

CLIMATE CHANGE ASSESSMENT

I. Basic Project Information

Project Title: BHU (50296-002): Skills Training and Education Pathways Upgradation Project
Project Cost (in \$ million): \$15 million grant
Location: Thimphu Thromde, Wangdue Phodrang, Punakha, Bumthang, Trashigang, and Trashiyangtse
Sector: Education
Theme: Skills development
Brief Description: <p>The following outputs will enhance chances of technical and vocational education and training (TVET) graduates for employment and in increasing the skilled human capital needed for equitable socioeconomic development in Bhutan.</p> <p><i>Output 1: Access to skills development increased.</i> This will (i) establish a new flagship technical training institute (TTI) in Thimphu in a new campus with modern facilities and upgraded courses at the diploma level and provide new classrooms, workshops and dormitories in TTI Samthang; (ii) provide advanced and green technology equipment and tools, including IT equipment in five TTIs ; and (iii) introduce at least six new courses at higher and advanced (diploma) level and in diversified disciplines in five TTIs.</p> <p><i>Output 2: Quality and relevance of skills development enhanced.</i> This will support: (i) deliver improved training of trainer programs with workplace experience to at least 60% of trainers in TTIs; (ii) partner with private sector training providers and civil society organizations for skills training in emerging occupations benefiting about 800 students (32% female and 5% persons with disabilities); and (iii) provide improved teaching and learning resources, particularly e-resources, in five TTIs to develop future-ready skills in graduates.</p> <p><i>Output 3: Vocational orientation of secondary school students improved.</i> This will provide support to: (i) improve the skills of secondary school students through offering TVET elective subjects in grades 9–12 in seven TVET premier schools linked to TTIs benefiting 400 students (32% female); (ii) provide career guidance with exposure to the world of work to all secondary students (grades 7–12) benefiting 30,000 students (40% female); and (iii) offer information and communication technology-enriched teaching and learning to improve modern competencies, such as critical thinking, problem solving, teamwork and communication in grades 7–12 in the seven TVET schools benefiting 2,500 students (40% female).</p> <p><i>Output 4: Governance and institutional capacity for TVET improved.</i> This will provide support to: (i) operationalize an integrated and web-based TVET management information system and an employment services portal, including the use of social media for dissemination; and (ii) facilitate international partnerships for capacity development in at least in one TTI.</p>

II. Summary of Climate Change Finance (if applicable)

Project Financing		Climate Finance (in \$ million)*	
Source	Amount (in \$ million)	Adaptation	Mitigation
ADB Resources			
OCR	-	-	-
COL	-	-	-
ADF Grant	15.00	0.08	0.88
Cofinancing**			
Global Environment Fund	-	-	-

III. Summary of Climate Risk Screening and Assessment (if applicable)

A. Sensitivity of Project Component(s) to Climate/Weather Conditions and Sea Level	
Project component <i>Part of Output 1</i> (i) construction of new Thimphu TTI in Serbithang (ii) additional new buildings (i.e., hostels, classrooms, and workshop) within the premises of existing Samthang TTI in Wangdue Phodrang	For skills development: Increase in temperature and changes in rainfall may at least affect students and teachers with some discomfort or heat strokes to hypertension on most serious cases. This can also lead to disruption of certain critical/important activities. For the infrastructure part of the project (Thimphu and Samthang TTIs, and seven secondary schools), there may be some sensitivity in terms of materials and design specifications and layouts of structures. ICT facilities may be affected

<p><i>Part of Output 3</i> Construction of 13 single-storey TVET laboratories within the existing premises of seven secondary schools in Thimphu, Punakha, Wangdue Phodrang, Bumthang, Trashigang, and Trashiyangtse to introduce TVET to secondary students</p>	<p>by climate and weather changes by overheating data centers, exchanges, and base stations; reducing the strength and quality of wireless signals in five TTIs; and increasing operation and maintenance costs.</p> <ol style="list-style-type: none"> 1. Temperature rise may cause the following: (i) premature deterioration of structures/equipment from thermal stress, (ii) changes in the dimension/shape of building materials and equipment from cracking and fissuring, (iii) changes in internal temperatures causing heat stress, health problems, or reduced productivity for building users, (iv) impacts on use of building equipment, including heating, cooling, and water systems, and (v) disruptions in construction or maintenance activities. 2. Changes in precipitation may cause the following: (i) increased precipitation can result to potential seepage and flooding in building interior and/or physical changes in building materials and finishing, (ii) increased precipitation can result to potential washout of temporary and or poorly-constructed structures; (iii) decreased precipitation may damage building foundation and façade from ground movements and subsidence, (iv) during construction, impacts on health, safety, and well-being of workers caused by deposits of fungi and mold, and (v) disruptions in maintenance and repair due to flooding. 3. Extreme events (heavy rainfall events including wind and storms) may potentially result to the following: (i) structural damage due to intense weather patterns, (ii) reduced durability of exterior surfaces due to erosion and weathering, (iii) disruptions to maintenance activities, (iv) increased safety hazards and physical damage, and (v) increased disturbance to operational support services such as electrical systems. 4. Sea level rise – not applicable as Bhutan is a land-locked country.
<p>B. Climate Risk Screening</p>	
<p>Risk topic</p> <ol style="list-style-type: none"> 1. Temperature 2. Precipitation 3. Extreme events could be heavy rainfall, wind and storms, and glacial lake outburst flooding (GLOF) 	<p>Description of the risk</p> <ol style="list-style-type: none"> 1. Temperature increase: Higher temperature increase during winter season is expected. For the period 2010–2069: <ul style="list-style-type: none"> • Projected mean annual temperature increase from 1.1°C to 2.6°C; • Projected mean monsoon temperature increase from 0.9°C to 2.3°C; and, • Projected mean winter temperature increase from 1.4°C to 2.7°C. 2. Changes in precipitation: Increase in rainfall in all seasons. For the period 2010–2069: <ul style="list-style-type: none"> • Projected mean annual precipitation change from 112 mm to 365 mm; • Projected mean monsoon precipitation change from 58 mm to 292 mm; and, • Projected mean winter precipitation change from 2.2 mm to 11 mm. 3. Data records are not adequate but in recent years, flash floods (2004) in six eastern Dzongkhags killed 9 people, washed away 29 houses,

