



PROJECT IDENTIFICATION FORM (PIF)¹

PROJECT TYPE: Full-sized Project

TYPE OF TRUST FUND: LDCF

PART I: PROJECT IDENTIFICATION

Project Title:	Addressing the risk of climate-induced disasters through enhanced national and local capacity for effective actions		
Country(ies):	Bhutan	GEF Project ID: ²	
GEF Agency(ies):	UNDP (select) (select)	GEF Agency Project ID:	4760
Other Executing Partner(s):		Submission Date:	2012-05-01
GEF Focal Area (s):	Climate Change	Project Duration (Months)	48
Name of parent program (if applicable): ➤ For SFM/REDD+ <input type="checkbox"/>	N/A	Agency Fee (\$):	1,149,120

A. FOCAL AREA STRATEGY FRAMEWORK³:

Focal Area Objectives	Expected FA Outcomes	Expected FA Outputs	Trust Fund	Indicative Grant Amount (\$)	Indicative Co-financing (\$)
CCA-1 (select)	1.2 Reduced vulnerability to climate change in development sectors	Vulnerable physical, natural and social assets strengthened in response to climate change impacts, including variability	LDCF	4,610,000	7,240,000
CCA-2 (select)	2.1 Increased knowledge and understanding of climate variability and change-induced threats at country level and in targeted vulnerable areas	Systems in place to disseminate timely risk information	LDCF	4,410,000	9,700,000
CCA-2 (select)	2.2. Strengthened adaptive capacity to reduce risks to climate-induced economic losses	Adaptive capacity of national and regional centers and networks strengthened to rapidly respond to extreme weather events	LDCF	1,924,000	2,758,000
(select) (select)			(select)		
(select) (select)			(select)		
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(select) (select)			(select)		
(select) (select)			(select)		
(select) (select)			(select)		
(select) (select)	Others		(select)		
Sub-Total				10,944,000	19,698,000
Project Management Cost ⁴			LDCF	547,200	1,100,000
Total Project Cost				11,491,200	20,798,000

B. PROJECT FRAMEWORK

Project Objective: To increase national, local and community capacity to prepare for and respond to climate-induced multi-hazards to reduce potential losses of human lives, national economic infrastructure, livelihoods and livelihood assets

Project Component	Grant Type	Expected Outcomes	Expected Outputs	Trust Fund	Indicative Grant Amount (\$)	Indicative Cofinancing (\$)
Risk reduction from	Inv	Risks from climate-	Protection of Pasakha	LDCF	4,610,000	7,240,000

¹ It is very important to consult the PIF preparation guidelines when completing this template.

² Project ID number will be assigned by GEFSEC.

³ Refer to the reference attached on the [Focal Area Results Framework](#) when filling up the table in item A.

⁴ GEF will finance management cost that is solely linked to GEF financing of the project. PMC should be charged proportionately to focal areas based on focal area project grant amount.

climate-induced floods and landslides		induced floods and landslides reduced in the economic and industrial hub of Bhutan	<p>Industrial area from flooding events through river bank protection, river training and development of flood buffer zones</p> <p>Slope stabilization to reduce climate-induced landslides in the Phuntsholing township</p> <p>Integrated risk hazard assessment and mapping completed in 4 critical landslide and flashflood prone areas with data collection standards compatible with the national database</p>			
Enhanced adaptive capacity at community level	Inv	Community resilience to climate-induced risks (droughts, floods, landslides, windstorms, forest fires) strengthened in at least four Dzongkhags	<p>Climate-resilient water harvesting, storage and distribution systems designed, built and rehabilitated in at least four Dzongkhags, based on observed and projected changes in rainfall patterns and intensity</p> <p>Community-level water resource inventory completed and maintained by Dzongkhag administration to increase the adaptive capacity of communities in the face of increasing water scarcity</p> <p>Disaster Management Institutions at various levels established and trained in four Dzongkhags to prepare for, and respond to, more frequent and intense floods, storm and wildfire events</p>	LDCF	1,924,000	2,758,000

Enhanced national capacity for managing climate risks	Inv	Relevant information about climate-related risks and threats shared across community-based organizations and planners in climate-sensitive policy sectors on a timely and reliable basis	Enhanced quality, availability and transfer of real-time climate data in all Dzongkhags which experience increasing frequency and/or intensity of extreme hydro-meteorological events Increased effectiveness of National Weather and Flood Forecasting and Warning Center through improved capacity to analyze, manage and disseminate climate information in a timely manner	LDCF	4,410,000	9,700,000
	(select)			(select)		
	(select)			(select)		
	(select)			(select)		
	(select)			(select)		
	(select)			(select)		
	(select)			(select)		
	(select)			(select)		
Sub-Total					10,944,000	19,698,000
				Project Management Cost ⁵	LDCF	547,200
				Total Project Costs		11,491,200
						20,798,000

C. INDICATIVE CO-FINANCING FOR THE PROJECT BY SOURCE AND BY NAME IF AVAILABLE, (\$)

Sources of Cofinancing	Name of Cofinancier	Type of Cofinancing	Amount (\$)
National Government	Coordinated by GNHC through: -Phuentsholing City Corporation -Local government budget -Public expenditure on forest fire management -Department of Hydro-Meteorological Services -Rural Economy Advancement Programme	Grant	10,740,000
National Government	National Environment Commission	In-kind	170,000
GEF Agency	UNDP through: -Capacity Building Programme for Early Recovery and Disaster Risk Management in Bhutan -Joint Support Programme	Grant	1,538,000
Others	GFDRR/World Bank: Bhutan Disaster Risk and Recovery Programme	Grant	1,000,000
Bilateral Aid Agency (ies)	Japanese Government through JICA	Grant	2,550,000
Bilateral Aid Agency (ies)	Norwegian Agency for Development Cooperation	Grant	4,000,000
Private Sector (select)	Association of Bhutanese Industry	Grant (select)	800,000

⁵ Same as footnote #3.

(select)		(select)	
(select)		(select)	
Total Cofinancing			20,798,000

D. GEF/LDCF/SCCF/NPIF RESOURCES REQUESTED BY AGENCY, FOCAL AREA AND COUNTRY¹

GEF Agency	Type of Trust Fund	Focal Area	Country Name/Global	Grant Amount (a)	Agency Fee (b)²	Total c=a+b
UNDP	LDCF	Climate Change	Bhutan	11,491,200	1,149,120	12,640,320
(select)	(select)	(select)				0
(select)	(select)	(select)				0
(select)	(select)	(select)				0
(select)	(select)(select)	(select)				0
(select)	(select)(select)	(select)				0
(select)	(select)(select)	(select)				0
(select)	(select)(select)	(select)				0
(select)	(select)(select)	(select)				0
(select)	(select)(select)	(select)				0
(select)	(select)(select)	(select)				0
Total Grant Resources				11,491,200	1,149,120	12,640,320

¹ In case of a single focal area, single country, single GEF Agency project, and single trust fund project, no need to provide information for this table

² Please indicate fees related to this project.

PART II: PROJECT JUSTIFICATION

A. DESCRIPTION OF THE CONSISTENCY OF THE PROJECT WITH:

A.1.1 the [GEF focal area/LDCF/SCCF](#) strategies /[NPIF](#) Initiative:

This project is fully in line with LDCF/SCCF focal area objective 1 to “reduce vulnerability to the adverse impacts of climate change, including variability, at local, national, regional and global level” and objective 2 to “increase adaptive capacity to respond to the impacts of climate change, including variability, at local, national, regional and global level.”

A.1.2. For projects funded from LDCF/SCCF: the LDCF/SCCF eligibility criteria and priorities:

This PIF was formulated in compliance with LDCF guidelines and aligned with the updated Results-Based Management Framework for the LDCF and SCCF (GEF/LDCF.SCCF.9/Inf.4 from October 20, 2010). Consistent with the Conference of Parties (COP-9), the proposed project will implement priority interventions addressed in Bhutan’s National Adaptation Programme of Actions corresponding to the following objectives, in part or full, as outlined in NAPA profile:

1. ‘Disaster management strategy’;
3. ‘Weather forecasting system to serve farmers and agriculture’;
4. ‘Landslide management and flood prevention’;
5. ‘Flood protection of downstream industrial and agricultural area’
6. ‘Rainwater harvesting’; and
8. ‘Promote community-based forest fire management and prevention’.

Thus, this satisfies the criteria outlined in UNFCCC Decision 7/CP.7 and GEF/C.28/18. The nature of the priorities and potential for synergies in implementation makes a compelling case for the Royal Government of Bhutan (RGoB) to address these priorities within one comprehensive framework. The project will address urgent and immediate climate change adaptation needs and leverage co-financing resources from national government, bilateral and other multilateral sources, and the private sector. The project requests the LDCF to finance the additional costs of achieving sustainable development imposed on the LDCF-eligible countries by the impacts of climate change. Following the NAPA formulation process, it is fully country-driven, cost-effective and focuses on the most vulnerable populations including women and farmers relying on rain-fed agriculture for their livelihood. It will safeguard essential economic and livelihood infrastructure in hazard-prone communities and key industrial areas from increasing climate hazards such as floods, landslides, windstorms and forest fire through reducing vulnerability at high-risk areas and increasing adaptive capacity of community-level disaster risk management institutions. To supplement this, national and sub-national capacity for producing and utilizing climate information will be strengthened. Thus, the proposed project is aligned with the LDCF Results Framework Objective CCA-1 and CCA-2 as described in Table A above. This approach also underpins the recognition of the linkage between adaptation and poverty reduction (GEF/C.28/18, 1(b), 29) and is aligned with the scope of expected interventions as articulated in the LDCF programming paper and decision 5/CP.9.

A.2. national strategies and plans or reports and assessments under relevant conventions, if applicable, i.e. NAPAS, NAPs, NBSAPs, national communications, TNAs, NIPs, PRSPs, NPFE, etc.:

The overarching objective of the project is to increase national, local and community capacity to prepare for and respond to climate-induced multi-hazards to reduce potential losses of human lives, national economic infrastructure, livelihoods and livelihood assets. This objective is fully aligned with the development priorities of the RGoB as set out in Bhutan’s tenth 5-year plan, which is in turn underpinned and guided by the long-term development vision of Gross National Happiness (GNH) and ‘Bhutan 2020: A Vision for Peace, Prosperity and Happiness’. Under the four pillars of GNH (i.e. sustainable and equitable socio-economic development; environmental conservation; preservation and promotion of culture; and good governance), the 5-year plan places a strong emphasis, among others, on balanced rural-urban development for poverty alleviation, expansion/maintenance of key economic infrastructure including road infrastructure that connects rural and urban centers, and strengthening of the agricultural sector which continues to employ the majority of Bhutanese and be the backbone of the rural economy.

The National Environment Strategy – *the Middle Path* (1998) provides a guiding framework for sustainable environmental management within the overall context of Bhutan’s development. It identifies

an increase in self-sufficiency in food production as one of the three main avenues of sustainable development that Bhutan is pursuing, and acknowledges unfavorable geographical conditions for largely rain-fed agriculture and hence the need to utilize and strengthen small-scale rural infrastructure such as irrigation. It is also cognizant of the limited availability of water for agriculture and hydro-power, which are the two other avenues of sustainable development that Bhutan has chosen to pursue. The National Environment Commission (NEC) is currently in the process of revising the Strategy with the intention to fully integrate the dual elements of climate resilience and carbon neutrality into the 10-year strategy for the nation – in line with its commitment to stay carbon neutral made at the Copenhagen COP.

