

PROJECT INFORMATION DOCUMENT (PID)

APPRAISAL STAGE

Report No.: 87653

Project Name	Enhancing Spatial Data for Flood Risk Management Project (P149629)
Region	AFRICA
Country	Mozambique
Sector(s)	General water, sanitation and flood protection
Theme(s)	Natural disaster management (30%), water resources management (30%), Climate change (40%),
Lending Instrument	Small Recipient Executed Grants -Global Facility on disaster risk reduction and recovery (US\$4.95m) with ARA-Sul -Global Facility on disaster risk reduction and recovery (US\$4.07m) With ARA-Zambezi
Project ID	P149629
Recipient	Republic of Mozambique
Implementing Agency	Southern Regional Water Authority (Administração Regional de Águas do Sul, ARA-Sul) Zambezi Regional Water Authority (Administração Regional de Águas do Zambeze, ARA-Zambeze)
Environmental Category	C
Date PID Prepared/Updated	16-April-2014
Estimated Date of Board Approval	Not applicable.
Decision	Cleared
Other Decision	

I. Project Context

Country Context

1. Mozambique is one of Africa's fastest growing economies. In the decade leading up to 2012, annual economic growth consistently ranged between 6 and 8% per year and in 2014, GDP is forecast to grow by 8%¹. Growth is driven largely by expanding extractive industries,

¹ World Bank *Mozambique Economic Update* (April 2014).

such as coal and natural gas, (38.2% real GDP growth in 2013) along with the transport and communications sector and financial services sector (16.1% and 15.2% real GDP growth 2013 respectively)².

2. The benefits of an expanding economy have not been equally shared and extreme poverty in Mozambique remains prevalent. Although per capita GDP grew by 4.7% in 2012 to US\$565, it is still well below the average of developing countries in Sub-Saharan (US\$1,417). Mozambique has a GINI index of 45.7, indicating substantial income inequality. Agriculture generates nearly 30% of economic output and employs 77% of the labor force, yet growth in the agricultural sector was 5.8% in 2013. Best estimates place unemployment between 17 and 20% of the population. The sub-5 child mortality rate is 89.7 per thousand, nearly 40% of the population is malnourished, and 55% of the population lives below the national poverty line. Life expectancy at birth is 49 years and Mozambique now ranks 185 out of 187 countries on the UNDP's Human Development Index.

Sectoral and Institutional Context

3. Mozambique is vulnerable to the impacts of natural hazards such as floods, cyclones, and droughts. With 2,740 km of coastline, where roughly 60% of the population lives, and located downstream of nine internationally shared rivers, Mozambican is exposed to cyclones and floods resulting from extreme weather events in the region. In more arid regions, droughts are prevalent and reoccurring. In recent years, major floods have hit Mozambique in 2000, 2001, 2007, and 2013 (collectively resulting in over 1,200 deaths, displacement of 1.5 million and destruction of US\$1.5 billion in physical infrastructure). Best estimates suggest that as much as 58% of the population is vulnerable to natural disasters and that annual economic growth is 1.1 percentage points lower than it otherwise would be as a result of weather and water shocks.

4. In 2013, extreme floods hit Mozambique in the lower stretches of the Limpopo, Incomati, and Zambezi River basins. The impacts were felt in urban centers and rural communities in the provinces of Gaza, Maputo, Zambezia, and Sofala. Over 170,000 people were evacuated, 113 lives were lost, and 89,000 hectares of crops were destroyed, making this the worst disaster to hit Mozambique since the floods of 2000. Other damages include destruction of 47,000 hectares of the most productive cropland, significant damage to the country's largest irrigation scheme, severe damage to the health and education systems, transport infrastructure, municipal water supply systems, urban drainage and sanitation systems, and flood protection dykes. Flooding forced the closure of the Chókwe hospital and eight additional health centers, destroyed 238 classrooms and damaged 450 more, and stagnant flood water increased the risk of diseases such as malaria and schistosomiasis. Substantial damage was also inflicted to the railway line linking the Maputo port to Zimbabwe, major bridges, major national roads, and the unpaved road system across the Limpopo valley. As a result, the food security and livelihoods of the entire population, and especially of more than 48,000 smallholder and subsistence farmers, were and remain threatened. An assessment carried out by the World Bank in response to the disaster estimated that short-term physical damages alone were in the order of US\$403 million, of which immediate physical restoration costs are estimated at US\$127 million, primarily in roads, water infrastructure (dykes, weirs and levees) and

