

PROJECT INFORMATION DOCUMENT (PID)
APPRAISAL STAGE

Report No.: PIDA718

Project Name	Climate Resilience: Transforming Hydro-Meteorological Services (P131049)
Region	AFRICA
Country	Mozambique
Sector(s)	General water, sanitation and flood protection sector (90%), General agriculture, fishing and forestry sector (10%)
Lending Instrument	Specific Investment Loan
Project ID	P131049
Recipient	Government of Mozambique
Implementing Agency	The National Directorate of Water (DNA, Direcção Nacional de Águas), The National Institute for Meteorology (INAM, Instituto Nacional de Meteorologia)
Environmental Category	B-Partial Assessment
Date PID Prepared	26-Nov-2012
Estimated Date of Appraisal Completion	25-Jan-2013
Estimated Date of Board Approval	05-March-2013
Decision	
Other Decision	

I. Project Context

Mozambique is experiencing rapid and sustained economic growth. Between 2001 and 2011, the average GDP growth rate was 7.2% and in 2013, it is expected to reach 8% as a result of foreign direct investments, expanding extractive industries and infrastructure investments. The productive base of the economy remains narrow and focused on agriculture (which grew with 8.4% and employed 78% of the population in 2011), mega-industry projects and extractive industries (grew 50% in 2012/Q2). Between 2003 and 2009, absolute poverty in Mozambique fell from 56.4% to 52.1%. Today, the average per capita income is estimated at US\$458 among its 23 million people. Despite macroeconomic achievements, Mozambique has 27% unemployment and remains one of the poorest countries in Africa. In the UNDP's Human Development Index the country ranks 184 of 187; average life expectancy is 49.7 years, 43.7% of children under five are malnourished, and child mortality is one Africa's highest. Human wellbeing is also challenged by disproportionate access to water between the urban and rural (77% and 29% respectively), as well as the prevalence of diseases such as malaria and HIV/AIDS. National progress in the MDGs masks regional variations where poverty and food insecurity are pervasive at local levels.

Mozambique is the third country most at risk from water and weather related hazards in Africa and as much as 58% of the population and more than 37% of GDP risk exposure to two or more hazards reducing GDP growth on average by 5.6%. This translates into 1.1% annual average loss in GDP. In 2000, Cyclone Eline hit southern Mozambique and caused loss of lives and livelihoods and damages equivalent to 20% of GDP. With more than 60% of the Mozambican population living in the low-lying and topographically flat and coastal areas, exposure to floods and cyclones is high and even small changes in sea level or river flow have far reaching impacts. In economic terms, floods cause annual average losses in the order of US\$42.5 million for maize, US\$17.5 million for household/shelter losses, and US\$0.7 million for roads.

The scenarios developed through the Intergovernmental Panel on Climate Change (IPCC) and the Global Circulation Models predict significant changes for Mozambique. Change in rainfall patterns are predicted to vary across the country – from 31% reduction in some locations and 16% in others. The rainy seasons could shorten and droughts prolonged especially in central regions. Sea level rise could reach 2.17mm/yr in the southern populated areas of Maputo (± 0.76 mm/yr) and temperatures increase with 1-2°C by the year 2050. Without adaptation, climate change could result in GDP losses of 4-14% relative to its expected growth by 2050. The GoM has set out to strengthen its hydro-met services in order to protect the economic gains of the past two decades, build resilience today and a more adaptive future.

II. Sectoral and institutional Context

The Government of Mozambique's (GoM) hydrological and meteorological services can play an important role in safe guarding the macro-economic gains made to date by delivering accurate, accessible and relevant information on water and weather. Hydro-met information provides a foundation for early warning systems that can prevent losses, for enhancing productivity of key sectors, and for building resilience to the negative impacts of climate change.