Bhutan completed its Initial National Communication to the UNFCCC in 2000 and the Second National Communication in 2011 as well as National Adaptation Programme of Action (NAPA) in 2006. After five years after the NAPA preparation, the RGoB led by NEC is now in the final stage of preparing a NAPA stock-take document to assess progress and remaining gaps in the original NAPA. All of these documents demonstrate Bhutan's vulnerability to climate change induced hazards especially glacial lake outburst floods (GLOF), landslides, flash floods and droughts, and their impacts on agriculture and key economic infrastructure such as national highways and industrial estates, and emphasize that climate change and disaster management are inseparable issues for the country.

The formulation of the National Disaster Risk Management Framework (NDRMF 2006), assisted by UNDP, was done out of the conviction that disaster management by its nature has to compete with other national priorities and development needs because of Bhutan's high, and increasing, vulnerability to climate change induced natural disasters. The NDRMF lists the following as the primary threats for the country's achievement of sustainable development: landslides; forest fires; epidemic, pests and diseases; earthquakes; GLOFs; flash floods; natural dam formation and dam bursts; and windstorms, hailstorms and droughts. The formulation of NDRMF has led to the drafting of the Disaster Management Bill (pending approval), which collectively not only give prominence to the nexus between climate change and natural disasters, but also enable the government to address them in a more coherent and holistic manner. The Disaster Management Act, once adopted and enacted, would provide the legal mandate to Dzongkhags (i.e. districts) to establish Dzongkhag Disaster Management Committees (DDMC) to enhance more systematic, and yet locally appropriate, disaster management capacity. It is anticipated that the Act will dramatically change the way the risks of natural disasters (both climate-related and non-related) are addressed in Bhutan. Although it is not legally mandated, it is expected that many Gewogs (blocks) and Chiwogs (villages) will also establish a lower-level DMCs in the future.

Lastly, Bhutan recently hosted the first *Climate Summit for a Living Himalayas*, inviting Bangladesh, India and Nepal, and agreed on a cooperative regional framework to promote adaptation to climate change. Among others, the framework highlights importance in regional cooperation in disaster risk management, water resources management and early warning system to minimize the risk of natural disasters.

B. PROJECT OVERVIEW:

B.1. Describe the baseline project and the problem that it seeks to address:

Situated on the southern slope of the Eastern Himalayas, Bhutan's landscape is mountainous and rugged with elevations ranging from 100m in the southern foothills to 7500m towards north. Due to its topography, habitable and arable areas are limited to approximately 8.3% and 2.9%, respectively, of the landmass. Agriculture, which employs 69% of the population and accounts for 78% of monetary income in rural households⁶, and industrial activities are largely practiced in this highly confined space that its topography permits. While Bhutan is in general endowed with abundant water resources from the four major rivers and their tributaries, most of the large rivers are at the bottom of valleys and gorges rendering these rich water resources largely inaccessible for agriculture or domestic use. As a result, irrigation is limited to areas near small perennial streams that exist above main rivers and majority of farmers rely primarily on monsoonal rains which account for 60-90% of annual precipitation⁷. The average precipitation in general decreases as the elevation increases: the southern belt with an altitude range of 100-2000m receives about 1500mm of annual rainfall; the central valleys between 2000-4000m in altitude receive about 1000 mm, and; the northern region above 4000 m receives about 40 mm of precipitations

⁶ Bhutan National Human Development Report 2011.

⁷ Macchi, M. et al. (2012). *Climate variability and change in the Himalayas – Community perceptions and responses*. International Centre for Integrated Mountain Development.

in the form of snow.

Bhutan is one of the most disaster prone countries in the Asia-Pacific region, irrespective of the presence of climate change. The country is exposed to multiple hazards, most prominently flash floods, landslides, windstorms, earthquakes, forest fires, and glacial lake outburst floods (GLOFs). In terms of relative exposure to flood risks (as % of population), Bhutan ranks fourth highest in the region at 1.7% of the total population exposed to such risks⁸. Although the direct human risks of landslides, windstorms, and forest fires are not particularly higher compared to other countries, the socioeconomic repercussions from these events are thought to be high due to the baseline poverty prevalence.

Climate change is likely to magnify the intensity and frequency of these hazards. In fact, according to the International Disaster Database⁹, among the top 10 natural disasters in Bhutan between 1900 to 2012, in terms of the number of casualties and number affected, all of them occurred in the last two decades (except epidemic outbreaks), which makes certain degree of attribution of climate change to the increasing magnitude of such hazards plausible. The most pronounced consequences of climate change in Bhutan are two folds: disruptions in the monsoonal system and increasing/intensifying trends of extreme hydro-meteorological hazards, both of which are obviously closely linked. These disturbances will amplify the socioeconomic challenges for the Bhutanese society, especially in rural areas where the majority of the population is engaged in rain-fed agriculture and rampant poverty makes them least equipped to adapt to creeping changes in climate. Monsoon rains generally arrive during the summer months (from late June to late September). Downscaled simulations undertaken in Bhutan's SNC indicate that the mean annual rainfall will increase by 26-30% by 2069 compared to the baseline year of 1980. This increase occurs primarily during the summer monsoon season while the dry winter season rainfall is projected to decline slightly. In addition, accelerated melting of glaciers, which act as a gigantic natural water retention and dispensing mechanism to communities downstream, is disrupting the hydrological regime of the perennial river systems in the region¹⁰. All in all, climate change will increase the uncertainty of water availability throughout the year, and rural farmers are likely to have to better manage high fluctuation of rainfalls – increasing volume of monsoonal rain so that they can sustain longer dry periods. This poses significant risks to development when built rural infrastructure to alleviate water shortages, such as communal rainwater harvesting, is minimally available.

Bhutan's NAPA, SNC and HDR on climate change point to a number of recent, climate-related disaster events that have disrupted national and local economies and livelihoods. Changes in monsoon rain patterns, especially intensified rainfall in short intervals, coupled with geologically young and unstable Himalayan terrain, triggered a number of flash floods and landslides in the past decades. Southern and eastern parts of Bhutan, characterized by deeply eroded, steep and closely spaced gullies, are particularly vulnerable to these disasters. A combination of flashflood and landslide events in 2003, 2004, 2009, and 2010, claimed a number of human lives, houses, livelihood assets and infrastructure, and scarce farmlands. In particular, the excessive rain brought by Cyclone Aila in May 2009 caused the worst floods across the country in 40 years. During this time, the water flow of the Punatsang Chhu River, one of the four major rivers in Bhutan, reached record levels higher than that recorded during the 1994 GLOF event. It is estimated that the economic damages caused by Cyclone Alia and subsequent floods were US\$17million. In addition to damages to rural livelihood assets, floods and landslides often sever key road networks of the country. With limited or no alternative detour options in the mountainous terrain, there are immense economic impacts on the Bhutanese society when these road networks are disrupted by floods or landslides. The critical importance of expanding the national road network and safeguarding it from disruption is considered one of the highest priorities in the 10th five-year plan as it provides essential market linkages between the rural and urban sectors. Landslide management is important not only to reduce human and material losses, but also to sustain the national economy and maintain connectivity between the different districts of Bhutan. Landslides often create landslide dams. Steep, narrow and rugged mountains of Bhutan require only small volume of materials to block a gully resulting in natural dams. In a 2003 landslide event along the Tsetichhu river, resulted in the formation of a natural dam 140m in depth. If this dam, which is located upstream of the Kurichu Hydro Power Plant, breaches, it will inflict significant damages to the power plant, which is one of the most important revenue earner for the country¹¹.

⁸ Top three countries with high risk exposure are: Cambodia (12.2%), Bangladesh (12.1%), and Viet Nam (3.9%). Data from *the Asia Pacific Disaster Report 2010*. UNESCAP/UNISDR

⁹ <http://www.emdat.be/>

¹⁰ IPCC Fourth Assessment Report, 2007

¹¹ Kuenzang, K., Dorji, Y., & Wangda, D. (n.d.) Landslides in Bhutan. Department of Geology and Mines.

Erratic monsoonal activities are also increasingly causing extreme windstorms during the spring and multiplying the risk of forest fires during the drier winter seasons. A series of windstorms were recorded in 2008, 2010, 2011 and 2012 causing severe damages to infrastructure and agricultural production. Between 1999/2000 to 2007/2008, 526 incidents of forest fire have been recorded affecting over 70,000 hectare of forest areas¹² (approximately 1.8% of the country) and often spreading the devastating damages to residential/farm areas. Projected reductions in winter rains in many districts under a changing climate, especially in the next two to three decades, are likely to compound the risk of forest fires. Slow onsets of disasters such as droughts and local extreme rainfall are less likely to make news headlines and therefore less well recorded, but the impacts are often equally detrimental to marginal farmers who have limited means to mitigate the impacts.

Table below lists recent climate-related natural hazards.

Year	Climate hazard events	Reported damages	Affected areas
2002	Forest fire	25 houses burnt down leaving 26 families homeless	Haa Dzongkhag
2004	Flashfloods	9 lives; damages to 162 houses, 664 acres of farmland and 39 irrigation channels; loss of 350 million tonnes of maize, 126 million tonnes of paddy and 2000 citrus trees. Transportation remained disrupted for days in the affected Dzongkhags. (SNC)	Six eastern Dzongkhags
2005	Forest Fire	5 houses burnt	Trashiyangtse Dzongkhag
2005	Forest Fire	7 shops burnt	Bumthang Dzongkhag
2005-2006	Drought	Damages unknown	
2006	Forest Fire	2 lives; 5 houses burned and thousands of acres of forests burnt	Trashigang Dzongkhag
2008	Windstorm	Damages to 249 households, eight school buildings, religious structures and one government office	Trashigang Dzongkhag
2008	Windstorm	More than 80 acres of maize crops affecting 96 households	Mongar Dzongkhag
2009	Windstorm	114 households affected	Trashigang Dzongkhag
2009	Cyclone Aila	12 lives; damages to farmland, infrastructure, etc. amounting to US\$17million	Across the country
2010	Flashfloods and landslides	Damages to 2000 acres of farmland and irrigation channels affecting nearly 4800 households; 40 acres of pastureland and a thousand livestock	20 (all) Dzongkhags
2010	Windstorm	Damaged more than 5000 acres of farmland affecting 432 households	Across the country
2011	Windstorms	Damages to 2424 houses, 81 religious structures, 57 schools, 21 health centers, and 13 government buildings	16 Dzongkhags
2011	Flashfloods and landslides	Loss of properties for 200 households	Industrial estates and residential areas in Phuentsholing and Pasakha
2012	Windstorm	As on 1 April 2012, damages to 143 houses, 1 religious structure and 1 school	4 Dzongkhags

Bhutan's latest Human Development Report 2011 explicitly acknowledges the potential impacts of climate change on the development dividends it has achieved over years and big strides towards meeting the MDG. For example, Bhutan has made remarkable progress in reducing incidents of poverty – from 36.3% in 2000 to 23.2% in 2007 – and reducing the proportion of population without access to improved water sources – from 55% in 1990 to 19% in 2007. Notwithstanding these developments, one in four Bhutanese continues to remain in income poverty and one in three farmers food-insufficient. Poverty is largely a rural phenomenon with 97.4% of income-poor living in rural areas and over 70% in the agriculture sector. With increasing incidents of climate-induced hydro-met

¹² Bhutan Second National Communications, 2011.

extreme events that destroy farmlands and rural infrastructure, and droughts and excessive rains that reduce the productivity of agriculture, it is likely that the hard-won development gains can be reversed easily. In fact, whereas the 5-year plan computes that an annual growth of 4% in the agriculture sector is needed to reduce rural poverty rate to 15%, the productivity of agriculture in Bhutan has been *declining* in recent years. The average cereal crop yield peaked in 2004 at 1256.3kg per acre and declined by about 20-30% over the subsequent years¹³. The Bhutan HDR assumes that the decline is due to loss of arable land from flashfloods, damage to crops, changes in temperature and rainfall patterns, and water scarcity.

