I. Project Context

Country Context

Mozambique is experiencing rapid and sustained economic growth. Between 2001 and 2011, the average GDP growth rate was 7.2% and during 2013 growth 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 at a rate of 8.4% and employed 78% of the population in 2011), industrial mega-projects and extractive industries (grew 50% in 2012). Despite macroeconomic achievements, Mozambique has 27% unemployment and remains one of the poorest countries in Africa. Concurrent with rapid economic growth between 2003 and 2009, the proportion of population living in 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, and 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 highly unequal access to water in urban and rural areas (77% and 29% respectively), and the prevalence of diseases such as malaria and HIV/AIDS. Further, MDG-progress at national level 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. As much as 58% of the population and more than 37% of GDP risk exposure to two or more natural hazards - translating 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 low-lying, topographically flat areas and in coastal zones, 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 on the order of US$17.5 million in loss of household/shelter, US$0.7 million in damage of roads, and US $42.5 million for loss in the staple crop maize.

In scenarios developed through the Intergovernmental Panel on Climate Change (IPCC) and the Global Circulation Models, significant changes in climate patterns are predicted in Mozambique. Rainfall patterns are predicted to vary across the country. In some locations, rainfall may decrease by 31% and in others by 16%. The rainy seasons could shorten and droughts be prolonged, especially in central regions. Sea level rise could reach 2.17mm/yr in the southern populated areas of Maputo (±0.76mm/yr) and temperatures increase by 1-2°C by the year 2050. Climate change could result in GDP losses of 4-14% relative to its expected growth by the year 2050. In order to protect and enhance economic gains, build future climate change resilience and more effective management of water resources and weather conditions, the Government of Mozambique has set out to strengthen its hydrological and meteorological information services.

II. Sectoral and Institutional Context

The Government of Mozambique’s (GoM) hydrological and meteorological information services can play an important role in safeguarding 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 climates prevail in the northern and central regions, whereas a dry, arid desert climate predominates in the south. The oscillations of the Inter-Tropical Convergence Zone and the El Niño/a 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 renewable water resources (216km3/yr). The country is the final downstream riparian in nine of its 13 major river basins (≥10,000km2), 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, and 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. Infrastructure such as bridges, roads, and drainage structures are improved by an 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 important, greater understanding of extreme weather events from more accurate, relevant and timely hydro-met information can minimise their negative impacts.

The government’s core responsibility for hydro-met monitoring and forecasting resides with a number of agencies across two ministries. The mandate for hydrology lies with the National Directorate of Water (DNA, Direcção Nacional de Águas) and the five Regional Water Authorities (ARAs, Administrações Regionais de Águas), which are both part of 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) located in the Ministry for Transport and Communication (MTC, Ministério dos Transportes e Comunicações). Noteworthy, there are other government agencies who manage climatological monitoring stations which feed into the national aggregate network for observation (such as the National Institute for Agrarian Research IIAM, Instituto de Investigação Agrária).

The role of hydro-met services that DNA, the ARAs and INAM provide is recognised in the Government’s strategies, laws and policies. However, the efficacy of the services to fulfill their role has been undermined by a number of challenges. These include lack of financial sustainability, where government budget allocations, donor support and revenues are not commensurate with the service’s estimated economic value and fluctuate significantly; fragmentation of institutional responsibilities and weak interagency collaboration reflected in poor implementation of quality standards and calibration of monitoring stations 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 result in only a small portion of the existing network of stations monitoring hydrology and meteorology being operational. The detailed evaluation of Mozambique’s hydro-met services completed during project 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 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 two Doppler Radars, which provide the only upper air monitoring, are not operating. In terms of the ARA’s network of monitoring, the diagnostic showed
that the ARAs manage a larger network than INAM (which includes monitoring of rainfall and evaporation otherwise monitored by INAM), yet the proportion of ARA’s monitoring network that is operational and providing data is similar. For example, 218 of 592 stations monitoring river stage (i.e., 36%) and 329 of 1,318 of stations monitoring rainfall (i.e., 25%) are providing data. The latter excludes the ARA’s automatic stations, where only 3 of 8 are reported as operating. Overall, this means that roughly only 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.

INAM, DNA and the ARAs are maintaining daily forecasting functions. Predictions of incoming water and weather conditions are primarily communicated in the format of bulletins (produced centrally at headquarters in Maputo) and disseminated 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, the agencies 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, these existing hydro-met products fail to meet the needs of users because of three major challenges: i) the lead time of forecasts is not long enough to allow time for appropriate decision making and action; ii) the space-resolution of forecasts is too low for location-specific information; and iii) the content, format and delivery of the forecasts are not tailored for key users.

The technical skills and levels of education of staff in INAM, DNA and the ARAs are significant and often match the technical needs of maintaining modern hydro-met services. However, the evaluation done during project preparation pointed to several challenges in human resources: the number of qualified staff is insufficient, the agencies have difficulty in retaining personnel, and several key staff members are tasked with responsibilities outside their immediate expertise. It is noticeable that, of all staff working with the five ARAs, 75% work in ARA-Sul, while 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 climate information to local communities and to support 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)

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VI. Implementation
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 (DRH, Departamento de Recursos Hídricos) who also have a monitoring role. The ARAs are tasked, among others, with hydrological monitoring and forecasting.

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.

VII. Safeguard Policies (including public consultation)

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VIII. Contact point

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