and five trained laboratory personnel stationed at the two CBFs.

6. The KST population in the USA is approximately 6,300, distributed in the Toledo and Bronx Zoo CBFs. Under the *ex-situ* programme, the two serve as *assurance* populations against risks posed to the survival of KST in Tanzania. The risks include but not limited to disease outbreaks readily available facility system spare parts (such as spray pumps), shortage of supplements (vitamins and minerals that are not locally available) and failure of systems such as water and cooling.

7. The government through wildlife research arm will continue with the reintroduction of KST in the wild in order to ensure minimum viable population in the wild is established. Survivorship challenges will be addressed over time. In order to have long term plan for reintroduction, the relocation plan for KST from USA Zoo to Tanzania is now the government priority. In line with this, the contingency measures to addressing and mitigating risks associated with the population persistence in Tanzania are in progress as well. Such measures are:

i. In-country spread of the risks by constructing a third facility at SUA for further assurance of population persistence in Tanzania.

ii. Renegotiate for renewal of KST breeding agreement in USA Zoos starting July 2020 and continue payment of $125,000 (on the short-term period), given the current risk levels of KST populations in Tanzania and time required for constructing a third CBF prior to their return to Tanzania.

iii. Thoroughly addressing the list of risks, including meeting financial and manpower requirements needed for accommodation of an additional 6,000 KST from the USA.

iv. Funding to address different KST survivorship challenges in the wild such as KST genomics that was not addressed by previous project financing phases.

Research of the Wild coffee

8. Research of the wild coffee (*Coffea kihansiensis*), initiated and supported by the project since 2017 has generated substantial information through series of research. The government has registered and paid fees in order to acquire patent for *Coffea kihansiensis.* Wild coffee research will be coordinated and continued by Tanzania Coffee Research Institute (TACRI) in collaboration with SUA in form of research for the national interests. Wild Coffee has demonstrated ability for domestication and adaptation to local coffee growing conditions. However, further studies are required to validate its productivity, resistance to common coffee pests and diseases as well as quality characteristics. Furthermore, detailed research is required for possible genetic hybridization with cultivated elite cultivars to improve its agronomic performances such as yield, drought and diseases tolerance. This will require concerted effort to generate fertile hybrids using advances in interspecific hybridization, protoplast fusion, somatic hybridization and regeneration of new coffee varieties. This will be a very important milestone in coffee improvement leading to novel variety from this unique wild coffee germplasm endemic to Tanzania.

Guidelines for Conducting Environmental Flow Assessment

9. The KCCMP undertook the studies with a need to review and accurately establish Environmental Water Requirement (EWR) of the Kihansi Gorge taking into considerations the scientific advancement of Environmental Flow Assessment (EFA) methodologies, in-country applications and draft EFA guideline for Tanzania. An EFA study for the Kihansi catchment was undertaken using several acceptable methodologies that were identified suitable for different surface water bodies in Tanzania with the focus on: -

i) testing suitability of various hydrology based EFA methodologies for recommending EWR in the Rufiji basin to provide details of needed human and financial resources to effectively execute the methodologies

ii) testing suitability of various holistic EFA methodologies for recommending EWR in the Kihansi catchment to provide details of needed human and financial resources to execute the methodologies

iii) Providing preliminary assessment of suitability of draft water body classification regulations and EWA guidelines for Tanzania.

10. Guidelines were developed, however its approval within the Ministry of Water and Irrigation is yet to be finalized. NEMC is making follow up on the approval process in order for the EWA guidelines to start getting implemented.

Guidelines on Rivers and Riverbank Management

11. The assignment for developing guidelines for management of rivers and riverbanks in Tanzania was conducted. The draft guidelines have been developed and submitted to NEMC in April 2020. One requirement is for stakeholders meeting to agree on the issues addressed in the guidelines to ease its implementation when approved. The emergence of the pandemic COVID-19 has delayed the process. The government will ensure this is finalized and implemented in order to address challenges of river and riverbanks management in the country.

ANNEX 6. SUPPORTING DOCUMENTS

Papers published in the Tanzania Journal of Science as reported by NEMC.