Underlying Causes

A number of underlying causes that prevent Bhutan from acquiring climate resilience can be found in its status as an LDC, geographical challenges, and historical, institutional and human factors. Most importantly, rampant poverty that is still prevalent in rural areas is one of the leading underlying factors of climate change vulnerability. In the face of the logistical challenges in Bhutan, public services and livelihood support are hard to reach remote areas of the mountainous society. A great degree of dependence of livelihood on natural resources with little built rural infrastructure makes the society vulnerable to ongoing climate variability, let alone to future climate change.

As it will be described later, garnering the capacity within the government to disseminate timely risk information to vulnerable residents, and thus better preparing them for future climate variability and extreme events, is also severely hampered by the geographical conditions of the country. Layers of mountains with steep gorges, valleys and gullies make the local climate of Bhutan highly variable, requiring a large number of monitoring points of local weather. Regionally available climate information, whose resolution would be sufficiently detailed for many other countries, is often of little use in Bhutan in gauging and disseminating imminent risks to people in hazard zones. Moreover, the topography of the country makes flashfloods highly dangerous because of the speed at which masses of water travel. Unavailability of the infrastructural system (along with human resource capacity constraints) for capturing and disseminating climate risk information has cascading effects on various sectors. Without such information, for example, smallholding farmers would continue to dependent on “good weather” for their harvest and livelihood; the hydro-energy sector is not able to formulate effective flood risk mitigation strategies; municipalities are unable to formulate evidence based risk zoning/land use plans, etc. This is compounded by the general paucity of information about high risk areas, preventing the RGoB from undertaking effective countermeasures. With projected intensifying monsoon rains, prolonged droughts, and stronger cyclones, climate change will likely to surface latent vulnerability to natural disasters.

Risk mitigation measures that have been offered to date, have been provided in a piecemeal manner based on historical occurrence of particular hazards without considerations of priority areas based on scientific risk assessments and of most relevant (i.e. cost-effective) measures for the particular risk area. This can be observed in the past landslide management where “prevention” has been placed disproportionate emphasis irrespective of the risk level of the slope, whereas in some highly critical areas, other measures, such as “protection” may present more realistic, effective, and eventually economical solution. Similarly in flood management, the ongoing investments that are being made by the government, municipalities or private entities are only for maintaining the current risk levels marginally low (such as annual dredging of river to reduce water level) without considering a series of options to increase the overall resilience of the prone areas, such as the combination of dredging, river bank protection, and proper zoning.

Bhutan is still in its transitional phase from pursuing a development paradigm that is centrally-driven to the one with greater emphasis on local governance. Accordingly, the process of equipping two tiers of local administrations (Dzongkhag-Gewog) is still in a nascent stage. Historically, “disaster response” has been the synonym for “disaster management” where central government provides reliefs and early recovery assistance to affected communities. This is gradually changing, and expected to achieve momentum with the adoption and enactment of the Disaster Management Bill. However, the progress towards a climate resilient society, with strong capacity both at national and local level, is being made only sporadically, at a pilot testing scale. These efforts need to be assessed for effectiveness, synthesized for efficiency, and upscaled for impact, in years to come.

Long-term Solution and Barriers to Achieving It

The national conviction to enhance the resilience to natural disasters is manifested strongly in the NDRMF and Disaster Management Bill, which are in turn underpinned by the 10th five-year plan and ‘Bhutan 2020’. Such legislative support is one of the critical elements in achieving both short- and long-term resilience. However,

¹³ Bhutan National Human Development Report 2011.

legislative support constitutes only a portion of what is needed for building a society that is capable of addressing emerging challenges imposed by climate change. To be fully prepared to localized climate anomalies and resultant hydro-meteorological hazards, first, a national level capacity to capture climate information needs to be developed. For the reason described above, in the context of Bhutan, this can only be achieved by establishing a nation-wide network of data infrastructure to accommodate locally variant climates. This enhanced infrastructural capacity needs to be accompanied by sufficient human resource capacity to translate climate information into climate hazard information based on underlying baseline risks (such as landslide risk assessments, potential peak discharge information of flood prone rivers). At the community level, various volunteer groups such as search and rescue team, forest volunteers, etc. coordinated by DDMC or Gewog DMC need to be sufficiently trained to operate within the framework of the Dzongkhag Disaster Management Plan. This includes a robust communication protocol within the community and with the central disaster agency (which in turn relies on the nation-wide climate information network to communicate specific climate risks described above), and clear lines of responsibilities which are continuously tested and validated through periodic trainings and mock drills. What underlies community resilience is awareness about sources of risks and vulnerabilities.

In turn, these long-term resilience building needs to be supplemented by the central response to address some of the urgent risks that could potentially undermine the socioeconomic lives of communities. Lowering water levels of some of the critical glacial lake, addressed as part of the first LDCF project, is an example. Implementing slope stabilization measures in Phuentsholing and flood protection measures in the Pasakha Industrial Area to mitigate the potential risks of landslides and floods are another (one of the focus of this project).

There are institutional, individual, financial, technological and informational barriers that prevent the desired situation from emerging. As describe earlier, the concept of disaster risk management at the community level is only gradually taking root through recent donor assistance programmes such as the first LDCF project, reinforced by the trend of decentralization in general and the formulation of the Disaster Management Bill in specific. Various capacity building initiatives for various aspects of DRM that have been undertaken so far, such as trainings on forest fire management or wind resistant masonry, have largely been at the national level, and these new technical know-hows need to be expanded into lower tiers of the society. Similarly, the concept of Community-Based Disaster Risk Management that has been successfully piloted in three Dzongkhags through the GLOF project needs to be continuously expanded to obtain a greater coverage. At the national level, not only do the basic infrastructural and human resource capacity to manage climate information need to be strengthened, the capacity to apply such information for specific needs of climate-sensitive sectors will be crucial. For example, weather-related information captured by the network of real-time Automated Weather Stations would be stored and managed within the Department of Hydro-Meteorological Service (DHMS), which also houses the National Weather Forecasting and Flood Warning Center (NWWFWC). This information needs to be shared across departments/ministries effectively to best utilize the greater infrastructural climate information network for climate resilience. For example, the Department of Geology and Mines, which is mandated to undertake assessment on and monitor landslide risks, would be able to improve the accuracy of their assessments by integrating climate information, but an avenue for information sharing is currently unavailable. Ministry of Agriculture and Forest can also utilize seasonal forecasting on rainfall and humidity to better assist farmers in coping with late/early arrivals of monsoons and assist communities in preparing for heightened risk of forest fire.

Project Target Sites

Component 1

Phuentsholing – The city of Phuentsholing, located on the border of India, is the second largest urban center in Bhutan, and one of the four “Class A” *Thromdes* (municipalities) that have greater autonomy in governance and budget. Being the nation’s commercial hub, the city is growing rapidly and its population is expected to increase from 20,537 in 2005 to 31,996 by 2025¹⁴. As it is visible from the map of the city (ANNEX II), it is confined in a small area (19.68km²) surrounded by the Amo Chhu river to the west, Indian boarder to the south, and steep hills on the north-eastern side of the city while a tributary of Amo Chhu traverses the middle of the city. The city sits on alluvial deposit covered by gravels and sand with big blocks of rocks occurring as terraces¹⁵. The landslide-prone areas are concentrated on the northern and eastern side of the city along with the Phuentsholing-Thimphu Highway. Due to the relatively young geological formation of the terrain, it is inherently fragile. This fragility causes development of tension cracks on the hill slope. During extreme rainfall events, excessive water seeps

¹⁴ Cited in ADB proposal for Urban Infrastructure Project (accessed from <http://www2.adb.org/documents/rtps/bhu/44240/44240-013-bhu-rrp.pdf>)

¹⁵ Phuentsholing Urban Development Plan 2002-2017.

through these cracks causing landslides. From the layout of the city, escape routes are limited and this makes the entire city extremely vulnerable to landslides and flashfloods from Amo Chhu and its tributary of Om Chhu (or combination of both). The Phuentsholing-Thimphu Highway which connects India, Phuentsholing, the Pasakha Industrial Area (17km east) and the capital, Thimphu, runs through identified landslide-prone areas. It has been severed by landslides a number of times in the past during which distribution of goods and services to Thimphu and the rest of the country from India, the single most important trade partner for Bhutan, have been disrupted for weeks. As it is explicitly stated in the Phuentsholing Urban Development Plan 2002-2017, the city's rapid growth in the last decades was guided primarily by the presence of roads, especially the highway. It is for the combination of the high vulnerability of the city as well as the strategic importance of the national highway that the city has been recognized as one of the highest priority intervention locations for landslide and flood risk management in a number of national documents such as NAPA, NDRMF, and the National Communications.

Pasakha Industrial Area (PIA) – Located 17km east of Phuentsholing along the Phuentsholing-Thimphu Highway in Chhukha Dzongkhag, is PIA which is Bhutan's first and largest industrial estate. The area houses heavy industry such as steel and cement, and has received nearly Nu 2.6 billion (USD 50million) investments since 1986. Pasakha Industrial Area is now Bhutan's economic driver as the Dzongkhag registers the second highest number of industrial firms (after Thimphu) and the highest number of large manufacturing industries (nearly half of large industries in the country). PIA has been hit frequently by monsoonal floods in the past. In the 1996 and 2000 floods, residential areas, factory buildings, production infrastructure such as telecommunication and power lines, and tonnes of raw materials were washed away.

Component 2

This component will focus on at least four of Bhutan's 20 Dzongkhags. Out of the four, Mongar has been identified in the NAPA, as well as through individual consultations, as the highest priority based on their vulnerability to ongoing water scarcity. The remaining three Dzongkhags will be identified in the course of the PPG phase while taking into account the following information:

- The progress made by the Department of Disaster Management on training of trainers at the Dzongkhag level on methodologies and tools in identifying and assessing localized disaster risks (trainings have been completed in 13 out of 20 Dzongkhags to date)
- Future projections of climate change especially the risk of drought and excessive rain
- Poverty incidence in the Dzongkhag
- Proposed target sites for the Joint Support Programme (Phase II of PEI).
- Operation of the GNH's REAP.

