CLIMATE CHANGE ASSESSMENT

I. BASIC PROJECT INFORMATION

Project Title:	Water Supply and Sanitation Investment Project
Project Cost ($ million)**:**	$62.5 million
Location:	Timor-Leste
Sector:	Water and other urban infrastructure and services
Theme:	Urban water supply and sanitation
Brief Description:	The proposed project aims to enhance water supply and sanitation infrastructure in secondary cities in Timor-Leste, to facilitate sustainable economic growth. The cities of Lospalos, Same and Viqueque have been selected for the project, based on their potential for economic growth, and communication and transport linkages. The total project cost is $62.5 million, of which Asian Development Bank (ADB) will finance $47 million, the Government of Timor-Leste will provide $12.5 million, and cofinancing of $3 million from the Global Environment Facility (GEF) is anticipated. The outputs of the project are: (i) **Output 1: Regulatory environment improved.** The project will support the project cities in developing, approving, and implementing a gender and socially inclusive institutional development roadmap that will guide the transfer of urban water supply and sanitation functions of the SMASAs to BTL, the newly established state-owned utility,[1] with consideration for appropriate information and communication technology, and digital solutions to improve efficiency in public service management. At the sector level, the project will support BTL in establishing service delivery guidelines on water supply and preparing a sanitation action plan for citywide inclusive sanitation.[2] (ii) **Output 2: Water supply and sanitation infrastructure improved.** The project will improve access to inclusive water supply and sanitation infrastructure in the three project cities through: (i) construction of 14 water supply storage and 7 treatment facilities; (ii) rehabilitation and expansion of 130 km of water supply distribution network and formation of district metered areas; (iii) installation of meters for 10,000 household connections; and (iv) construction of 12 public toilets and 3 septage treatment facilities, including septage collection and transport. (iii) **Output 3: Institutional effectiveness improved.** To ensure that infrastructure created under the project deliver services efficiently, the project will enhance the capacity of BTL and the SMASAs to plan, deliver, operate, and maintain water supply and sanitation infrastructure over the long-term. Women's participation in the sector will be encouraged including through enhanced job skills training for both women and men water services employees. To monitor institutional effectiveness, the project will develop and implement customer service feedback and complaint mechanism that ensures accessibility and responsiveness to the specific needs of both male and female customers. Improved O&M arrangements will also be developed to enhance the sustainability of the project assets and services.

Source: Asian Development Bank.

[1] The roadmap will cover key aspects of planning, service delivery, and financial management, and identify solutions that will be implemented over the project period.

[2] Citywide inclusive sanitation aims to achieve the following: (i) everyone in the city has access to and benefits from sustainable sanitation services, and (ii) human waste is safely managed along the whole sanitation service chain.

II. SUMMARY OF CLIMATE CHANGE FINANCE

Project Financing		Climate Finance	
Source	**Amount** ($ million)	**Adaptation** ($ million)	**Mitigation** ($ million)
Asian Development Bank			
Ordinary capital resources (concessional loan)	47.00	3.45	N/A
Cofinancing			
Global Environment Facility	3.00	3.00	
Government of the Democratic Republic of Timor-Leste	12.50		

Source: Asian Development Bank.

III. SUMMARY OF CLIMATE RISK SCREENING AND ASSESSMENT

A. Sensitivity of Project Component(s) to Climate or Weather Conditions and the Sea Level

1. **Water Sources:** river systems are short and seasonal, and changes to seasonality and intensity of rainfall affect the reliability of surface water sources. Same and Viqueque face significant challenges with seasonality of flow from the springs which comprise the current water supply system, with dry season flow approaching zero in some years. There is a need for greater information on groundwater yields and aquifer recharge.
2. **Water Supply Network:** The piping and transmission network for all three cities will be laid underground and follow roads where possible. This provides a degree of resilience to landslides, however, large events pose a risk if the slope itself where the pipe is buried undergoes movement, with damage to pipes, valves and other infrastructure possible. Flooding can affect pumping stations, water storage tanks and water treatment plants required as part of the transmission and distribution system. The increase in extreme rainfall means that an increase in flood frequency and extent is likely.
3. **Septage Treatment:** The septage treatment elements of the projects comprise STPs and the construction of public toilets. Damage from flooding is the key risk to the STPs.

B. Climate Risk Screening

1. **Drought and water availability:** Timor-Leste water sources are sensitive to water scarcity from intermittent and unreliable rainfall associated with seasonality, as well as regular droughts, associated with El Niño events in particular. This causes dry/low river flows and reduced groundwater recharge during the dry season. Reduced water supply in drains/sewers causes the build-up of solids and waste in the drainage network, reducing sewerage capacity.
2. **Flooding**: The project cities are all at high risk of flooding, largely from flash floods caused by high rainfall intensities and increased surface runoff. All water supply and sanitation infrastructure is at risk of flooding and contamination. High intensity rainfall that causes flash floods causes reduced groundwater recharge for aquifers, reducing available water. Floods also impact treatment processes through power outages and reduced treatment processes. Drainage pipes and sewerage infrastructure can be overloaded causing contaminated floods.
3. **Landslides:** Heavy rainfall causes regular landslides in areas of steep topography and are a risk for Same and Viqueque in particular. Landslides can damage water supply and sanitation infrastructure, and block watercourses or decrease water quality.
4. **High temperatures:** With increased temperatures, water supply will increase for drinking water and agricultural/industry use despite low supply, putting pressure on water sources. Timor-Leste watercourses are fast-flowing and intermittent and so are sensitive to increased temperatures and evaporation reducing water availability and water quality. Increased surface water temperatures also interfere with treatment processes whilst extreme heat can interfere with power supply required for treatment processes.

