INTEGRATED SAFEGUARDS DATA SHEET
CONCEPT STAGE

Report No.: ISDSC6215

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I. BASIC INFORMATION

A. Basic Project Data

Country:	Africa	**Project ID:**	P146515
Project Name:	Kariba Dam Rehabilitation Project (P146515)		
Task Team Leader:	Marcus J. Wishart		
Estimated Appraisal Date:	28-Oct-2014	**Estimated Board Date:**	09-Dec-2014
Managing Unit:	GWADR	**Lending Instrument:**	Investment Project Financing
Sector(s):	Hydropower (60%), Flood protection (20%), General water, sanitation and flood protection sector (20%)		
Theme(s):	Water resource management (60%), Natural disaster management (40%)		

Financing (In USD Million)

Total Project Cost:	294.20	Total Bank Financing:	75.00
Financing Gap:	0.00		

Financing Source	Amount
BORROWER/RECIPIENT	19.20
International Development Association (IDA)	75.00
African Development Bank	75.00
EC European Development Fund (EDF)	100.00
Free-standing Single Purpose Trust Fund	25.00
Total	294.20

Environmental Category:	A - Full Assessment
Is this a Repeater project?	No

B. Project Objectives

The proposed Project Development Objective is to assist the Zambezi River Authority in securing the long-term safety and reliability of the Kariba Dam Hydro-Electric Scheme.

C. Project Description

The proposed project will assist ZRA in financing implementation of two critical components for the rehabilitation of the Kariba Dam.

Component 1: Stabilization of the Kariba Dam Plunge Pool. This includes an estimated US$80m for reshaping and stabilization of the plunge pool. The ZRA commissioned consultants who completed a series of feasibility and design studies in July 2012 estimating the cost of the works at around US $50m, excluding required advanced infrastructure (access roads etc.), tendering, supervision and engineering costs, along with the owners own costs, provisional sums or escalations from 2012. These works are required to prevent further scour along the weak fault zone towards the dam foundations.

An 80m deep scour hole has formed in the bedrock immediately downstream of the dam foundations over the past 50 years. This work is unprecedented in dam history and urgently needed to prevent any potential further regression and protect the dam from catastrophic failure due to lack of foundation support. The measures are required to reshape the plunge pool through excavation of the downstream face and north and south bank sides of the pool. An estimated volume of 300,000 m3 of rock is required to be excavated from the plunge pool resulting in a stepped profile to increase the energy dissipation and guide the spilling water in the downstream direction, away from the dam foundations. A 3D FEM model has been established to assess how the plunge pool scouring progress and excavation works would affect the stress field of the dam foundation. Further geological investigations may also be required during work preparation and execution period.

This component would support: (i) technical assistance to ZRA in procurement for the works associated with reshaping of the plunge pool, through either design-build contract or preparation and supervision of detailed bidding documents; (ii) works associated with the reshaping of the plunge pool; (iii) environmental and social mitigation activities; and, (iv) strengthening the project implementation team for effective project monitoring and implementation. This will be supported through the provision of: i) Consulting Services; ii) Civil Works; (iii) Goods, Equipment and Non-Consulting Services; along with (iv) Operating expenses.

Component 2: Rehabilitation of the Spillway Up-stream Hydro-mechanical Facility. The ZRA completed a series of feasibility and design studies in July 2012 estimating the cost of the works at around US$120m for capital expenditures related to the design, fabrication and installation of an emergency gate and a new gantry, with refurbishment of associated civil works, including replacement of secondary concrete and stopbeam built-in-parts, to prevent failure of the upstream spillway control facility. This excludes any advanced infrastructure, tendering, supervision and engineering costs, along with the owners own costs, provisional sums or escalations from 2012.

The studies conducted by ZRA highlight concerns over the limited function of the upstream stop beam-facility due to the advanced deterioration of the secondary concrete in the guide slots, and inability to lower the stop-beams for closing a sluice in the event of a downstream flood gate failure. This means that there is no way to stop water flow if the downstream flood gate is jammed and cannot be closed. The water level in such a case may go down to the sill of the spillway at +455.37 meters, well below the minimum operating level before the gates can be repaired. Thereafter, it may take more than a year to restore the water level to the minimum operational level, corresponding to the live storage volume of 41.3 km3, given that the annual runoff volume ranges between 15-94 km3/ year. During this period no power production would be possible at either the Zambian or

Zimbabwean power stations.

There is also a possibility that the gate could be jammed in the middle position and cannot be fully opened when required during large floods. The swelling effect of alkaline aggregate reaction (AAR) in the dam concrete has resulted in distortions of the stop-beam guides, causing periodic jamming of the stop-beams during operations. The AAR has also reduced the tolerances for gate movements making gate operation increasingly difficult. The support would include plans to upgrade the current stop beams (composed of six pieces) to a flexible roller gate which has independent opening/closing function for the upstream sluice opening irrespective of downstream gate position/flow condition. The existing gantry crane also needs to be replaced with higher capacity gantry in order to operate the new emergency gate under water flowing conditions.