Component 3

The exact number of target Dzongkhags will be presented at the CEO Endorsement stage.

Description of Baseline Projects addressing the Climate-related Problem:

The RGoB recognizes that building national capacity to prepare for and respond to increasing/intensifying natural hazards is the highest climate change adaptation priority, which is also exemplified in the number of NAPA priorities that are related to disaster risk management as well as recent progress in the DRM legislative landscape. Notwithstanding the Government's continuous efforts, these national initiatives are often small and less well-coordinated. The proposed LDCF project envisages bringing about synergies and complementarities across the following development baseline initiatives while ensuring climate resilience is integrated in the operation of these initiatives.

- **Government of Bhutan public expenditure (Coordinated by Gross National Happiness Commission)**

Total co-financing: USD 2,740,000

Gross National Happiness Commission (the former Planning Commission) is the ultimate custodian of all activities that are guided by the government's five-year plan. Thus, these ongoing public activities/expenditures that constitute development baseline for this project will be coordinated by GNHC:

- City Corporation expenditure on landslide mitigation by Phuentsholing City Corporation (PCC), Ministry of Works and Human Settlements – USD 1,600,000

District budget expenditure on flood and landslide mitigation in the Pasakha Industrial Area (PIA) – USD 840,000¹⁶

Historically, containing the risks of landslides and floods has been one of the highest priorities in both Phuentsholing and the PIA. Usually the largest proportion of the respective budgets of PCC and Dzongkhag has been spent for this purpose. In 2010-2011 in the current five-year cycle, the largest proportion (Nu 20m = USD0.4m) of PCC's budget is spent on landslide mitigation. The most common landslide risk mitigation measure in and around Phuentsholing is surface and subsurface drainage as it provides a less costly, but somewhat temporary, measure. In the PIA, in the current fiscal year, about \$210,000 is earmarked for river protection and dredging, which represents nearly 8% of the entire district budget. Two largest firms in the area are, on average, spending almost an equal amount of private investment each year for flood protection (see below).

Despite their efforts, however, the degree of ongoing mitigation by the PCC, Dzongkhag and private entities is likely to be insufficient under a changing climate where extreme monsoon rains are projected especially in the southern parts of the country. Extreme rainfall events are likely to increase the risk of both landslides and flashfloods in risk areas. Budget constraints also act as a significant impediment to undertake thorough assessments of strength parameter of geological materials and special distribution of landslides, and undertake subsequent mitigation measures which range from avoidance, prevention, stabilization and protection, based on the extent of vulnerability and potential hazards¹⁷. The LDCF grant, therefore, will build on the ongoing efforts carried out by both Dzongkhag administration and PCC and provide the necessary resources needed to undertake thorough assessments of strength parameters of slopes for landslide protection in Phuentsholing, and potential peak discharge and river hydraulic and morphologic analysis for flood protection in Pasakha, and implement appropriate risk mitigation measures to ultimately provide longer-term, more secure protection against climate-induced floods and landslides (for more details on potential implementation measures, see Section B.2.).

- Departmental budget for Hydro-Meteorological Services (DHMS), Department of Energy, Ministry of Economic Affairs and baseline capital value of the NWFFWC – USD 7,150,000¹⁸.

DHMS is responsible for planning, designing and maintaining hydro-meteorological network for data collection and database management for hydropower planning, flood and weather forecasting, and energy generation scheduling. Provision of reliable, accurate and timely information on the condition of weather and water resources is crucial not only for mitigating potential risks of floods and landslides, but also for helping farmers to cope with a changing climate. Recently the DHMS was upgraded from a division within the DoE to an independent department and mandated as the technical agency responsible for providing early warning information related to hydro-meteorological hazards including GLOF early warning with the recognition that under a changing climate the Department's services need to go well beyond that of a "weather forecasting agency" and transform itself into a technical information clearinghouse with robust capacity to collect, analyze, and disseminate various parameters of elusive climate. Under the new mandate, with the annual Departmental budget of USD 1.75 million, they are also required to turn the raw weather information into relevant information for various users including Dzongkhag/Gewog planners, hydropower plant operators, disaster management institutions, farmers, etc. However, despite RGoB's aspiration to strengthen the capacity of DHMS, the transformation has been slow due to financial, human resource capacity constraints and technical/mechanical constraints to support the transition.

Through a technical assistance project, the Government of Denmark recently provided both investment and TA support to assist the government in modernizing the operation of the weather/warning station network and enhancing the analytical and information management capacity for dissemination of more

¹⁶ Even though the city of Phuentsholing and the Pasakha Industrial Area are located within 17km from each other, the baseline development in these two locations are financed by two different sources due to the special administrative status that the municipality of Phuentsholing is granted. In other words, while the PCC has fiscal autonomy, the budget for the Pasakha Industrial Area is set within the framework of the Dzongkhag's budget.

¹⁷ Chatwin, S.C., et al. (1994). A guide for management of landslide-prone terrain in the Pacific Northwest. Ministry of Forests, Province of British Columbia

¹⁸ The departmental budget for the period of the project timeframe plus the investments made so far on establishing the NWFFWC is taken into account as the baseline development and co-financing.

reliable warning information. Through its \$110,000 assistance programme, DHMS installed for the first time in the country three real-time Automated Weather Stations (AWSs) and two real-time Automated Water Level Stations (AWLSs)¹⁹. Secondly, the project assisted in establishing a National Weather Forecasting and Flood Warning Center (NWFFWC), with necessary hard and software to maintain and manage all underlying data on weather and floods and issue early warning based on hydro-meteorological/hydrological modeling. While this DANIDA support was an important step in modernizing the functions of DHMS and NWFFWC to provide necessary climate and early warning information on hydro-meteorological hazards and eventually assisting various climate-sensitive sectors in coping with unexpected climate patterns, various capacity assistance programme for both the Department and the Warning Center came to a halt along with the closure of the DANIDA assistance in 2011. The proposed LDCF project will follow in a very direct manner on the modernization process of Bhutan's hydro-meteorological services at a greater scale. As it will be discussed in detail in later sections, the hydro-met data acquisition infrastructure will be strengthened at the nation-wide scale; a basin-wide Early Warning System (EWS) will be built in association with the data infrastructure; and the analytical capacity of the Warning Center will be enhanced to meet increasing demands for such services under a more variable climate.

o The Rural Economy Advancement Programme (REAP), Gross National Happiness Commission – USD 960,000

The 10th five-year plan targets to bring down the number of people living under the poverty line to less than 15 percent by 2013 from 23.2% in 2007. REAP was initiated to identify the needs of the poorest villages and Gewogs in the country to reduce poverty through targeted interventions and enable the poor to secure sustainable livelihoods by enhancing their productive capacities. It endeavours to take into consideration the special needs of the rural poor who have not benefited much from broad-based poverty reduction interventions and economic growth, and to address them specifically through targeted interventions that supplement, in a synergistic way, mainstream development efforts. The implementation of REAP is anchored at the local level, benefiting from the technical support of the various sectors, while the GNHC takes responsibility at the central level for coordination of the implementation of the interventions and programme evaluation. Based on the premise that village-level participation in development planning is essential for poverty reduction, the REAP works directly with local communities with specific focus on the six multidimensional poverty themes of: Education, health, standards of living, financial security, community vitality and food security. During REAP Phase I, 10 poorest villages were selected on a pilot basis, implementation is in various stages of completion and this Phase will end by December 2012. Under REAP Phase II, 116 villages were selected across all 20 Dzongkhags. Baseline socio-economic data have been collected and the villages are in the process of developing their Village Development Plans through the use of Village Participatory Planning Guidelines. This programme provides a key point of departure for the proposed LDCF project for more comprehensive stakeholder discussions in the context of promoting CBDRM, integrating climate risks within the overall framework of local development discussions, and achieving greater alignment between Dzongkhag Disaster Management Plan and the national community-based poverty reduction programme. Furthermore, whenever design of small scale irrigation is promoted by the REAP, the LDCF resources will provide additional costs necessary to install rainwater harvesting scheme to supplement the water availability throughout the dry seasons. During the PPG discussion, a more detailed discussion will be held among GNHC, Tarayana and DDM to seek the possibility of full alignment between the two projects.

o Public expenditure on forest fire management – USD 190,000

Given the frequent incidence of forest fires in Bhutan, and the importance of forests as the lifeline for the country, the RGoB has historically invested in building human capacity for sustainable forest management, including forest fire management. In April 2011, the Ugyen Wangchuck Institute of Conservation and Environment (UWICE) in Bumthang trained 61 forest fire fighters on 'Basic Introduction to fire and fire fighter course' through volunteer support from the University of Montana and RGoB funding. The same training was also conducted in Thimphu for the fire fighters from the western region in May 2011. The Bhutan Trust Fund for Environmental Conservation has also supported in awareness raising and advocacy programmes on forest fires. While the basic capacity to

¹⁹ Three AWS were placed in Trashigang, Bumthang and Thimphu Dzongkhag; Two AWLS were placed along Mochhu and Wangchhu rivers.

manage the risks of forest fire is being nurtured, these capacity building programmes are still concentrated at the national level and the RGoB presently faces serious shortages of trained fire fighters. Projected increase in dry spells during the dry season is likely to increase the risk of forest fire, and due to the logistical challenges in deploying professional firefighters in a timely manner, the need to enhance the community capacity to tackle local forest fires is acutely being felt. Community awareness and technical/professional capacity to manage forest fires will be fully integrated in the operations of the DDRM and implementation of CBDRM under the Output 2.3 in the proposed LDCF project.

- **Private sector investment on flood risk mitigation in the Pasakha Industrial Area**

- **Co-financing: USD 800,000**

- Apart from public expenditure in the Pasakha Industrial Area on flood mitigation, industries also invest every year on flood control. For the period since 2001, for which records are available, the two largest firms operating in the Industrial Area – Bhutan Carbide & Chemicals Limited and Bhutan Ferro Alloys Limited – collectively spent approximately \$200,000 per year on various measures to alleviate the potential damages from floods. The investments include construction of gabion walls, spur walls, retaining walls, drainage and river dredging. Around 30 other smaller firms are also known to make private investments for the same purpose. A close examination will be done during the PPG stage to gauge more accurate figures of the total private investment made, which is likely to be larger than what is currently reported.

- **Management of geo-hazards for infrastructure development in Bhutan**

- **Co-financing: USD 4,000,000 (the Norwegian Agency for Development Cooperation)**

- The Department of Geology and Mines has been receiving technical assistance from the Norwegian Geotechnical Institute in the last 10 years with financial assistance from the (the total financial support during the four phases is \$4 million). The current assistance cycle is in its 4th, and the last, phase up to 2014. Through this technical assistance project, technical staff within the DGM have been trained on scientifically rigorous methodologies for geotechnical, hazard and risk assessments. This long-term technical assistance has contributed to enhanced technical capacity within DGM to undertake robust geo-hazard assessments, most notably landslides. However, this assistance is purely TA in nature and does not involve direct investments to mitigate the risks of landslides. Landslide risk mitigation activities under the proposed LDCF project provides additional financial resources for DGM to undertake concrete investments in hard engineering solutions for landslide management based on the technical capacity that has been developed through the Norwegian support.