² Ibid.

agriculture-related infrastructure.

5. High-resolution spatial/topographic data, also called digital elevation models (DEM) is required for estimating potential extent and impacts of floods. At present, the resolution of spatial data and DEMs available for modeling in the Limpopo and Zambezi River basins is limited to 90m-by-90m grid-pixel data that is sourced through the SRTM satellite (Shuttle Radar Topography Mission) and made available freely through NASA³. In the low-lying areas of the lower stretches of the two flood-prone basins, this resolution is inadequate for hydrological and hydraulic modeling and risk analysis or risk management.

6. The institutional mandate for water resources management lies with the Ministry of Public Works and Housing (MoPH, Ministério das Obras Públicas e Habitação), the National Directorate of Water (DNA, Direcção Nacional de Águas – Ministerial Decree 142/2012) and the five Regional Water Authorities (ARAs, Administrações Regionais de Águas – Water Law 16/1991 addendum). The DNA combines the responsibility for policy making, implementation, planning and management of water resources, and of water supply and sanitation services. The strategic activities undertaken by DNA are operationalised by the five Regional Water Authorities (ARAs).

7. The ARAs are public institutions reporting to the MoPH tasked with the operational management, allocation and licensing of water resources. They are also responsible for hydrological monitoring and modeling and operating water infrastructures. Strategic guidance and technical support for water resources management is provided by DNA to the ARAs. The ARAs coordinate directly with agencies such as: the national meteorological services (INAM, Instituto Nacional de Meteorologia), the disaster risk management agency (INGC, Instituto Nacional de Gestão de Calamidades), the national roads agency (ANE, Agencia Nacional de Estradas), amongst others. There are five ARAs for the southern, central, Zambezia, central-north and northern region (ARA-Sul, ARA-Centro, ARA-Zambezi, ARA-Centro Norte and ARA-Norte). The first, ARA-Sul, was established in 1992.

8. The institutional and operational mandate for disaster and crisis management lies with the INGC. The INGC is an autonomous institution under the Ministry of State Administration (Ministério da Administração Estatal) with a strong coordinating and crisis-response function. INGC also manages day-to-day matters related to disaster preparedness and response, including coordination and communication (e.g., issuing of alerts at national, provincial and district levels).

1. Mozambique's FY12-15 Country Partnership Strategy is based on two pillars, the second of which is decreasing vulnerability and increasing resilience. Specifically, the second of Pillar II's three objectives is to improve resilience to natural disasters and the impacts of climate change. The CPS acknowledges that Mozambique's extreme exposure to weather-related hazards, highlights the significant destructive impact of floods, cyclones, and droughts, and identifies climate change mitigation and adaptation activities as a new and important business line. The CPS is aligned with Mozambique's own poverty reduction strategy, the *Plano de Acção de Redução da Pobreza* (PARP), which calls for broad-based and inclusive growth through reduction of vulnerability to natural disasters and the threat of climate change.

³ The models available in the two ARAs, but in limited use, are MIKE11, Waflex WEAP and FloodWatch.

II. Project Development Objective(s)

9. **The Project Development Objective (PDO)** is to increase the capacity of Mozambique to prepare for and manage flood events in the Limpopo and Zambezi River basins.

