

CLIMATE CHANGE ASSESSMENT

I. BASIC PROJECT INFORMATION

Project Title:	Phuentsholing Township Development Project
Project Cost (\$ million):	\$93 million (Additional financing of \$30 million)
Location:	Phuentsholing, Bhutan
Sector:	Agriculture, natural resources and rural development; and Water and Other Urban Infrastructure and Services
Theme:	Disaster risk reduction and urban development
Brief Description:	<p>The Phuentsholing Township Development Project was approved by the Board on 5 June 2018 and will develop 66 hectares (ha) of riparian land near the city of Phuentsholing that is located adjacent to the Amochhu River near Bhutan's southwestern border with India. The project will construct about 4.77 kilometers of river walls to provide protection from floods and erosion to the existing municipality and new urban areas. Behind the new river walls, it will raise ground levels to above the 100-year flood levels, and install common urban infrastructure comprising water supply, sewerage, and roads to the new plots of land.</p> <p>The additional financing will cover cost overruns on the ongoing project and extend 360 meters of the Omchhu River to reinforce the existing riverbank protection. The works on the Omchhu will take place in an engineered channel and the works will not extend beyond the existing river channel width. The climate baseline and projections determined in the ongoing project are still applicable and the expected impacts are the same for the additional financing. Similarly, the ongoing projects Disaster and Climate Risk and Vulnerability Assessment (CRVA) still applies.¹</p>

Source: Asian Development Bank

II. SUMMARY OF CLIMATE CHANGE FINANCE

Project Financing		Climate Finance ^a	
Source	Amount (\$ million)	Adaptation (\$ million)	Mitigation (\$ million)
Asian Development Bank			
Ordinary capital resources (concessional loan)	18.5	0	0
Special Funds resources (ADF grant)	10.0	0.05	0

ADF = Asian Development Fund.

Source: Asian Development Bank Estimates

¹ ADB. 2018. [Report and Recommendation of the President to the Board of Directors: Phuentsholing Township Development Project](#). Disaster and Climate Risk and Vulnerability Assessment (accessible from the list of linked documents in Appendix 2). Manila.

III. SUMMARY OF CLIMATE RISK SCREENING AND ASSESSMENT

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

The main climate risk to the project (both currently and into the future) is extreme precipitation and associated flooding.

Components of the project that are important to its success but also potentially impacted by current and future climate variability and change are:

- (i) The 4.77 kilometers of river walls to provide protection from floods and erosion to the existing municipality and new urban areas. Behind the new river walls the ground levels will be raised to above the 100-year flood levels. The Amochhu has a large catchment area with no natural or man-made storage in the catchment to attenuate flooding. Changes in precipitation with higher intensity storm events may result in higher run-off and more severe flood discharge for a given frequency, as well as the associated velocity attack leading to erosion/scour which could ultimately lead to structural failure of the diaphragm wall and protection works, exposing the land reclamation to erosion and flooding.
- (ii) The cross-drainage works will be sensitive to the predicted increase in frequency and intensity of precipitation, which will result in more severe floods. They are also sensitive to sediment and debris flows resulting from landslides.
- (iii) Storm water Drainage and Road network may be sensitive to damage from flooding and heavy rainfall events.

The project is not sensitive to sea level as it is located inland.

B. Climate Risk Screening

The Aware climate risk screening tool suggests that:

- (i) This project is in a region that has experienced recurring major flood events in the recent past (between 1985 and 2010 there has been more than one significant, large-scale flood event in the region).
- (ii) Climate change is projected to increase the frequency and intensity of flood events in this region (due to climate change impacts on the location, frequency, and magnitude of extreme precipitation events).
- (iii) Increased frequency and intensity of flood events may increase erosion and siltation of water courses, landslide events, surface flooding (pluvial) and damage to drainage systems.
- (iv) Existing engineering designs need to adequately take into consideration existing flood risks as well as the projected increases to flood risk associated with climate change.
- (v) An increase in landslide activity may increase sediment generation and debris flows, leading to conveyance issues for the cross-drainage facilities.

Climate Risk Classification: *high*

C. Climate Risk and Adaptation Assessment

The CRVA was completed for the ongoing project and still applies to the additional financing (footnote 1). The additional financing will cover the increased costs of the river training wall and backfill and the urban component.

Key climate risks are:

- (i) **Precipitation increase:** may lead to increased seasonal runoff and therefore erosion and siltation of watercourses, reservoirs, and flooding and precipitation induced landslide events.
- (ii) **Flood:** climate change is projected to increase the frequency and intensity of flood events and existing engineering designs may not take into consideration the risks associated with this.
- (iii) **Landslide:** the project is in a region that has experienced frequent precipitation (and earthquake) induced landslide events. The slope, lithology, geology, soil, vegetation and

land use in this region suggest that landslides will continue to be a problem in the future. Existing design standards may not take into consideration the impact of climate change on landslide risk.

The overall project will help better cope with climate variability and change through:

- (i) **Dimension and capacity standards.** Designs of planned infrastructure (river training works, cross drainage and storm water system) allow for climate change, including effects of potential increase in flood event magnitudes. A climate change allowance has been estimated for the Amochhu river and an appropriate freeboard between the estimated flood level for the design event and the top of the embankments / finished levels in land reclamation areas.
- (ii) **Material specifications.** High strength/durable concrete mix and increased reinforcement cover has been specified on areas of the river training structures which are exposed to abrasion and erosive forces (e.g. the cast in-situ wall on the outside of the river bend). Riprap is sized and graded appropriate for the anticipated hydraulic conditions.
- (iii) **Protective engineering structures.** Adequately sized debris dams are specified on the tributary catchments that feed the cross-drainage facilities. Scour counter measures will be provided for cross drainage facilities and for river training works to protect foundations.
- (iv) **Flood management.** Meteorological and hydrological data collection in the catchment to improve the database used for making decisions.
- (v) **Infrastructure operation and maintenance planning.** regular and detailed monitoring of channels and structures will be implemented, particularly prior to and during the monsoon season when flood risk is highest. Vigilant management of sediment deposition will be vital to maintain conveyance capacity of the natural and engineered channels.
- (vi) **Master planning and land use management.** Development within the project area will avoid geologically unstable areas and flood prone areas.
- (vii) **Training/capacity building.** Training will be provided for implementing agency maintenance personnel related to climate change impacts, use of climate information, weather forecasting and early warning systems.
- (viii) **Information systems.** A flood early warning system will be implemented and operated in accordance with a flood management plan that will be prepared under the project.

D. Climate Risk Screening Tool and/or Procedure Used

The preliminary climate risk screening was done using Aware.

Source: Asian Development Bank

IV. CLIMATE ADAPTATION PLANS WITHIN THE PROJECT

Adaptation Activity	Target Climate Risk	Estimated Adaptation Costs (\$ million)	Adaptation Finance Justification
Increased height of river walls and fill for the new township	Increased frequency or magnitude of extreme precipitation events. Increased frequency or magnitude of flooding.	\$0.05	The river walls and township level are required to prevent flooding of the new township on land adjacent to a river. Adaptation cost is based on incremental cost of increasing river wall and backfill heights to allow for increased water levels with climate change.

Source: Asian Development Bank