- **Capacity Building Programme for Disaster Risk Management in Bhutan**

- **Co-financing: USD 500,000 (to be finalized during PPG) (UNDP)**

- As a follow-up of the Regional Climate Risk Reduction Project (2009-2010), the Earthquake Risk Reduction Project (2007-2010), and the Bhutan Recovery and Reconstruction Project (2009-2011) assisted by UNDP, a new project is currently being devised in discussion with the RGoB. The key components currently under discussions are:

- DM bill implementation support and capacity building
 - Promoting multi-hazard safe construction practices including building code, construction guidelines, training of engineers and masons
 - Disaster risk reduction in urban areas for example through contingency and business continuity planning of essential sectors, disaster and climate resilient human settlement planning/policy, awareness and DM plans for municipalities (potentially including Phuentsholing/PIA)
 - Insurance (including feasibility analysis of weather-based insurance)

- Over the coming months, the design of this programme will be finalized by directly taking into account the proposed design of this LDCF project so that these two UNDP-assisted programmes obtain synergies. The project is envisaged to commence before the end of 2012. At the time of the submission of the CEO Endorsement Form, a detailed description of the baseline project as well as the stakeholder involvement plan will be presented.

- **Joint Support Programme (PEI) (Phase-II)**

- **Co-financing: USD1,038,000 (UNDP) (Part of Outcome 2 in JSP relating to the assistance in CBDRM)**

- After the successful completion of the preparatory phase and Phase-I of PEI implementation (2007-2009), the follow-up phase in partnership with UNEP/DANIDA/UNCDF commenced in 2010 (titled “*Joint Support Programme for Capacity Development in Mainstreaming Environment, Climate Change and Poverty*”)

concerns in Policies, Plans and Programmes (JSP)”). The focus of this phase of the JSP is to mainstream, at both national and local levels, environment and climate change concerns within the broad context of the planning and implementation of Bhutan’s 10th five-year plan. PEI works through the GNHC and NEC (coordinating agency for environment/climate change issues) to ensure utmost cross-ministerial coordination and alignment with the national development priorities. PEI Phase-II has a component that is of direct relevance to Component 2 of the proposed LDCF project. In particular, it is promoting the implementation of Community-Based Disaster Management Plans in up to five pilot Dzongkhags through DRM trainings and provision of capacity development district block grants to the pilot Dzongkhags. While the trainings are specifically on DRM, block grants are intended for general capacity development use. Thus, these activities in the JSP provides a useful platform on which LDCF assistance can be directly built in the form of implementation support for CBDRM activities while aligning them with the Dzongkhag/Gewog/Chiwog Disaster Management Plans and Contingency Plans. During the PPG stage, the progress made in PEI in terms of water management plan and community needs assessment in implementing CBDRM will be investigated and the detailed ways in which the LDCF resources can be used to build on this initiative will be presented in the full proposal. (Mobilization of resources for the block grant is currently explored and the exact amount of co-financing will be reported at the time of CEO Endorsement)

- **Bhutan Disaster Risk and Recovery Programme (Phase I: 2010-2012; Phase II: 2013 onward)**
Co-financing: USD 1,000,000 (GFDRR/World Bank)

World Bank and the Global Fund for Disaster Risk Reduction, through its phased assistance programme on DRM, are promoting DRR capacity within Bhutan. The project is covering multiple areas within the overall context of building DRR capacity in Bhutan including:

Phase I (2010-2013)

- Seismic hazard risk and vulnerability assessment and mapping (Implemented through GeoHazard International);
- Search and rescue (SAR national task force, equipment); and
- International conference on DRM.

Phase II (2013- onward)

- Multi-hazard risk mapping (through Department of Geology and Mines);
- Search and rescue (training facility, training at district level, equipment);
- CBDRM; and
- Capacity building for DM Bill implementation.

World Bank and UNDP are currently in discussion for the possibility of jointly implementing the respective DRM programmes as they provide various opportunities for synergies. DGM and the World Bank are also in discussion to finalize a data management architecture for multi-hazard mapping (mainly geo-hazard like landslides). Currently two options are considered: First, as part of the UNDP-supported GLOF project, ICIMOD is providing technical assistance to DGM for building a GIS-mapping capacity which also includes an establishment of geo-science database. Second, SAARC Disaster Management Centre is also developing a South Asia Digital Vulnerability Atlas. The World Bank/GFDRR’s assistance on multi-hazard risk mapping will largely depend on the outcome of the ongoing discussions with DGM and SAARC and ICIMOD. Under Component 1 of the proposed LDCF project, multi-hazard assessments and mapping in at least four locations are envisaged and the particular methodology of data collection will follow the outcome of this discussion so that the results from the assessment will be directly fed into the national database. Moreover, discussions between UNDP and World Bank/GFDRR are ongoing to ensure that the proposed LDCF project will contribute to the proposed DRM projects by the two organizations, which are likely to precede the implementation of the LDCF project.

- **Development of an Integrated GLOF Early Warning System with Operational Capacity Enhancement for Climate Change Adaptation in Mangde Chhu and Chamkhar Chhu River Basins in Kingdom of Bhutan**

Co-financing: USD 2,550,000 (to be confirmed during the PPG) (Government of Japan)

The RGoB is currently finalizing a partnership agreement with the Government of Japan to enhance the hydro-meteorological early warning capacity within two river basins that are considered high risk from potential GLOF or other hydro-met threats – the Mangde Chhu and Chamkhar Chhu River Basins. This project, expected to run for two years starting in late 2012, envisages building on the EWS component of the first NAPA implementation project and expanding its coverage to these additional river basins. While the exact scope of the project will be finalized after a technical mission in July/August 2012, a series of discussion between JICA and UNDP has already commenced to seek ways in which to achieve maximum

synergies from the collaboration and will continue during the PPG phase.

- B. 2. [incremental /Additional cost reasoning](#): describe the incremental (GEF Trust Fund/NPIF) or additional (LDCF/SCCF) activities requested for GEF/LDCF/SCCF/NPIF financing and the associated [global environmental benefits](#) (GEF Trust Fund/NPIF) or associated adaptation benefits (LDCF/SCCF) to be delivered by the project:

Consistent with priority adaptation strategies identified by the Bhutan NAPA, the proposed project will aim at:

- Reducing the human and material losses from sudden onset of climate induced disasters of flash floods and landslides in a commercial/industrial/economic hub
- Enhancing climate resilience of Bhutanese community to climate induced hydro-meteorological hazards
- Strengthening national capacity to collect and disseminate relevant information about climate-related risks and threats across community-based organizations and planners in climate-sensitive policy sectors on a timely and reliable basis

These components, implemented within a single project framework in a coordinated and complementary manner, will have a transformational impact on how the Bhutanese society will address climate-induced multi-hazards in the future. As described in this section, as well as the previous co-financing section, the project will build on and align itself with a number of public and donor-assisted initiatives to assist this transformational change.

Project target areas will be determined over the course of the project preparation phase, based on data from existing risk and vulnerability assessments, analysis from national and regional scientific sources, and information on the specific locations of baseline development initiatives. At the time of PIF submission, stakeholder discussions assisted by the NAPA document have tentatively agreed on the proposed sites as described in Section B.1 “Project Target Sites”.

Component 1: Risk reduction from climate-induced floods and landslides

Baseline:

To achieve a balanced urban-rural development, the RGoB is promoting concentrated assistance in the development of a few industrial areas and major municipalities. They are all concentrated in the southern belt to avoid rugged terrain in the middle and northern parts of the country, and due to proximity to India. The strategic importance of the city of Phuentsholing and the adjacent Pasakha Industrial Area, in particular, as a driving force for Bhutan’s economic development is stated explicitly in a number of government documents. The strategic importance of Phuentsholing is best exemplified in the fact that it was the second city, after Thimphu, which was designated as a “Class A” municipality with autonomous status with elected representatives as part of the country’s decentralization process (Bhutan Municipal Act 1999).

At the same time, southern Bhutan, where many rivers converge before they drain to the plains of India, contains a number of flood- and landslide-prone areas posing continuous challenges in protecting crucial economic/industrial/commercial infrastructure from the risk of hydro-meteorological hazards. In Phuentsholing, the vulnerability of the city to these hazards is compounded by the rapid increase in the city population. In an effort to alleviate the pressure from increasing population, the city is currently planning to expand its city limit, and under the new demarcation, residential areas are to be designed within the high-risk landslide areas (See ANNEX II). The new limit expands into the dark green section in the south eastern part of the city, surrounded by light green areas representing “landslide prone zones”). The City Corporation currently spends approximately \$400k annually for surface and subsurface drainage from unstable rock structure to prevent potential landslides. However, the efficacy of this measure, compared with other potential measures of avoidance / prevention / stabilization / protection, vis-à-vis the risk level of particular slopes, is unknown due to unavailability of scientific hazard assessments. In some of the historical landslide-prone zones, more direct *stabilization/protection* measures may be needed, which has been minimally implemented to date as these measures are more costly and due to insufficient baseline information.

The Pasakha Industrial Area was hit by two major floods in the last 2 decades, each time with

considerable material damages and losses inflicting economic setbacks for the entire country. The Barsa and Singye rivers that flow in the area have been rapidly increasing monsoon season water level in recent years. As described in the Baseline Project Section in B.1, the district administration (Dzohgkhag) and private industries spend a large sum of money each year to alleviate the potential damages from floods, which is likely to be nearly \$500,000 annually. However, the ongoing risk mitigation measures are of a temporary and piecemeal nature. For example, in Pasakha the industries and the Dzongkhag engage in dredging of river each year to remove silt transported from upstream areas during the monsoon season. The silt raises the riverbed and thus increases the risk of overflow of water during the monsoon season. Individual firms that are situated near the rivers also invest in more direct protection measures such as rock gabions. However, all of these measures do not take into considerations of likely increase in peak discharge of monsoon river flows and thus these ongoing investments face a significant risk of failure as the impact of climate change enlarges.

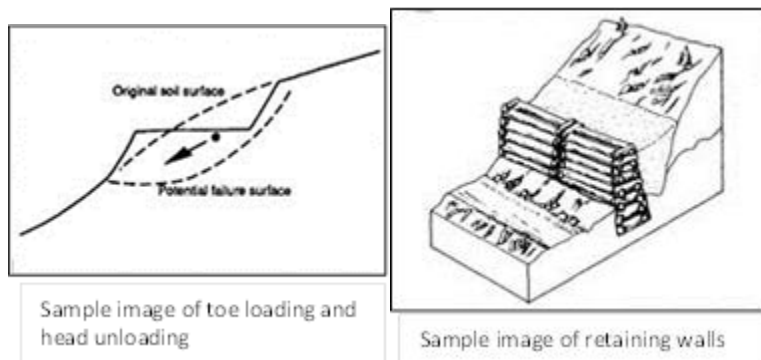
The ongoing assistance programme by the Norwegian Agency for Development Cooperation has contributed tremendously to strengthening the technical capacity of the Department of Geology and Mines to undertake robust geo-hazard assessments, most notably landslides. However, to determine the appropriate risk reduction measures in a specific landslide risk area, typically more detailed geomorphological, geological, and geophysical assessments are necessary, which are beyond the scope of the Norwegian assistance. Furthermore, given the close causal relationship between increasing precipitation and the risk of occurrence of landslide, future assessments need to fully integrate the projected increase in runoff water that act as a trigger of unstabilization/failure of slopes.