III. Project Description

10. The project will support: the acquisition of high resolution spatial and topographic data through airborne Lidar⁴ (Light Detection and Ranging) and co-registered orthophotography surveys; the subsequent production of digital elevation models (DEMs); derivative information products such as land cover/use classification maps and breaklines; the incorporation of those products into hydrologic models, hydraulic models, and decision support systems; and, the application of those models to flood and natural disaster risk management.

11. Two survey operations will be conducted in parallel, one in the Limpopo River basin and one in the Zambezi River basin. Potential survey sites within each basin will be ranked and prioritised by the degree to which high-resolution elevation models of their terrain will improve modeling accuracy and inform decision making and planning in the basins (for example zoning for disaster risks or key infrastructure). A detailed description of the project, including Lidar technology, the utility of DEMs, and their broader applications is presented in Annex 2.

12. The project will consist of two small recipient-executed grants implemented in parallel by ARA-Sul and ARA-Zambezi, respectively, with each grant constituting one of the project's two components. The grants will finance:

13. **Component A. Limpopo River basin high-resolution Lidar survey** (ARA-Sul, US\$4.95 million, GFDRR⁵). Component A will be implemented by ARA-Sul in close collaboration with DNA and INGC, as well as key stakeholder agencies.

14. Component A includes the following activities: A1) Technical Assistance for implementation of Limpopo Lidar assignment, including quality control and strategic guidance; A2) Determination of priority Survey Areas of the Limpopo recognising already surveyed areas in the lower Limpopo and agreed priority areas and assets (including roads, settlements, bridges and areas at risk of flooding); A3) Acquisition and completion of Limpopo Lidar Survey (including all logistics, permits, and aerial and field operation); A4) Processing and quality assurance review of acquired Lidar point data for open access, long-term use and all possible applications; A5) Integration of Lidar data into existing models and decision support systems, and establishment of new ones (including mapping, hydrological and hydraulic modeling, disaster risk tools etc.); A6) Long-term training and capacity building for technical staff in ARA-Sul, DNA, INGC and associated agencies working in the Limpopo River basin; A7) Effective data management systems and solutions to ensure Lidar data and derivative projects from the Limpopo River basin are easily and openly accessible; and, A8) Investments into physical Information Management Systems (IMS) to ensure long-term accessibility and use of

⁴ Light Detection and Ranging, Lidar, is a remote sensing technology that measures distance by bouncing a laser off a target and analysing the reflected light. When flown in an airborne survey, Lidar can be used to scan large swaths of terrain and create three dimensional models of the terrain surface (see Annex 2, Section F for detailed information on Lidar technology).

⁵ Multidonor trustfund Global Facility on Disaster Reduction and Recovery.

Lidar data and derivative products, including reinforcing IT infrastructure and internet access.

15. **Component B. Zambezi River basin high-resolution Lidar surveys** (ARA-Zambezi, US\$4.07 million, GFDRR). Component B will be implemented by ARA-Zambezi in close collaboration with DNA, INGC and other key stakeholder agencies.

16. Component B includes the following activities: B1) Technical Assistance for implementation of Zambezi Lidar assignment, including quality control and strategic guidance; B2) Determination of priority Survey Areas of the Zambezi recognising surveyed areas in the Shire River basin and agreed priority areas and assets (including roads, settlements, bridges and areas at risk of flooding); B3) Acquisition and completion of Zambezi Lidar Survey (including all logistics, permits, and aerial and field operation); B4) Processing and quality assurance review of acquired Lidar point data for open access, long-term use and all possible applications; B5) Integration of Lidar data into existing models and decision support systems, and establishment of new ones (including mapping, hydrological and hydraulic modeling, disaster risk tools etc.); B6) Long-term training and capacity building for technical staff in ARA-Zambezi, DNA, INGC and associated agencies active in the Zambezi River basin; B7) Effective data management systems and solutions to ensure Lidar data and derivative projects from the Zambezi River basin are easily and openly accessible; and, B8) Investments into physical Information Management Systems (IMS) to ensure long-term accessibility and use of Lidar data and derivative products, including reinforcing IT infrastructure and internet access.