Climate Risk Classification:

CRVA – *Medium risks overall. Not possible to fully assess residual risks in absence of groundwater assessments.*

C. Climate Risk and Adaptation Assessment

The risk assessment considered project components that had a high vulnerability to extreme weather and future climate change. The assessment was based on desk study using the available baseline data, climate change projections, project documents, feasibility studies and research literature. Climate scenarios were developed based on NASA statistically downscaled CMIP5 climate change models. Additional data sources included global risk assessment resources, namely CatchX hydrological model and KNMI Explorer climate data sets.

The vulnerability assessment (Section I) identified high vulnerabilities to (i) water scarcity during low rainfall and periods of drought (ii) flooding during extreme rainfall events iii) landslides, and (iv) extreme heat. The future climate changes for southern and eastern Timor-Leste by the mid-century (2050s) are for hotter conditions, with general model agreement on greater annual precipitation but strong inter-annual variability driven by ENSO, and potential changes to seasonality.

- Under the RCP4.5 climate scenarios temperatures rise by around 1C compared to the historical baseline, with increases in annual precipitation likely to fall in the range of +2%-+12%, and increases in the number of days with extreme rainfall of up to 25%.
- Under the RCP8.5 climate scenarios temperatures rise by 1.2C-1.6C compared to the historical baseline, with increases in annual precipitation likely to fall in the range of +1%-+17%, and increases in the number of days with extreme rainfall of up to 17%.
- Rainfall variability in Timor-Leste is driven by the ENSO cycle, and the evolution of ENSO under climate change will play an important role in determining drought and inter-annual variability in rainfall in the country. Changes in the ENSO cycle are still not well captured by climate models, however, the latest research indicates that El Niño events may become both more frequent and more severe over the course of the century.

The overall project responds to the existing climate vulnerability context of Timor-Leste and its impacts, and supports of the implementation of the Timor-Leste's Nationally Determined Contributions under the Paris Agreement by improving water supplies for communities with limited access to water and poor sanitation facilities. It is well aligned with climate change priorities in Timor-Leste, including the NAPA, and INDC.
The main adaptation activities are summarized below:

- Increasing the overall water supply and number of water sources will address immediate issues where current sources can run dry in the dry season.
- Increased water storage in the water supply system will allow for a more consistent water supply.
- Distribution and transmission networks will be buried, affording good protection against both flooding and landslides, both of which are expected to increase.
- The development of hydrological, and groundwater models for the cities that will be carried out as part of the project will enhance understanding of sustainable water resources, as well as understanding of flood risk.
- Communication and awareness-raising activities will increase community knowledge on climate change, and potential adaptation measures.
- Activities related to leak detection and repair, and the deployment of a monitoring system to detect and leaks and maintain the pipes will reduce losses and increase the resilience of the system.
- The introduction of metering for some connections will reduce demand.

Additional adaptation:

- Ensure that the design of assets in the project will take into account likely changes in the frequency and magnitude of flood events, and extreme precipitation.
- Include upstream catchment management to maintain good water quality at river abstraction points.

D. Climate Risk Screening Tool and/or Procedure Used

This study used the ThinkHazard tool, local information and existing climate change studies, to review the exposure to hazards and potential risks, and downscaled climate data for the climate risk assessment.

ADB = Asian Development Bank, CatchX = Catchment scale global hydrological model, CMIP5 = Coupled Model Intercomparison Project Phase 5, CRVA = climate risk vulnerability assessment, ENSO = El Niño-Southern Oscillation, INDC = Initial Nationally Determined Contribution, KNMI = Netherlands Meteorological Institute, NAPA = National Adaptation Program of Action, NASA = National Aeronautics and Space Administration. STP = septage treatment plant, Source: Asian Development Bank.

IV. CLIMATE ADAPTATION PLANS WITHIN THE PROJECT

Adaptation Activity	Target Climate Risk	Estimated Adaptation Costs ($ million)	Adaptation Finance Justification
Enhanced water supply and water storage	Low rainfall/drought	2.99	Water storage and supply has been designed to buffer against periods of low water availability. Climate change is not the sole reason storage is needed but is a contributing factor. The costs include costs of additional boreholes sources in Same to increase the resilience of the supply system ($1.08 million) and proportional cost (19%) of water tanks and pumping stations, which maintain supplies during periods of low water availability ($2.01 million).
Burying of transmission and distribution networks	Landslides Flooding	0.86	The distribution network will be laid underground. The major drivers for this are to reduce human interference with the network, and illegal connections, but also to avoid landslide and flood risk. The costs are proportional costs (4%) of the transmission mains and distribution network to make these more resilient to climate hazards.
Reducing water leakage and nonrevenue water	Low rainfall/drought	2.0	Activities related to leak detection and repair, and the deployment of a monitoring system to detect and leaks and maintain the pipes will reduce losses and increase the resilience of the system. The introduction of metering for some connections will reduce demand. The costs are proportional costs (50%) for activities to reduce leakage. A high proportion is justified due to significant water efficiency savings.
Development of groundwater monitoring system and hydrological model	Low rainfall/drought Flooding	0.5	Addresses a key knowledge gap needed to effectively manage water resources in the municipalities. GEF-financed. The full costs of the monitoring system is attributed to adaptation.
Communication and Awareness Campaign	Climate variability	0.1	Clearly targeted to adaptation under GEF cofinancing Full costs of climate/water efficiency awareness campaigns.

GEF = Global Environment Facility.
Source: Asian Development Bank.

V. CLIMATE MITIGATION PLANS WITHIN THE PROJECT

1. The project has no climate mitigation activities.