Additionality: Climate change, increasing intensity and amount of monsoon rains in particular, is increasing the risk of floods and landslides in these two areas. Flood events are directly linked with changes in the monsoon system while landslides are now more easily triggered by excessive runoff seeping into cracks of unstable rock masses on slope. The LDCF grant will be used to undertake direct engineering measures to reduce the eminent risk of landslides and flashfloods. In addition, detailed integrated risk hazard assessments and mapping will be carried out to increase the scientific knowledge body within DGM and DHMS with explicit focus on the contribution of climate change to these risks. The methodology of assessments and data collection will be carried out in a way that is compatible with the ongoing assistance programmes to enhance the information management capacity within these departments (i.e. the geo-science database assisted by ICIMOD and/or development of South Asia Digital Vulnerability Atlas by SAARC, and the past assistance by DANIDA on the data management capacity within NWFWC). This component of the project will target Phuentsholing and the Pasakha Industrial Area, two of the historically landslide- or flood-plagued sections of the country.

In Phuentsholing, corresponding to NAPA priority 3, assessments on spatial distribution of risk areas within the (proposed expanded) city limit will be carried out along with quantitative assessments of rock masses to identify the most critical sites. Capacity building programme that have been undertaken as part of the ongoing Norwegian geotechnical support programme and investments made by the Phuentsholing City Corporation in landslide prevention will provide an important baseline in this regard. Then, at the most critical sites, based on the risk levels, a set of most appropriate risk reduction measures will be implemented. Some of the potential measures include:

- Excavation (which can include removing of the entire slide mass that is in critical danger; loading of the toe/unloading of the head of the rock mass to shift the center of gravity – See image; reducing the height of the slope; backfilling with lightweight materials, etc)
- Slope drainage
- Retaining walls (See image)
- Plastic mesh reinforcement
- Construction of rock benches
- Cable and mesh
- Surface reinforcement/anchors, bolts and dowels

The selection of appropriate set of measures will be done with considerations of multiple factors such as risk levels, potential impacts, costs, and projected increase in future extreme precipitation.



In Pasakha Industrial Area, corresponding to NAPA priority 6, building on the investments made by the Dzongkhag and individual industrial firms in flood risk mitigation, the LDCF grant will be used to finance additional protective investments needed against intensifying flood events in the face of climate change. Based on river hydraulic and morphologic analyses and consideration of potential peak discharge during extreme monsoonal rain, a suit of flood and bank protection designs will be implemented, including:

- Gabion spur construction
- Excavation of new river channels with drainage culverts
- Embankment protection
- Siltation control in upstream locations

In addition to these direct, artificial risk reduction measures in high risk areas, LDCF resources will be used to undertake detailed integrated risk hazard assessments and mapping (both floods and landslide) in at least 4 most critical locations in the country, apart from Phuentsholing and Pasakha. This will include geo- and hydro-morphological risk assessments, slopes and hazard assessments, and hazard zonation and land susceptibility maps (See ANNEX III for a sample hazard zonation map produced in the first LDCF project). This work is considered critical for longer-term resilience of the country as the lack of comprehensive understanding of locations of vulnerable areas have hindered the government from using their limited resources in the most cost-effective manner. Furthermore, the proposed assessments will be fully linked with the other components of the project: First, the information collected through this activity on flood risks will be stored within the National Weather and Flood Forecasting and Warning Center (FWFFWC), which will also collect, analyze, manage and disseminate hydro-meteorological information from the national network of real-time monitoring stations (see descriptions of Component 3 below for details on the support provided with LDCF resources). This will ensure effective integration of i) pre-identified vulnerability areas; ii) real-time monitoring of climate parameters; and iii) issuance of early warning based on predetermined threshold values of certain climate parameters. On the other hand, the information on landslide risks will be store in a national database (either the geo-science database or Digital Vulnerability Atlas). As a project sub-output, sharing of information on various climate parameters from Component 3 between DHMS and DGM will be strengthened with a specific communication protocol. Second, Component 2 of the project, where community-level disaster management capacity will be strengthened, communities under these high vulnerability zones will be fully trained and equipped, within the framework of the Disaster Management Bill/Act, to prepare for and respond to anticipated hydro-meteorological hazards with support from the hazard zonation maps.

Component 2: Enhanced adaptive capacity at community level

Baseline: Apart from sudden onset of disasters, mountain communities in Bhutan have been plagued with periodic droughts and dry spells in the past. With physical challenges in accessing perennial rivers, approximately only 18% of the cultivated area is estimated to be irrigated²⁰. Also with the possibility of expanding arable areas physically impossible, the country needs to increase the unit productivity in agriculture if it is to achieve the target envisioned in its five-year plan – an annual growth of the agriculture sector by 4% to reduce rural poverty rate to 15%. The government’s aspiration to reduce rural poverty through agricultural development is also visible in GNHC’s Rural Economy Advancement Programme as well as the current annual budget where Renewable Natural Resources (RNR) Sector,

²⁰ FAO Aquastat. Accessed from http://www.fao.org/nr/water/aquastat/data/factsheets/aquastat_fact_sheet_btn_en.pdf

which includes the agriculture sector, receives 13% of the total outlay. Promotion of on-farm water management in rural areas is explicitly mentioned as an important intervention in the five-year plan. Despite government's continuous effort to increase the unit productivity of agriculture, the actual figures in recent years have shown gradual decline, and it is assumed that the combination of crop failure from erratic monsoonal rain and loss of arable land due to floods/landslides/forest fires is largely responsible for this.

During the recent mid-term review exercises for the five-year plan undertaken by the RGoB, almost every Dzongkhag highlighted the issue of water scarcity during the dry seasons and the need to tap into alternative sources such as groundwater or rainwater in recent years. The simulation undertaken in the SNC process indicate that between 2010-2039, 11 out of 20 Dzongkhags is projected to experience declining dry season rainfall. The impact of water scarcity can be observed on both domestic and agricultural water use. Mongar is an area that most acutely feels the impact of water shortages. It is the second largest town in eastern Bhutan and the population is rapidly increasing. Presently, during the dry season, the water production of the town already falls short by 88,000 liters daily²¹, which is being met simply through reduced use of water or through other informal means. While UNHABITAT is currently assisting the town in installing a rainwater storage system in community buildings with a total storage capacity of 150m³ (150,000 liters), this represents only 1% of the additional capacity the town needs to ensure continued supply of safe drinking water to all of its residents.

As described earlier, challenging lives of rural Bhutanese are punctuated by national-, regional- or local-level hydro-meteorological disaster events, which are suggested to be increasing in recent years. These events leave deep scars in the form of lost farmland and pasture, damaged livelihood assets and houses, and at times, lost lives. Abundant volumes of literature exist that external shocks are the single most important event that push people into poverty.

RGoB's ongoing efforts in addressing these two interlinked issues of slow and sudden onsets of climate-induced disasters can be observed in two areas. First as part of the 10th five-year plan, GNHC is spearheading the government's efforts to tackle rural extreme poverty through its Rural Economic Advancement Programme (also known as "Targeted Poverty Reduction Programme"). \$3.9million has been earmarked during the 2008-2013 five-year cycle, part of which includes enhancement of small-scale water infrastructure especially targeting those below the national poverty line. The pilot-level implementation of the REAP will expand to the national scale from 2012/2013. Secondly, the RGoB is bolstering the DRM capacities at both national and local levels by the legislative development in this area, followed by proposed implementations of specific actions for building disaster risk management. The National Disaster Risk Management Framework (2006), followed by the formulation of the Disaster Management Bill/Act, is expected to offer legal underpinnings in strengthening adaptive capacity of local communities to increasing disaster events, most notably climate-induced hazards. The Bill stipulates that each Dzongkhag would be required to establish a Dzongkhag Disaster Management Committee (DDMC) as the responsible entity for prevention, mitigation, preparedness, response and capacity building within the Dzongkhag for various disasters in the district. It also mandates each Dzongkhag to establish a Disaster Management Plan and a Contingency Plan based on various hazard assessments.

Given the importance of the issues, there are a number of ongoing and future initiatives in this area undertaken by the Department of Disaster Management (DDM) as well as multilateral donors. They include:

- National initiative: The DDM has already commenced trainings of trainers at the Dzongkhag level on methodologies and tools in identifying and assessing localized disaster risks. It has completed trainings in 13 out of 20 Dzongkhags. They envisage that the trainers will pass on this knowledge down to Gewog (village block) and Chiwog (village community) over time.
- National initiative: Forest department is undertaking national capacity building exercises targeting forest firefighters.
- First LDCF project on GLOF: The concept of Community-Based DRM (CBDRM) is being pilot tested in *Punakha*, *Wangdue Phodrang*, and *Bumthang*, which include the formation of the DDMC and Dzongkhag Disaster Management Awareness and Planning Team (DDMAPT). A CBDRM Guideline is currently being produced. Trainings go down to the Gewog and Chiwog

²¹ NAPA Stocktaking document (draft).

level.

- JSP: Support to CBDRM, similar to that provided in the GLOF project, is envisaged in 2012 in *Samdrup Jongkhar* and *Lhuntse*.
- UNDP DRM project (forthcoming – 2012/13-2015): Likely support on the implementation of the DM Bill without specific plans to support CBDRM.
- WB/GFDRR (2010 onward): A review of CBDRM (without specific Dzongkhag in the plan of operation), support on the implementation of the DM Bill, and support to Search and Rescue operations in the country.

Additionality: From the preceding discussions, community resilience to climate change in the context of rural Bhutan embraces two critical elements: increased capacity to cope with increasing/intensifying drought events during the dry season; and to cope with sudden onsets of climate-induced disasters. Under Component 2, LDCF resources will be used to build adaptive capacity of local communities at Dzongkhag, Gewog and Chiwog level to various localized climate-induced hazards ranging from droughts, flashfloods, landslides, forest fires, and windstorms, by building on, coordinating, synthesizing, and expanding the numerous support initiatives described above.

First, to address the urgent local needs in enhancing the water retention and storage capacity in anticipation of prolonged droughts in the future, community-based rainwater harvesting schemes will be implemented in both urban and rural settings in at least four Dzongkhags. This will include the township of Mongar where water shortages are already manifested most significantly in Bhutan and expected to be severer under a changing climate. In Mongar, given the size of the township (5,500 residents), the RGoB concluded that it would be most cost-effective to construct a small-scale impounding reservoir (150m x 35m) in the upstream of the Yakpogang water source, retain excess water during the monsoon, and slowly discharge during the dry season to the water treatment plant which is already operational. During the PPG phase, it will be validated whether this initial design specification will ensure continued supply of safe drinking water to all residents of Mongar after taking into considerations 50- to 100-year drought events and projected population increase. In rural areas, where households are more scattered and pumping water from perennial rivers poses an economical and logistic challenge, the LDCF grant will be used to design, build and rehabilitate climate-resilient water harvesting, storage and distribution system. This will include both traditional roof catchment-based rainwater harvesting as well as on-farm small scale irrigation reservoirs. The design phase of the project will review the project target areas under GNHC's REAP and Tarayana's ongoing operations in promoting small-scale rainwater catchment schemes to build on these initiatives and seek complementarity.