1. **Nahonyo, C. L**. 2019. Research Work and Conservation Initiatives in the Kihansi Catchment Ecosystem, Tanzania.
2. **Devolent Mtui, Colin Congdon, Ivan Bampton, Parson Kalenga and Haule Leonard**. Altitudinal Distribution and Monthly Occurrence of Butterflies in the Kihansi Gorge Forest, Tanzania, with a Checklist of Species.
3. **Cuthbert L. Nahonyo, Ezekiel M. Goboro, Richard S. Ugomba, Emmanuel S. Nkombe, Severinus Mutagwaba, Hussein Adam, Juma I. Kimera, Person Kalenga and Wilirk Ngalason**. Management and Population Status of Kihansi Spray Toad *Nectophrynoides asperginis* in Captive Breeding Facilities in Tanzania.
4. **Charles A. Msuya and Nassoro Mohamed.** Reintroduction of the Kihansi Spray Toad *Nectophrynoides asperginis* Back to its Natural Habitat by Using Acclimatizing Cages.
5. **Wilirk Ngalason, Cuthbert L. Nahonyo and Charles A. Msuya**. The Dynamics of Re-introduced Kihansi Spray Toad *Nectophrynoides asperginis* and other Amphibians in Kihansi Gorge, Udzungwa Mountains, Tanzania.
6. **Dennis K. Ikanda, Samuel N. Mtoka, Mustafa Hassanali, Anna Mshanga.** Mammals Inventory of the Kihansi River Gorge in Udzungwa Mountains, Tanzania.
7. **Joshua J Malago.** Histopathological Diagnosis of Diseases Affecting Amphibians Inhabiting Kihansi Gorge, Tanzania.
8. **Joshua J Malago**. Some Histopathological Findings in Dead Kihansi Spray Toads in Captivity.
9. **Paul M Kusolwa, Faraja Makwinja, Jackson Nashon, Mayomba Marianna and Amina Kibola.** Morphological Diversity of Wild Coffee (*Coffea kihansiensis*) a Potential Coffee Species for Genetic Improvement.
10. **Beatrice Pallangyo, K. Mdily, C. Mkondo and A. Kibola.** Crop Pests, Control Measures and Potential Impacts in Kihansi Catchment Area.
11. **Chacha Werema* and Charles A. Msuya.** Understorey Bird Communities 8 and 18 Years after River Diversion in Kihansi Gorge, Udzungwa Mountains in the Eastern Arc Mountains, Tanzania.

Paper published in another journal:

Weldon C, Channing A, **Misinzo G** and Cunningham AA. 2020. Disease driven extinction in the wild of the Kihansi spray toad (Nectophrynoides asperginis). https://doi.org/10.1101/677971

Other supporting documents:

KCCMP Aide memoires

KCCMP Implementation Status and Results Report (Numbers 1 – 10)