IV. Financing (in USD Million)

Total Project Cost:	9.02	Total Bank Financing:	9.02
Financing Gap:	0.00		
Financing Source			Amount
Recipient			0.00
The global facility on disaster risk reduction and recovery: Limpopo			4.95
The global facility on disaster risk reduction and recovery: Zambezi			4.07
Total			9.02

V. Implementation

Institutional and Implementation Arrangements

17. **The two recipient executed small grants from the GFDRR will be implemented by the two Regional Water Authorities, ARA-Sul and ARA-Zambezi.** The ARAs were established in 1992 by an Addendum to the Water Law (No. 16/1991). ARA-Sul was the first ARA to be established. The ARAs are semi-autonomous institutions who report to the Ministry for Public Works and Housing (MoPH, Ministério das Obras Públicas e Habitação) and receive strategic and management guidance from the National Directorate for Water (DNA, Direcção Nacional de Águas).

18. **Component Coordinators within both ARA-Sul and ARA-Zambezi will be responsible for the technical management and delivery of each component and their**

respective activities. There is strong alignment of the Lidar surveys with the activities under the National Water Resources Development Project (P107350), the Emergency Flood Response Additional Financing (P146098) and the Transforming Hydro-Meteorological Services Project (P131049), where the outputs will be mutually beneficial. Responsibilities for ongoing activities under the associated projects are already established. Therefore, the new activities under the proposed small grants will be harmonized with existing staff resources to the extent possible (also because the ARAs, DNA and INGC experience constraints in staff capacity and availability). The technical work related to the development of the technical content of the bidding documents for the Lidar surveys and the prioritisation of the areas to be surveyed will be completed by staff within ARA-Sul and ARA-Zambezi, respectively, with support provided by DNA, INGC and other government agencies (Technical Assistance will also provide support during implementation).

19. The Project Administration and Monitoring Team (PAMT) in DNA will be responsible for procurement, financial management and coordinating progress reporting. In 2012, the PAMT was set up with funds from the National Water Resources Development Project within DNA. The PAMT includes a Project Manager, Procurement Specialist, Financial Management Specialist, a Monitoring & Evaluation Officer, and administrative support staff. The PAMT will extend its support to provide the same services and functions for the new proposed grants. Their core tasks will include: supervising and managing procurements, financial management and reporting, and coordinating reporting on progress of implementation and results.

20. The airborne Lidar surveys will be flown by a specialised contractor(s). The firms providing the non-consultancy service of Lidar surveys will be contracted through a competitive bidding process in adherence with the World Bank's Procurement Policies and Guidelines of January 2011.

21. Inter-agency coordination is critical for successful results, and will build on existing platforms for coordination on water resources and floods in Mozambique. During preparation, focal points have already been identified and mandated to support coordination amongst the key agencies of the ARAs, DNA and INGC. This group will continue to collaborate during implementation and extend the engagement to other key agencies by engagement through existing platforms for coordination (e.g., see Section II.B.). These include the operative centers for emergency (e.g., CENOE), the inter-agency working group on hydro-meteorological services and the collaboration established under the previous smaller Lidar survey of the lower Limpopo in 2012 (P124755 GFDRR).

VI. Safeguard Policies (including public consultation)

Safeguard Policies Triggered by the Project	Yes	No
Environmental Assessment OP/BP 4.01		x
Natural Habitats OP/BP 4.04		x
Forests OP/BP 4.36		x
Pest Management OP 4.09		x
Physical Cultural Resources OP/BP 4.11		x

Indigenous Peoples OP/BP 4.10		X
Involuntary Resettlement OP/BP 4.12		X
Safety of Dams OP/BP 4.37		X
Projects on International Waterways OP/BP 7.50		X
Projects in Disputed Areas OP/BP 7.60		X

VII. Contact point

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