Second, this work will be supplemented by a detailed water resource inventory of the Yakpogang stream catchment for local administrators to better understand the impact of climate change on water resources. This will involve hydrological and surface water analysis of the river and GIS mapping of the river basin to assist local communities in identifying and understanding the risks of droughts and reflect them in the Community Disaster Management Plan in respective Gewogs and villages (see below).

Lastly, the LDCF resources will be used, building on the ongoing national initiative of the implementation of the Disaster Management Bill/Act and strengthening of community-based DRM institutions, to strengthen community level preparedness and response capacity to increasing incidents of climate-induced hazards. This will involve establishment (and continued strengthening of) Dzongkhag/Gewog/Chiwog level Disaster Management Committees and DDMAPT, and training for Gewog and village level officers and community members. A range of activities are envisaged under this Output such as assistance to formulating a Dzongkhag Disaster Management Plan and a Contingency Plan, training of community members on search and rescue, training of emergency medical teams, establishing and training forest fire volunteers, and carrying out mock drills with particular focus on clarifying roles and responsibilities of DRM institutions and community members at the time of 1) receipt of warning; 2) evacuation; and 3) de-warning. Based on strong evidence from other parts of the world, women usually play a significant role at the time of disasters, especially in disseminating information within the community, and therefore, women's specific role will be identified and communicated during this process. Project activities will be designed by building on and improving the pilot-level support that is currently being provided by the GLOF project, and by coordinating closely with other UNDP and World Bank assistance that is currently being designed. It should be emphasized that this component of the project provides a platform to integrate results from the other project components. Notably, the information from the integrated risk

hazard assessments and mapping of flood and landslide risks will be integrated into the Disaster Management Plan and CBDRM programme, and enhanced communication protocol from the National Weather and Flood Forecasting and Warning Center (Component 3) will also be reflected within the community level communication protocols.

Component 3: Enhanced national capacity for coordination and managing climate risks

Baseline: Geologically, the Himalayas, of which Bhutan is part, are young, active and structurally unstable. Topographically, steep hills, sharp gorges and gullies, and major rivers that travel from the altitude of 7000m to 1000m within about 150km of distance, make the country highly vulnerable to landslides and floods. Floods often travel with such speed that they leave little time for communities downstream to react. While equipping the country with an infrastructure that helps save lives, livelihoods and livelihood assets through early warning based on accurate weather information is one of the highest development priorities in the country, the country's topography also stands in the way. Due to the mountainous terrain, local climate tends to vary from one gorge to the next, requiring a large number of weather monitoring stations. The existing hydro-meteorological network is far from accommodating the variable local climates. The existing network that was designed and established in 1991 consists of 24 river gauging stations, 90 meteorological stations and 15 flood warning stations²², whereas the Department of Hydro-Meteorological Services estimates that one weather station is necessary in each of the 205 Gewogs²³ to fully meet the basic weather information needs of the nation. Moreover, apart from the three real-time Automated Weather Stations (AWSs) recently installed with DANIDA assistance, all other weather stations has no real-time data transmission functionality. This means that the data are manually retrieved from a data logger twice a day (at 9am and 3pm), compiled and sent to the capital on a monthly basis, which makes it impossible to use this information for early warning.

The infrastructural needs in the context of providing climate-related risk information are being addressed, though gradually, through on-going and future developmental assistance. For example, the first NAPA implementation project, assisted by UNDP, has put in place 17 early warning sirens dedicated for GLOF risks (three in Lunana in the vicinity of the Thorthormi glacial lake and 14 along the Punakha-Wangdi valley downstream). This is linked to four hydro-met monitoring stations, which check water levels of the Thorthormi lake, and two automated weather stations (AWSs). This project also established a control station in Wangdu – the district capital – which gathers and synthesizes data collected from these monitoring stations. This network has put under the early warning coverage 875 households and a number of private and public buildings in the Punakha-Wangdi valley such as two new large hydropower plant that are currently under construction. The Government is envisaging expanding the EWS infrastructure with Japanese assistance in which part of the Mangde Chhu and Chamkar Chhu river basins will be equipped with EWS linked with automated weather and water level monitoring stations. The EWS in these two river basins are expected to secure a number of households and the Mangde Chhu hydropower plant construction, against future GLOFs. The coverage from these two initiatives, as well as the existing network of the (manual) weather stations are provided in Annex I²⁴. The EWS established through these two initiatives are specifically to reduce potential risks from GLOFs but their automated weather monitoring stations will also provide crucial data to capture precipitation extremes which can be translated into warning signals for flash floods.

As described earlier, DANIDA recently completed its assistance programme through which three real-time AWSs and two Automated Water Level Stations (AWLSs) with wireless data transmission facility were installed. The system, for the first time in the country, enabled officials in the Department of Hydro-Meteorological Service to monitor local weather conditions in three locations (Trashigang, Bumthang and Thimphu). The programme also assisted in the establishment of the National Weather and Flood Forecasting Warning Centre (NWFFWC) within DHMS. The NWFFWC is now equipped with the facility to receive and store data transmitted from the real-time AWS and AWLS. The assistance from DANIDA

²² Department of Energy, Ministry of Economic Affairs (2011). Application for Japan's Technical Cooperation. (Unpublished).

²³ The necessary number of river gauging station is unknown as there is limited needs assessments based on the hydrology, geography and topography of the river systems in Bhutan.

²⁴ The locations of EWS and AWS/AWLS from the JICA assistance are based on the initial proposal. This will be modified and/or finalized during the proposed technical mission in July/August.

provided the critical initial step for the RGoB to modernize the operation of DHMS and strengthen the quality, availability, reliability and timeliness of transfer of climate information. However, the support to NWFFWC ended as the DANIDA programme ended and the Center requires continuous support on technical capacity to analyze and transform raw weather/water data into user friendly climate risk information.

Despite these positive developments in recent years, as it is clear from the map in Annex I, the existing network of early warning system is disproportionately GLOF-focused and the total areas covered by early warning system is minuscule compared with the degree of risks of future hydro-meteorological extreme events under a changing climate. At the same time, the institutional capacity within NWFFWC/DHMS is still limited to manage, analyze, and synthesize the weather information and translated it to a user friendly format, whether it is early warning information for sudden onset of disasters or seasonal monsoon forecast for farmers and agricultural extension officers or seasonal risk information for forest fires, is under development.

Additionality: Under this component of the project, the LDCF grant will be used to facilitate a transformational change in Bhutan in the way climate risks are gathered, analyzed and disseminated, to ultimately save lives, livelihoods and livelihoods assets in years to come. This will include investment of the LDCF grant on the following at various strategic/high risk locations across all Dzongkhags in the country²⁵:

- At least 70 Automated Weather Stations (including real-time communication equipment)
- At least 25 Automated Water Level Stations (including real-time communication equipment)
- At least 8 landslide monitoring devices
- At least 35 sets of integrated early warning systems

This will enable the most vulnerable locations in Bhutan to be placed under the 24/7 integrated early warning system (covering multi-hazards especially flashfloods and landslides), which operate automatically based on the predetermined intensity of climate parameters. Based on site assessments undertaken prior to the installation of AWS/AWLS and EWS, the trigger threshold on climate parameters will be determined.

Apart from the physical investment in installing the nation-wide early warning system based on real-time climate data, capacity of NWFFWC/DHMS/NEC staff will be built both at the central level as well as field level to 1) enhance the overall operation of DHMS to assist in transforming the department from a “weather forecasting department” to a department with the technical and analytical capacity to manage, assess, analyze and disseminate climate information and 2) increase the overall effectiveness of the operation of the warning center. Trainings will include hydrological modeling with climate change information, general data analysis and management, use and integration of regional and global early warning information such as Regional Integrated Multi-hazard Early Warning System (RIMES), and maintenance of the system. Additionally, a set of trainings specifically DHMS and NEC staff are envisioned to further analyze climate data and provide relevant information to climate-sensitive sectors. For example, to better assist marginal farmers in coping with the late or early arrival of the monsoon in a given year, a seasonal forecast of the expected rainfall and temperature can be provided with accompanying planting/harvesting schedules. Furthermore, to enhance the disaster management capacity, a communication protocol with specific roles and responsibilities within and beyond DHMS at the time of emergency will be formulated. This will be done in close alignment with the community-level disaster contingency plan that is supported in Component 2. For example, when the risk of landslide is reported particularly high in a given area, there needs to be close communications among DHMS, DDM and Department of Geology and Mines while early warning information is issued to the particular locality, which will effect the contingency plan in the Dzongkhag/Gewog/Chiwog under question. With the 1) enhanced data collection capacity through the nation-wide network of AWS/AWLS/landslide monitoring, 2) early warning network to communicate real-time threat of hydro-meteorological threats, and 3) strengthened operational/human resource capacity within NWFFWC to manage, monitor and analyze climate data which are increasingly becoming more unpredictable, it is envisaged that communities of Bhutan will be better equipped to prepare for, and respond to, growing threats of climate change induced hazards.

²⁵ Specific combination of these equipment will be analyzed based on the cost effectiveness during the PPG phase and will be confirmed in the CEO Endorsement Form.

B.3. Describe the socioeconomic benefits to be delivered by the Project at the national and local levels, including consideration of gender dimensions, and how these will support the achievement of global environment benefits (GEF Trust Fund/NPIF) or adaptation benefits (LDCF/SCCF). As a background information, read [Mainstreaming Gender at the GEF.](#)":

To fully appreciate the magnitude of socioeconomic benefits of the proposed LDCF intervention, it is worth revisiting the original NAPA priority selection process. In selecting the most urgent and immediate adaptation priorities from the large number of potential options, the NAPA Taskforce applied four criteria: 1) human life and health saved by the intervention; 2) arable land with associated water supply and production of forest saved by the intervention; 3) essential infrastructure, i.e. existing and projected hydropower plants, communication systems, industrial complexes, cultural and religious sites, and main tourist attractions; and 4) estimated costs. As it is clear from the deliberation of the Taskforce in selecting these specific criteria, the NAPA prioritization process is characterized by the strong endogenous considerations towards social and economic benefits that any interventions would bring about. This is especially true in the areas of disaster risk management, rural livelihoods such as agriculture and forestry, and protection of key economic infrastructure. In literature, it is becoming increasingly apparent that investment in disaster risk reduction is more cost-effective than investment in disaster reactions. Studies conducted by the World Bank and IFRC found that for every dollar invested in disaster risk reduction, two to ten dollars are saved in avoided or reduced disaster response and recovery costs.