KCCMP Project Completion Report prepared by NEMC

KCCMP Project Reports

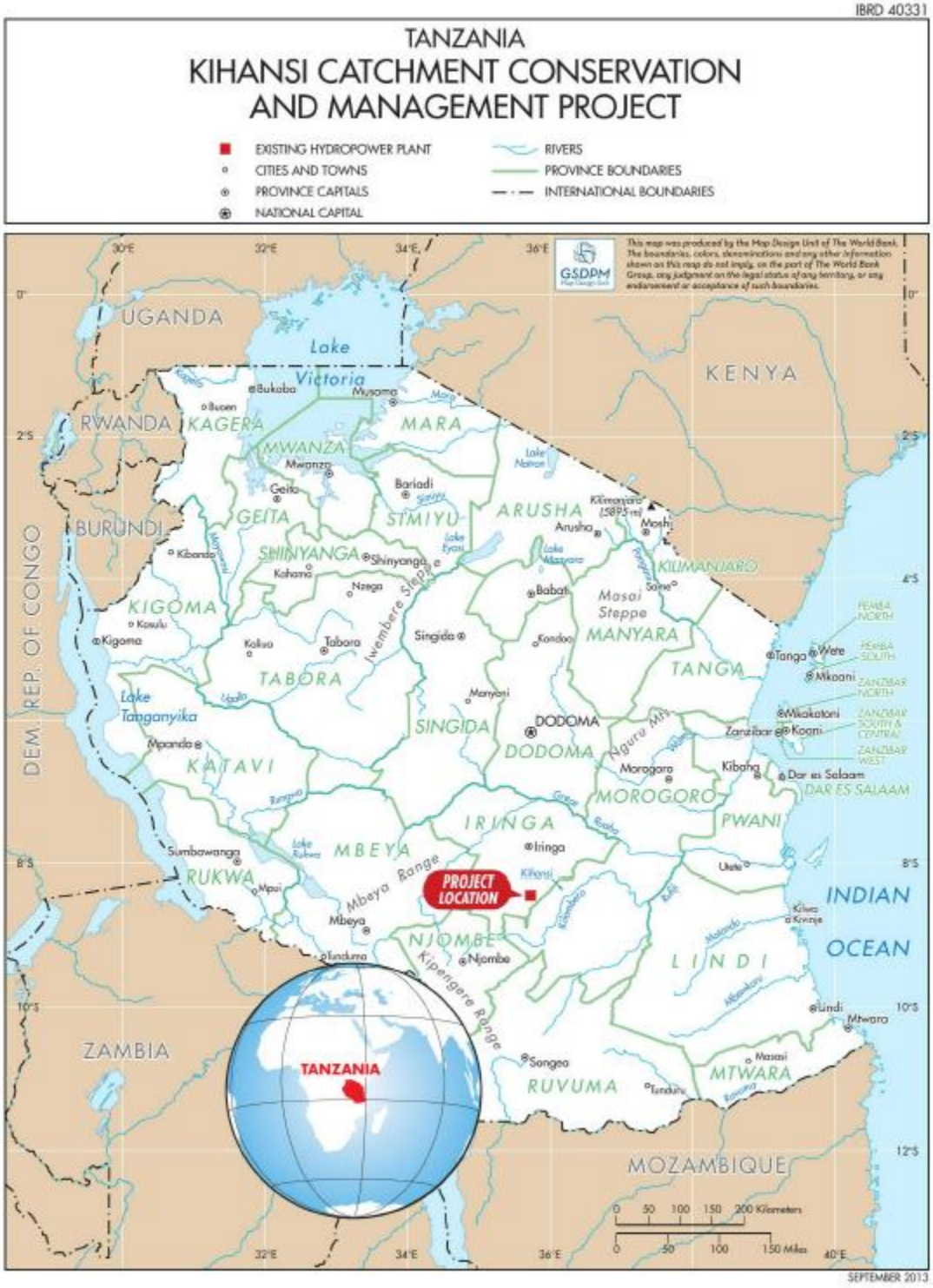
KCCMP M&E Report 2018/2019

ANNEX 7. KIHANSI SPRAY TOAD RELEASE SCHEDULE

Date	USW	LSW	Mid-Gorge	Mhalala	Location	Source
October 30, 2012	2,000			435		
March 2013	1,500					
18-Feb-15	1,483					
July 2016	696					
October 28, 2016	892				Cage 1	
November 19, 2016	100				cage 2	Bronx
December 11, 2016	943				cage 2	Bronx
May 15, 2017	589				cage 2	Toledo
May 2, 2018	**106***				cage 1	Kihansi baby toads
May 5, 2018	701				cage 2	Toledo
May 7, 2018	500				cage 1	UDSM (285), Kihansi (215)
July 6, 2018	252	488			cage 3	Kihansi (252), US (488)
October 27, 2018		**100***	**200***		cage 3, mid-gorge	UDSM baby toads
January 7, 2018		646				Toledo
January 23, 2019	300				cage 1	Kihansi adult/ sub-adult
January 24, 2019	**950***				cage 2	UDSM (450 baby toads)
May 14, 2019	1,014				cage 1	Bronx
June 15, 2019			**400***			Kihansi adult/baby toads
August 20, 2019	150		**350***		cage 2	UDSM adult/baby toads
January 15, 2020			**500***			UDSM adults, 200 baby toads
March 11, 2020		**700***	1018			
June 17, 2020			**1,200***			UDSM adult/baby (400) Kihansi adult/sub-adult
Total	**12,176**	**1,934**	**3,668**	**435**		