Mozambique experiences some of southern Africa's most variable hydrological and meteorological (hydro-met) conditions. Tropical to sub-tropical climate prevail in the northern and central regions, whereas dry arid desert climate predominate in the south. The oscillations of the Inter-Tropical Convergence Zone and the El Niña/o phenomena influence the timing and magnitude of rainy seasons (lasting October to March, 25-27°C) and dry winter seasons (April to September, 20-25°C). The national average rainfall of 1,032mm/yr varies across seasons with 60-80% of rain falling between December and March. Precipitation also varies spatially where the wetter north can receive 1,000-2,000mm/yr compared to 500mm/yr in the south. In contrast, frequent droughts affect the southern provinces and central areas along the Zambezi River valley (7 in 10 and 4 in 10 years respectively). With a low-lying topography and a coastline of 2,470km, Mozambique is particularly exposed to tropical cyclones. Warm-core air centers arise over the Indian Ocean and the Mozambique Channel and move westward towards the mainland, bringing heavy downpours and wind gusts that can reach 300km/hr in velocity. In terms of water, Mozambique has some of Africa's highest total actual renewable water resources (216km³/yr). The country is the final downstream riparian in nine of its 13 major river basins ($\geq 10,000$ km²) and thus, more than 50% of the country's total-mean-annual runoff is generated outside Mozambique's boundaries. Upstream activities and neighboring weather/water conditions directly affect the country. The rainfall extremes combined with limited storage and flood-control infrastructure, result in frequent flooding and variable inter-annual river flows.

Improvements to Mozambique's hydro-met services have the potential to enhance productivity in sectors such as agriculture, fishery/maritime, hydropower, aviation, road transportation, infrastructure planning and health. Subsistence rain-fed farming provides livelihood, income and food for almost 80%

of the population. Collectively, land farmed for subsistence agriculture represents 97% of total cultivated land. However, only 4% of the agriculturally viable 2.7 million hectares is equipped with irrigation infrastructure. Aquaculture, commercial fisheries and artisanal fishers depend on timely meteorological information to avoid dangerous storms and the resulting loss of life and physical resources such as nets and boats. The fishing sector provides over 95,000 jobs, makes up 4% of GDP and 28% of foreign exchange earnings. Developing the country's hydropower potential of 13,000MW and effectively operating existing and future dams, such as Cahora Bassa and Mphanda Nkuwa, relies directly on an accurate record of hydrological data. Infrastructures such as bridges, roads, and drainage structures are improved by accurate and long-term hydrological record. In transport, the efficiency and security of Mozambique's aviation industry is impeded by the absence of upper-air, lightning-detection, now-casting and higher spatial and temporal resolution forecasts. Hydro-met information can enhance productivity of key sectors of the economy by providing information that can translate into economic output. Equally, greater understanding of extreme weather events from more accurate, relevant and timely hydro-met information can minimise their negative impacts.

The government responsibility for hydro-met monitoring and forecasting resides with a number of agencies across two ministries. The mandate for hydrology is with the National Directorate of Water (DNA, Direcção Nacional de Águas) and the five Regional Water Authorities (ARAs, Administrações Regionais de Águas) who report to the Ministry of Public Works and Housing (MOPH, Ministério das Obras Públicas e Habitação). The mandate for meteorology is with the National Institute for Meteorology (INAM, Instituto Nacional de Meteorologia) who report to the Ministry for Transport and Communication (MTC, Ministério dos Transportes e Comunicações).

The value of the hydro-met services of DNA, the ARAs and INAM is recognised in the Government's strategies, laws and policies. However, the efficacy of the services has been undermined by a number of challenges. These include a lack of financial sustainability where government budget allocations and revenues are not commensurate with the service's estimated economic value ; institutional fragmentation and weak interagency collaboration as reflected in poor implementation of quality standards, calibration of stations/data as well as dissemination of raw data and advanced forecasts; and insufficient technical and staff capacity at multiple levels to operate and maintain monitoring and forecasting functions.

Nationally, these challenges manifest in the fact that only a portion of the existing network of stations monitoring hydrology and meteorology are operational. The diagnostic of Mozambique's hydro-met services completed during preparation revealed an inconsistent, disconnected and deeply weakened monitoring network. In terms of INAM's network for meteorological monitoring, for example, only 38 of 154 of manned meteorological stations are reporting regularly (i.e., 25%), automatic weather stations increased from 3 to 12 between 2005 and 2011 but remain low in comparison to needs, and the country's only upper air monitoring is via two Doppler Radars that are need of rehabilitation and are therefore not reporting. In terms of DNA and the ARA's network of hydrological monitoring (including rainfall), the diagnostic revealed that they manage a larger network than INAM but the proportion of the operational network is similar. For example, 218 of a total of 592 stations monitoring river stage (i.e., 36%) and 329 of 1318 of stations monitoring rainfall (i.e., 25%) are reporting regularly. The latter excludes the ARA's automatic stations where only 3 of 8 are reported as operating. Overall, this means that roughly a third of the collective hydro-met monitoring network is functioning and that there are substantial needs for rehabilitation, calibration and upgrade within the existing network.

