

CLIMATE CHANGE ASSESSMENT

I. BASIC PROJECT INFORMATION

Project Title:	Proposed Loan Republic of the Union of Myanmar: Yangon City Water Resilience Project
Project Cost (\$ million):	196.00
Location:	Yangon City
Sector:	Water and other infrastructure and services
Theme:	Inclusive economic growth; Environmentally sustainable growth
Brief Description:	<p>The project will address urgent water infrastructure needs associated with bulk water supply in Yangon City. It will support the government's strategies to make its cities more livable through the provision of better and more widespread urban water services. Untreated water is conveyed from Ngamoeyeik reservoir to Nyaungnhapin water treatment plant through a series of open, unlined canals. The intake at the reservoir and the initial 29 kilometers (km) of the canal is shared with the Ministry of Agriculture, Livestock and Irrigation (MOALI). Open canals require frequent maintenance, and hence the potential for intermittent bulk water supply combined with a lack of direct operational control of the overall length of canal by the Yangon City Development Committee (YCDC) presents an unacceptable risk to the city for its water security. Use of the canal is not a sustainable long-term solution for the city, with substantial water loss through seepage, evaporation, and bank deterioration. Water safety issues are high due to the open canal being exposed to the risk of pollution from various sources. Resilience of the bulk water transfer system will be even more critical as the city's water demand increases. In demonstrating leadership in the principles of good water management, YCDC will play its part in managing the region's natural resources in a responsible manner. This approach recognizes water as both a service and a resource, which will be a robust response to future impacts of climate change, limiting as far as possible additional stress on the reservoir.</p> <p>The project is aligned with the following impacts: Yangon City's urban resilience and livability enhanced. The project will have the following outcome: Security of Yangon City's water supply reinforced.</p> <p>Output 1: Bulk water transmission system constructed. The project will finance the construction of new facilities to transfer about 818 MLD of water to Yangon City, including (i) an intake structure at the Ngamoeyeik reservoir, (ii) an online pumping station 900 meters (m) downstream of the intake structure, and (iii) a 34 km pipeline of 2.4 m diameter from Ngamoeyeik reservoir to the Nyaungnhapin WTP. These interventions will secure and expand the existing water services and will complement the YCDC's strategic plan by increasing the supply of raw water from the Ngamoeyeik reservoir to the Nyaungnhapin WTP by one third from 614 MLD to 818 MLD.</p> <p>Output 2: Institutional sustainability strengthened. The project will strengthen the YCDC's institutional sustainability to increase the reliability of its water services and by supporting its subsidiary water authority, the WRWSA. It will support capacity building of the YCDC in critical areas, such as water systems operational management and climate change responsiveness. The project will prepare a wide-ranging financial sustainability road map for the YCDC, including options for a new water tariff strategy. The project will also provide targeted support to build the YCDC's self-financing capacity to meet the growing demands on its water service. The project will support the YCDC in optimizing its operating efficiency by expanding its metered water service and improving its collection efficiency and customer service.</p>

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)	180.0	0.50	4.0

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

The bulk water transmission system project components that may be vulnerable to potential damage due to erosion and/or flooding are (i) the pumping station structures; (ii) pipeline foundations and structures crossing over creeks and other water courses; (iii) pipeline structures crossing under creeks and other water courses; and (iv) the regulation buffer tank structures and equipment. The remaining sections of the pipeline are not at risk from climate impacts.

B. Climate Risk Screening

Climate change forecasted trends have been assessed by the Department of Meteorology and Hydrology (DMH) in accordance with Representative Concentration Pathways (RCP) 4.5 and RCP 8.5. RCPs are the four greenhouse gas concentration trajectories adopted by the Intergovernmental Panel on Climate Change (IPCC) for its fifth Assessment Report (AR5) in 2014, superseding its Special Report on Emissions Scenarios projections published in 2000. The pathways are used to describe four possible climate futures and result from different combinations of economic, technological, demographic, policy, and institutional futures. RCP 4.5 is one of the medium-low scenario and RCP 8.5 is the highest emission scenario.

Temperature increase. The new climate change projections at country level reveal a 0.8–2.7°C increase of average minimum temperature and a 0.8–2.6°C increase of average maximum temperature by the end of 2100 under the RCP 4.5. Under the RCP 8.5, annual minimum temperatures should increase by 0.9–1.4 by 2021–2040, 1.8–2.4°C by 2041–2060, 2.5–3.4°C by 2061–2080, and 3.4–4.3°C by 2081–2100; annual maximum temperatures should increase by 1.0–1.3°C by 2021–2040, 1.6–2.1°C by 2041–2060, 2.4–3.1°C by 2061–2080, and 3.3–4.1°C by 2081–2100. In Yangon City by the end of the century (2100) forecasted Annual Maximum Temperature is expected to increase by 2.3–3.8 °C (RCP 4.5) or by 3.3–4.1 (RCP 8.5).