	<p>damaged 107 houses and destroyed 664 acres of wet and dry farm loads (NDRMF 2006). In May 2009, cyclone Aila originating from the Bay of Bengal caused one of the worst climatic disasters in Bhutan that recorded up to 76 mm of rain in 24 hrs for Thimphu. In the most recent 1994 glacial lake outburst flood (GLOF), all major rivers more than doubled in size and the flows in the Punatsangchhu exceeded the volumes. Other GLOF occurrences were in 1957 and 1960.</p>
<p>Climate Risk Classification: <i>Medium</i> – While Bhutan is prone to multiple natural hazards that pose varying risks to the population, properties, and livelihoods; the scope of the project that may be subject to the impacts of climate change is not extremely sensitive.</p>	
<p>C. Climate Risk and Adaptation Assessment</p> <p>As projected until 2069, an increase in mean annual temperature to be 2.6°C may not be significant to cause deterioration of buildings and structures but may cause some discomfort to students who have been used to cold weather. Increased precipitation may disrupt some outdoor school activities. Changes in weather may affect the strength and quality of wireless signals needed in computer-based activities both in the TTIs and secondary schools. Changes in weather will have associated costs in terms of heating during cold months and cooling during summer both in schools and hostels.</p> <p>Increasing temperature may potentially increase the risk of GLOF which could affect the Chamkhar Chhu and the Punatsangchhu basin where Bumthang, Punakha, and Wangdue Phodrang are located. Through the UNDP, GEF, Government of Austria, JICA and other financial support, the Government has installed early warning systems (GLOF-EWS), GLOF monitoring, flood level markings, sirens along the flooding route, identified evacuation sites, and hazard zonation in the Punakha-Wangdue Valley to guide in planning and development. GLOF-EWS became operational in 2012. Bhutan has received significant technical and financial support from the UNDP and GEF to reduce climate change-induced risks and vulnerabilities from GLOF and earthquakes including response and recovery preparedness.</p> <p>The main climate risk management within the project was site selection. All the sites for the workshops to be provided in seven secondary schools carefully considered the hazard zonation identified by the Department of Disaster Management (DDM), Department of Geology and Mines, and Department of Hydromet Services. Selection criteria included factors such as: (i) it should be more than 30 m from the edge of a river or major stream/edge of gullies, and (ii) it should be more than 15 m from the edge of all natural rivulets/gulleys and natural drainage channels. In Samthang TTI located in Wangdue Phodrang, additional buildings will be within the yellow zone hazard zonation which represents medium risk areas where the most probable indirect impact of GLOF can occur based on the worst case scenario of a future occurrence of GLOF with 53 million cubic meters (MCM) of water. The Samthang TTI has been identified by the DDM as one of the evacuation sites in the event of GLOF. All the existing buildings in Samthang TTI are above the existing national road where the areas below the road are part of the red zone (high risk).</p> <p>The design of all the new buildings will be resilient to climate change and could withstand earthquakes higher than 7Mw. Climate change adaptation measures include retaining walls and drainage system while mitigation measures that will be incorporated in the design are use of energy-efficient lighting and appliances, pre-fabricated doors and windows, double glazed glass in windows, and autoclaved aerated concrete blocks.</p> <p>Bhutan has a National Action Plan for School Earthquake Safety (January 2013) being implemented by the Ministry of Education. Flooding is the most frequently occurring hazards followed by earthquakes and storms.</p>	
<p>D. Climate Risk Screening Tool/Procedure Used (specify): SARD climate risk screening framework and tool</p>	

IV. Climate Adaptation Plans within the Project (if applicable)

Adaptation Activity	Target climate risk	Estimated adaptation finance (in \$ million)	Adaptation Finance Justification
Robust site development works for the construction of the Thimphu TTI in terms of better drainage system and retaining walls.	Increased precipitation in all seasons	0.08	Measures to ensure that the buildings provided to the trainees and secondary students are resistant to climate change.

V. Climate Mitigation Plans within the Project (if applicable)

Mitigation Activity	Estimated Greenhouse Gas (GHG) Emissions Reduction (tCO₂e)/year	Estimated Mitigation Finance (in \$ million)	Mitigation Finance Justification
<ul style="list-style-type: none"> • Adoption of techniques that reduce building energy consumption in the construction of the new Thimphu TTI (i.e., double glazed glass in windows, use of prefabricated doors and windows, use of aerated cement concrete blocks instead of brick as it is lighter and has better insulation). • Use of energy efficient lighting and appliances to improve energy efficiency. 	114 tons	0.88	To reduce building energy consumption and the contribution to GHG emissions