The operation of the flood gates is also constrained by the plunge pool condition. The operator can currently open only a maximum of three out of six gates due to excessive scouring and erosion of the plunge pool over 50 years of operation. This has the effect of needing a low ering of the operation rule curve of the reservoir, thus reducing the water available for power generation. The delay in commissioning of the north bank power station further contributed to more spilling and unanticipated deepening of the plunge pool. Continued spilling will cause the progression of scouring towards the dam toe area affecting the foundation rock supporting the dam. An empirical formula based simulation, (numerical and physical modeling) has been established to allow comparison with survey results to better understand the scouring phenomena and predict the progression and the intervention measures required to arrest the scouring.

This component will support: (i) technical assistance to ZRA for either a design-build contract or preparation and supervision of detailed bidding documents for the sluice gates; (ii) works required for rehabilitation of the sluice gates; (iii) environmental and social mitigation activities; (iv) strengthening of the project implementation team for effective project monitoring and implementation. This will be supported through the provision of: i) Consulting Services; ii) Civil Works; (iii) Goods, Equipment and Non-Consulting Services; along with (iv) Operating expenses.

Project Cost and Financing

The cost of the Kariba Dam Rehabilitation Program is estimated at around US$200 million. This is based on a series of feasibility and design studies completed in July 2012 by consultants appointed by the Zambezi River Authority. These initial estimates were subject to an independent review by an expert panel in 2013 and have been escalated to account for possible advanced infrastructure, tendering, supervision and engineering costs, along with the owners' own costs, provisional sums and escalations from 2012.

The ZRA is a financially autonomous organization that generates operating revenue through water tariffs charged to the power utilities for water consumed in the generation of electricity. The formula used is intended to provide the ZRA with sufficient revenues to carry out the mandated functions, including operation and general maintenance but not to generate profits or finance major rehabilitation works. The current tariff structure includes two-parts, with a fixed monthly element supplemented by a volumetric charge billed monthly. The formula is reviewed every three years with tariffs adjusted annually according to the CPI rate of the United States. The ZRA has experienced a steady supply from 2007 to 2011, averaging around 35,000 MCM in the past 10 years. Tariffs have increased roughly 10% per annum from 2008 to 2011, with average annual revenues of around US $10 to 12m per year. A preliminary financial model has been developed and preparation would

support a more detailed analysis to provide an indication of:

(i) ZRA's current assets and liabilities, including cash flows available to service debt;
(ii) ZRA's ability to take on further debt and at what cost;
(iii) the impact of additional debt to ZRA's tariff structure; and
(iv) optimal tenor and margins ZRA should consider when seeking any debt.

A preliminary financial analysis indicates that concessional resources less than 3-5% could be repaid by the Zambezi River Authority within a 10 year grace period without any increase in the current tariff regime. Any non-concessional resources would require an increase in the current water tariff regime charged by the ZRA which would have a pass through effect on the electricity sector tariffs. Any such non-concessional resources would further require a substantial equity injection in order to be financially sustainable under ZRAs current financing framework.

The Governments of Zambia and Zimbabwe have formally written to request support from the Bank in exploring viable options for financing and raising resources for the Kariba Dam Rehabilitation Program. Given that the Government of Zimbabwe is currently limited in its access to concessional financing until settlement of outstanding arrears to the multi-lateral development banks, it will defer the full cost to Zambia.

The proposed project is intended to be processed as one in a Series of Projects envisaged as part of a program of support to the riparian states and regional bodies in the Zambezi River basin in accordance with Investment Project Financing OP/BP 10.00. The Series of Projects is being supported through the multi-donor trust fund for Cooperation in International Waters in Africa (CIWA MDTF), complimenting an existing portfolio and pipeline of IDA projects among the eight riparian states within the Zambezi River basin over a 10 to 15 year period. The projects are intended to provide a broad program of support in response to the common development goals of the riparian states and regional organizations relating to the integrated development and management of water resources in the Zambezi River basin.

An allocation of US$25 million has been earmarked from Zambia's national IDA envelope for the proposed project. The African Development Bank has indicated an interest to co-finance a portion equal to the IDA contribution and the European Union has submitted an application to the 11th European Development Fund for an estimated €50 to 70 million (~US$70-100m).

Regional concessional funds could be used to leverage the national contribution from Zambia and close the financing gap. The project meets IDA's regional eligibility criteria in that it provides specific investments that have important regional as well as national social and economic benefits for the eight riparian states as well as the members of the Southern African Power Pool.