Source: Dr. Charles Msuya
*Represents baby toads released

ANNEX 8. MAP and PROJECT PHOTOS



View of Upper, Lower and mid-gorge spray wetlands
Source: Newmark, W./Google earth, 2015
Excerpted from client completion report

Spray from Waterfall before and after diversion
Source: Project reports

Adult KST, Kihansi Captive Breeding Facility, 2020
Source: ICR mission

Breeding *Drosophilia* for KST feeding, UDSM captive breeding Facility, 2020
Source: ICR Mission

Kihansi captive breeding Facility. Visitor viewing area
Source: Project Reports

Cage for releasing KSTs in the wetlands
Source: Msuya, C. A
Excerpted from client completion report

February 2015 release of KST Upper Spray Wetland
Source: Project reports

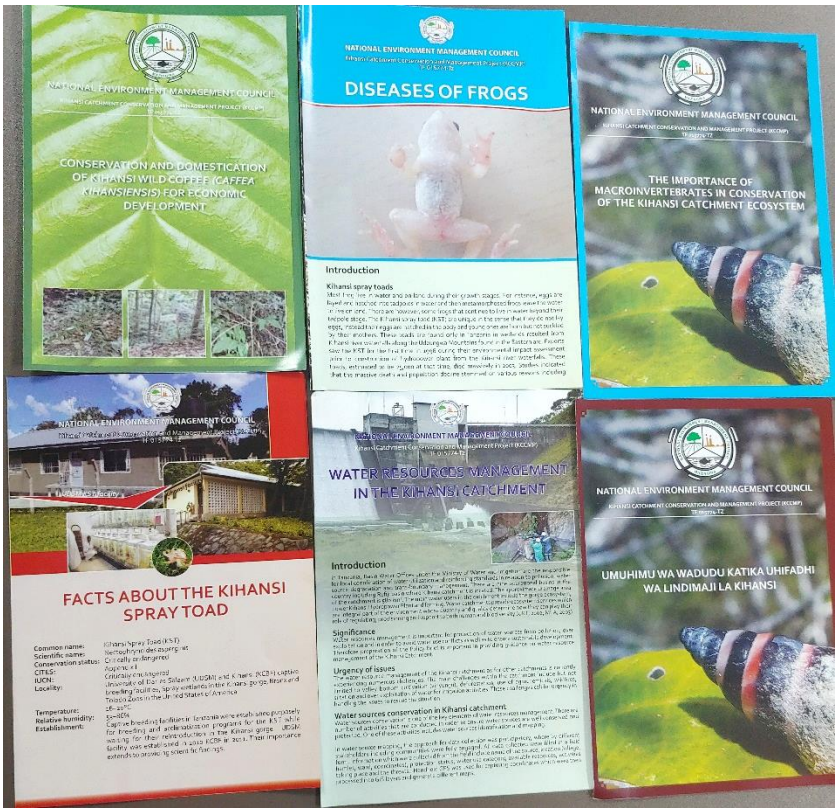
KST being released
Source: Project reports

Sterilization foot baths at entrance to the Kihansi Gorge
Source: Project reports

Sign installed at the entrance to the Kihansi Gorge
Source: Project reports

Development stages of Kihansi Charaxes (*Charaxes mtuiae*).
Source: Mtui, D., Kohi, E., Okick, R. and D. Bwenge (2019).
Excerpted from client completion report

Propagation of wild coffee (*Coffea kihansiensis*) from seeds and cuttings.
Source: Kusolwa, P.M., Nashon, J. Maryanna, M. Faraja Makwinja (2020)
Excerpted from client report



Communication material prepared and distributed by the Project
Source: ICR Mission, 2020

Field guides for Integrated Pest Management prepared in English and Kiswahili
Source: ICR Mission, 2020