An analysis of the outputs/forecasting products of Mozambique's hydro-met services shows that all agencies are maintaining daily forecasting functions. These are primarily communicated in the format of bulletins from INAM and DNA (centrally at headquarters in Maputo) using email and fax as

communication channels to reach a set list of recipients and agencies. In times of high river flows or severe weather events, both agencies including the ARAs provide monitoring and forecasting information three times per day according to the protocol managed by the National Institute for Disaster Management (INGC, Instituto Nacional de Gestão de Calamidades). Overall, the existing hydro-met products fail to meet the needs of users due to three key challenges: i) the lead time of forecasts needs to be longer to allow enough time for appropriate decision making and action; ii) the space-resolution of forecasts is not sufficiently location-specific to be relevant; and iii) the content, format and delivery of the forecast are not tailored for key users.

The technical skills and levels of education of staff in INAM, DNA and the ARAs are often commensurate with the needs of maintaining modern hydro-met services. However, the diagnostic revealed several challenges facing these institutions: the number of qualified staff is insufficient, the agencies have difficulty retaining personnel, and several key staff members are tasked with responsibilities beyond their immediate expertise. It is noticeable that of all staff working with the five ARAs, 75% work in ARA-Sul and the remaining 25% work across the other four ARAs.

III. Project Development Objectives

To strengthen hydrological and meteorological information services to deliver reliable and timely information that increases climate resilience, in turn lowering water and weather related risks to local communities and economic development.

IV. Project Description

Component Name

Component A: Strengthening Hydrological Information Management

Component B: Strengthening Weather and Climate Information Management

Component C: Piloting resilience through delivery of improved weather and water information

V. Financing *(in USD Million)*

For Loans/Credits/Others	Amount
Borrower	0.00
Strategic Climate Fund Grant	10.00
Nordic Development Fund (NDF) – Parallel Cofinancing	5.70
Total	15.70

VI. Implementation

The implementation arrangements are aligned to the national agencies responsible for hydro-met services: the DNA, the five ARAs and INAM. In the Ministry of Public Works and Housing (MOPH – Ministério das Obras Públicas e Habitação), the National Directorate of Water (DNA – Direcção Nacional de Águas) and the five Regional Water Authorities (ARAs – Administrações Regionais de Águas) are responsible for water resources management.

The DNA combines the responsibility for policy making, implementation, planning and management of water resources, as well as provision of water supply and sanitation services. The strategic activities undertaken by DNA are operationalised by the five Regional Water Authorities (ARAs). The ARAs are

public institutions reporting to the MOPH tasked with the management of water resources. They receive guidance and technical support from the DNA, primarily through its Department of Water Resources Management (DGRH – Departamento de Gestão de Recursos Hídricos) who also have a monitoring role. The ARAs are also tasked, among others, with the monitoring of water resources.

The National Institute for Meteorology (INAM – Instituto Nacional de Meteorologia), within the Ministry for Transport and Communication (MTC – Ministério dos Transportes e Comunicações), is mandated to generate and coordinate the national meteorological services in all of Mozambique’s ten provinces and 128 districts.

To implement the project, DNA and INAM will have designated Project Leaders and Activity Coordinators and the ARAs will have Activity Coordinators. In many of the project activities, the individual agencies will have separate responsibilities reflecting their respective policy and legal mandates. For those activities that are shared or where there are mutual benefits (such as ensuring WMO standards or establishing data sharing platforms), the Project Leaders and Activity Coordinators will come together in a technical Working Group. This Working Group has been established during preparation and consolidated through a mutual Memorandum of Understanding. Each agency has also designed Focal Points to facilitate cooperation across the institutions.

To support the Working Group with strategic matters, a Technical Committee would be established where higher-level decisions can be agreed to guide the optimisation of the combined national hydro-met systems. The possibilities of shared facilities and equipment to the benefit of key implementation agencies will be explored. Procurement and financial management of the project will be done through the PAMT established under the National Water Resources Development Project.

Interagency cooperation for disaster risk management: DNA, the ARAs and INAM collaborate closely with the National Institute for Disaster Management (INGC, Instituto Nacional de Gestão de Calamidades). INGC’s mandate is to direct and coordinate disaster management at the national down to local level, and assist disaster victims whilst increasingly taking on implementation actions. The INGC lies within the Ministry of State and Administration (MAE, Ministério da Administração Estatal).

VII. Safeguard Policies (including public consultation)

Safeguard Policies	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

VIII. Contact point

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Borrower/Client/Recipient

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