Rainfall increase. While there has been no statistically meaningful trend in the number of rainy days (defined as days with rainfall >1mm) per year over 1981–2010, annual precipitation totals have increased, implying that rainfall events have become more intense. At country level, average annual precipitation is projected to rise by 36% under RCP 4.5 and 40% under RCP 8.5. Under the RCP 8.5, rainfall change is projected at 6–13% by 2021–2040, 14–25% by 2041–2060, 12–44% by 2061–2080, and 10–31% by 2081–2100.

Climate Risk Classification: Low

C. Climate Risk and Adaptation Assessment

Subproject	Potential Climate Risk	Risk Level	Possible Adaptation Measures
Pumping station	(electrical/equipment submersion)	Medium	Raising the structures and equipment to resist higher flood risks (including Climate Change).
Creek-crossing (superstructure)	(higher velocities and heights along the creek could ruin the superstructure and the pipe)	Low	Design the superstructure and its foundations to resist/transit safely increased flows, heights, velocities and risks of debris.
Creek crossing (under)	(higher velocities and erosion along the creek could uncover and ruin the pipe)	Low	Bury the pipeline at a sufficient depth under the creek bed not to be exposed to erosion.
Distribution system (buffer tank)	(higher flood level could impact the access, operation and maintenance)	Low	Raising the structures and equipment to resist higher flood risk.

D. Climate Risk Screening Tool and/or Procedure Used

Preliminary risk screening is conducted in accordance with the Asian Development Bank's climate change risk management framework, and the project is rated as "low risk" for climate change impacts. The AWARE tool and especially the project's AWARE report has been used. Additionally, a desk-based GIS assessment of risks was performed using the Global Data Risk Platform which show low risk to flooding and extreme events.

IV. CLIMATE ADAPTATION PLANS WITHIN THE PROJECT

Adaptation Activity	Target Climate Risk	Estimated Adaptation Costs (\$ million)	Adaptation Finance Justification ¹
Pumping station: Raising the structures and equipment	Damage due to floods (submersion)	0.15	+ \$50,000 for the platform + \$100,000 for the structures (on the assumption of + 50 cm offset to protect equipment and infrastructure).
Creek crossing (over): Reinforcing foundations and structure	Damage due to floods (velocities, height)	0.15	+ 20% added cost for the structure that will support the pipe x 1 creek crossing (on the assumption higher piles, thicker structure and deeper foundation to resist erosion).
Creek crossing (under): Bury the pipeline at a sufficient depth under the creek bed not to be exposed to erosion	Damage due to floods (velocities, erosion)	0.15	+ 15% added cost over piping works x 3 creek crossings (on the assumption 1 m extra depth under the creek bed)
Regulation buffer tank: Raising the structures and equipment	Damage due to floods (submersion)	0.05	+ \$25,000 for the platform + \$25,000 for the structures (on the assumption + 50 cm offset to protect equipment, infrastructure and access).
Total		0.50	

V. CLIMATE MITIGATION PLANS WITHIN THE PROJECT

Mitigation Activity	Estimated GHG Emissions Reduction (tCO ₂ e/year) ^a	Estimated Mitigation Costs (\$ million)	Mitigation Finance Justification
Use of high efficiency motors to pump water from reservoir to treatment plant, reduced water loss	TBD ^b	4.00	The use of energy efficient motor for water pumping station in lieu of the BaU low efficient motor and the reduction of NRW are mitigation activities.

CH₄ = methane, GHG = greenhouse gas, N₂O = nitrous oxide, TBD = to be determined, tCO₂e = tons of carbon dioxide equivalent.

^a Energy savings/year x emission factor = GHG emissions reduction.

^b Significant energy efficiency gains are expected as a result of reduced water loss and the use of high efficiency pumps. The project management consultant will prepare detailed engineering design and supervise construction works and will undertake a full baseline energy efficiency audit of the proposed system, from the intake structure, to the pumping station, and to the water treatment plant, and prepare proposals for energy reduction and optimization. The output from this work will be detailed and summarized in annual energy optimization reports. The project management consultant will also establish the baseline of the greenhouse gas reductions or emissions (i.e., tCO₂e per KWh) from the operations of the pumping station and establish the total greenhouse gas emission reduction benefits of the project.

Source: Asian Development bank.

¹ Preliminary assumptions to be confirmed at the detailed engineering design stage.