D. Project location and salient physical characteristics relevant to the safeguard analysis (if known)

The project is located on the mainstem of the Zambezi River between Zambia and Zimbabwe at the Kariba Dam. The Bank was involved in supporting the initial financing and development of the Kariba Dam between 1954 and 1959 through an IBRD loan to the Federation of Rhodesia and Nyasaland. This predates the current operational safeguard policies and the project involved the resettlement of 57,000Gwembe-Tonga peoples; 34,000 people were resettled in Zambia. Subsequently, the IDA financed Power Rehabilitation Project (1998) attempted to improve the life of affected people through the Gwembe Tonga Rehabilitation and Development Program. Integrated,

multi-sectoral activities, designed through a consultative process attempted to balance infrastructure needs with food production activities. While the outcomes of all the components funded under the project were judged satisfactory, efforts at rehabilitation and environmental management for the people were considered partially achieved.

E. Borrowers Institutional Capacity for Safeguard Policies

The Borrower has limited experience with World Bank safeguard policies. There is a dedicated water resources and environmental management department that carries out routine monitoring and community relations. The ZRA also manages the Zambezi Valley Development Fund which was established in 1997 to enhance the socio-economic status of people displaced during construction of the Kariba Dam. A detailed assessment will be carried out during preparation to determine appropriate capacity enhancement measures as required.

F. Environmental and Social Safeguards Specialists on the Team

Kristine Schwebach (GSURR)

Sanjay Srivastava (GENDR)

II. SAFEGUARD POLICIES THAT MIGHT APPLY

Safeguard Policies	Triggered?	Explanation (Optional)
Environmental Assessment OP/BP 4.01	Yes	The rehabilitation measures are not expected to have any significant adverse environmental impacts. Any potential impacts are likely to be associated with site specific rehabilitation works. Given the limited scope, the project's potential negative and positive environmental impacts will be assessed as part of the detailed design works. Recommendations will be made to ensure necessary measures required to prevent, minimize, mitigate, or compensate for any potential adverse impacts during implementation.
Natural Habitats OP/BP 4.04	No	The policy is not triggered. The rehabilitation works will take place in situ and will not lead to the significant loss or degradation of any critical natural habitats.
Forests OP/BP 4.36	No	The policy is not triggered. The project is limited to rehabilitation of the existing dam and will not impact on the health and quality of any forests; affect the rights and welfare of people and their level of dependence upon or interaction with forests; nor will it bring about changes in the management, protection, or utilization of natural forests or plantations.
Pest Management OP 4.09	No	The project does not involve the use of pesticides and agro-chemicals. Thus the policy is not triggered.
Physical Cultural Resources OP/BP 4.11	Yes	The rehabilitation includes civil works and so provisions will be included for chance find procedures in the Environmental Management Plan.

Indigenous Peoples OP/BP 4.10	No	There are no Indigenous Peoples in the project area.
Involuntary Resettlement OP/ BP 4.12	TBD	The rehabilitation works is not expected to require the land acquisition, leading to involuntary resettlement, or restrictions of access to resources, livelihoods or legally designated parks and protected areas. The need for a resettlement instrument will be confirmed before appraisal.
Safety of Dams OP/BP 4.37	Yes	The rehabilitation works will be carried out in compliance with the OP/BP with the project aimed at ensuring appropriate measures are implemented and sufficient resources provided to ensure the continued safety of the dam. An independent Panel of Experts will be appointed to review the investigations, design, and implementation of the rehabilitation works.
Projects on International Waterways OP/BP 7.50	Yes	No new works will be undertaken and the rehabilitation is not anticipated to adversely change the quality or quantity of water flows to other riparians in the Zambezi River basin, nor will it adversely affect water use by the other riparians. The rehabilitation works will not exceed the original scheme, change its nature, or so alter or expand its scope and extent as to make it appear a new or different scheme. However, notification will be made in accordance with provisions of the ZAMCOM Agreement along with the Revised SADC Protocol on Shared Watercourses in compliance with OP/BP 4.37.
Projects in Disputed Areas OP/ BP 7.60	No	The policy is not triggered. The dam has been under joint operation under the current arrangements since 1987 and there are no disputes over the project area.

III. SAFEGUARD PREPARATION PLAN

A. Tentative target date for preparing the PAD Stage ISDS: 30-Apr-2014

B. Time frame for launching and completing the safeguard-related studies that may be needed. The specific studies and their timing[1] should be specified in the PAD-stage ISDS:

Safeguard studies that may be required will be confirmed and launched during the March 2014 consultative mission.

IV. APPROVALS

Task Team Leader:	Name: Marcus J. Wishart
Approved By:	

[1] Reminder: The Bank's Disclosure Policy requires that safeguard-related documents be disclosed before appraisal (i) at the InfoShop and (ii) in country, at publicly accessible locations and in a form and language that are accessible to potentially affected persons.

Regional Safeguards Coordinator:	Name: Alexandra C. Bezeredi (RSA)	Date: 02-May-2014
Sector Manager:	Name: Jonathan S. Kamkwalala (SM)	Date: 17-Dec-2014