This project will deliver measurable socioeconomic benefits to the most vulnerable populations in Bhutan both in a direct and indirect manner. In Component 3, LDCF investments in EWS supported by real-time climate information will be made in all Dzongkhags in Bhutan (specific locations will be determined by the assessments on the basis of the “potential lives saved for money” undertaken during the PPG) and will provide a real-time safety net for thousands of Bhutanese. Through Component 2, in at least four Dzongkhags, small rural infrastructure, such as rainwater harvesting and irrigation channels which act as a crucial input to agriculture, will be designed/rehabilitated to safeguard vulnerable farmers against the altering monsoon system. Securing continuous access to water throughout the year for agricultural purposes is critical in enhancing the resilience of rural communities to emerging threats of climate change with more variable and unpredictable arrival of monsoons. As poverty incidents in Bhutan are disproportionately concentrated in rural areas and among farmers, building climate resilience among rural farmers has a direct nexus with poverty reduction and the achievement of the MDGs. Communities’ resilience to climate-induced natural hazards will be further bolstered by the establishment of DRM institutions at different tiers of the society (Dzongkhag, Gewog and Chiwog).

It should be emphasized that the institutional infrastructure and capacity that will be established/strengthened will have lasting impacts beyond the project timeframe. In particular, the interconnected nature of a) integrated multi-hazard assessments and mapping on landslide and flashflood (Component 1); b) enhanced capacity within the NWFFWC/DHMS to monitor the conditions of these areas in parallel with expanding body of information on real-time weather/water information (Component 3); and c) corresponding DRM capacity at the community level (Component 2) to take advantage of a) and b), will have mutually reinforcing benefits that will be institutionalized and likely to pay dividends for future generations.

Women in Bhutan historically enjoy high level of representation in political and household decision making compared to its neighbors in the region. This is largely thanks to the religious belief that men and women are equal and to the matrilineal society. In fact, Bhutan’s Human Development Report points out that male-headed households are on average more disadvantaged by female-headed households. The mid-term evaluation from the first NAPA implementation project also notes that while the project offered little scope for gender-specific interventions, the project saw high level of involvement of women especially in the areas related to community-level DRM activities. Notwithstanding these welcoming trends, the proposed project will place a strong emphasis on collecting gender-disaggregated information during the project preparation phase so that latent disadvantages that women (or men for that matter) may face in a changing climate will be fully addressed during the project implementation stage. The work on CBDRM, in particular, will ensure women’s participation throughout the course of the project. The national project counterparts are acutely aware that women play a special role in preparing for and during the times of disasters. Specific ways in which women will play a role as members of CBDRM institutions will be made explicit during the time of PPG and implementation stage.

B.4 Indicate risks, including climate change risks that might prevent the project objectives from being achieved, and if possible, propose measures that address these risks to be further developed during the project design:

Risk	Level	Mitigation
Coordination challenges across many responsible parties lead to inefficient and/or ineffective project execution	M	During the series of national consultations, both GNHC and NEC have shown strong interest and willingness to provide coordination for this project. These institutions are both mandated to coordinate all government activities as one government while NEC's mandate is limited to activities related to environmental issues including climate change. As such, these agencies have convening power and are best placed to provide an institutional lead for the project. During the initial discussion, it was tentatively agreed that NEC will play the lead role for this project while GNHC will be fully informed and involved at critical nodes of the project implementation (Specific implementation arrangement will be agreed on during the course of PPG). Moreover, all project stakeholders have already agreed to use the National Coordination Committee on Climate Change, of which NEC is the chair, as a technical-level platform to discuss progress, challenges and opportunities of the project.
Delay in delivery of AWS/AWLS/EWS equipment will cause delay in project implementation	M	The issue of slow delivery of equipment was observed by DANIDA during the implementation of their "Enhancing Adaptive Capacity to Climate Change" Programme, and by UNDP to a lesser extent in the GLOF project. This was due to the fact that all parts of the necessary equipment are manufactured outside Bhutan. However, this process is expected to be expedited in the future as this project will have been fourth project (after the first NAPA follow-up, DANIDA support, and JICA Technical Cooperation that is in the pipeline) that will involve procurement of EWS and AWS. The DHMS is now well accustomed with the procurement process from overseas vendors. Furthermore, as soon as the project implementation begins, the procurement process will commence to minimize the impact of potential delays on the overall progress of the project.
Costs of AWS, AWLS, landslide monitoring equipment, and EWS prohibit the rollout of the nation-wide EWS network	H	It is acknowledged that with the proposed budget, it is impossible to cover all inhabited areas of Bhutan under the national EWS. Nonetheless, during the PPG process, an attention will be paid to 1) identifying those high priority areas where the "potential number of lives saved" are highest; and 2) validating the appropriate mix of AWS, AWLS, landslide monitoring and EWS so that the grant from LDCF will be used most cost-effectively.
A challenge in acquisition of land for AWS/AWLS/EWS may delay the implementation	L	The project team will start looking into this issue as soon as the PPG phase begins so that potential issues can be identified well in advance and remedies proposed before the project implementation begins.
Lack of community involvement in some project sites under Component 2	L	Some activities during the PPG phase are inevitably characterized as awareness raising. This would mitigate future issues of "lack of interest". Moreover, one of reasons to build activities on existing, especially national, initiatives such as the REAP is to minimize the risk from the lack of community involvement. Assessment of available community workforce prior to project inception, and options such as cash-for-work will be also explored for some activities

B.5. Identify key stakeholders involved in the project including the private sector, civil society organizations, local and indigenous communities, and their respective roles, as applicable:

STAKEHOLDER	RELEVANT ROLES
National Environment Commission (NEC)	NEC is mandated to coordinate all government agencies on all issues related to environment, including climate change. They are also the focal agency for Bhutan for global environmental conventions such as UNFCCC, UNCCD and CBD. NEC was therefore a lead agency for the formulation of Bhutan's NAPA in 2006 and National Communications (first in 2000 and second in 2011). NEC will be the executing partner in this project while at the same time providing the overall coordination across other responsible parties. NEC will be also undertaking community-level water resource inventory as part of project Component 2.
Gross National Happiness Commission (GNHC)	GNHC is the former Planning Commission, and is responsible for coordinating all government agencies as one body of the Royal Government of Bhutan. They are the custodian of the overall development direction for the country including the national five year development planning. GNHC is the GEF focal agency, and hence, all co-financing from government sources for this project will be coordinated by GNHC and joint investment planning will be ensured through

	the window that GNHC provides.
Department of Disaster Management (DDM), Ministry of Home and Cultural Affairs	DDM is mandated to coordinate disaster risk management at the national and local levels. Once passed, they will also be responsible for implementing the Disaster Management Act, including the formulation and capacity building of Community-Based Disaster Risk Management Institutions. DDM will have a technical and an executive role as a member of the Project Executive Board.
Association of Bhutanese Industry (ABI)	ABI is a non-profit organization represented by industries of Bhutan. ABI will be implementing the flood risk reduction activities in the Pasakha Industrial Area under Component 1 in collaboration with the Industrial Infrastructure Development Division. ABI will have an executive role as a member of the Project Executive Board.
Department of Geology and Mines (DGM)	DGM will be implementing engineering risk reduction measures against landslides in Phuentsholing as well as undertaking the inventory of high risk flashfloods and landslides across the country. They will also provide technical input in selecting the appropriate technology for the landslide monitoring under Component 3. DGM will have a technical and an executive role as a member of the Project Executive Board.
Ministry of Works and Human Settlement (MoWHS) <ul style="list-style-type: none"> Phuentsholing City Corporation (PCC) 	MoWHS has three technical departments: Department of Roads, Department of Engineering Services, and Department of Human Settlements. MoWHS, within the proposed project, will be designing and building the impounding reservoirs in Mongar. MoWHS will have a technical and an executive role as a member of the Project Executive Board. Institutionally, PCC works under MoWHS. However, PCC, along with Thimphu City Corporation, is granted the status of autonomous municipality and there is no budgetary support received from MoWHS.
Department of Hydro-Meteorological Services (DHMS), Ministry of Economic Affairs	DHMS is mandated to collect hydro-meteorological information and provide to national users. DHMS will be responsible for designing and installing AWS/AWLS/EWS under component 3. Weather and Flood Forecasting Warning Centre (NWFFWC) is housed within DHMS, and thus the Department will coordinate all activities under Component 3. DHMS will have a technical and an executive role as a member of the Project Executive Board.
Forest Service Division (FSD), Ministry of Agriculture and Forest	In the context of implementing CBDRM, FSD will be providing technical input in the areas specific to forest fire management. Their activities will be closely coordinated with DDM. FSD will have a technical and an executive role as a member of the Project Executive Board.
Local authorities <ul style="list-style-type: none"> Dzongkhag administrations Dzongkhag level line departments Gewog administrations Chiwog (village communities) Community-Based Disaster Risk Management Institutions 	District (Dzongkhag) and block (Gewog) level authorities and line ministries are essential stakeholders for this project. They will systematically coordinate and link with the central level authority of respective agencies, and represent the contributions and interests of their agencies in the context of the project. In particular, Dzongkhag, Gewog and Chiwog representatives will be involved in the establishment of CBDRM institutions at the respective level. Their coordination in the context of the CBDRM component of the project will be ensured by the DDM/FSD/Tarayana.
Tarayana Foundation	Tarayana Foundation is one of the leading national NGOs in Bhutan. They were established in 2003 and since have provided pro-poor development assistance at the community level that is in line with the national 10 th five year development plan. Within this project, they will be responsible for delivering rainwater harvesting system for domestic and agricultural purposes in four Dzongkhags. They are also a responsible party for the physical infrastructure component in GNHC's Rural Economic Advancement Programme, with which the project intends to ensure maximum alignment. Tarayana will have an executive role as a member of the Project Executive Board.
Bilateral development partners	This project will work closely with JICA, which is one of the largest bilateral development partner in Bhutan. JICA will provide one of the main sources of co-financing for the proposed project through their proposed technical cooperation programme on enhancing EWS for GLOF events. The project will ensure maximum alignment with their proposed programme especially in selecting the technical specifications of the EWS so that the infrastructural network developed in the respective project are technically compatible and both contribute to strengthening of the national climate risk management system. JICA will have a technical advisory role under this project and a seat on the Project Advisory Board. DANIDA is currently partnering with UNDP/UNEP on the Joint Support Programme. Their past assistance programme on climate change has also provided the first-ever real-time AWS/AWLS in Bhutan. They will be closely consulted on the project in so far as it has relevance within the context of the JSP and technical specifications of AWS/AWLS.
UNDP	At the request of the RGoB, UNDP will serve as Implementing Partner for this project

	<p>(implementation arrangements will be explored during the PPG stage). In this role, UNDP would ensure project execution on time, on scope and on budget and draw on technical services provided by its regional offices and headquarters to provide technical quality assurance.</p> <p>Moreover, the proposed Capacity Building Programme for Disaster Risk Management programme will be supported by UNDP and constitutes co-financing for the proposed project. Alignment in project activities will be ensured within the UNDP Bhutan Country Office as well as UNDP Asia-Pacific Regional Centre which houses technical advisors for these projects.</p> <p>UNDP also jointly manages, with UNEP, the Joint Support Programme (Phase II of the Poverty Environment Initiative). The JSP provides baseline development and co-financing for CBDRM activities. The PEI office is co-located within the Environment/DRM Unit in UNDP Bhutan, ensuring maximum coordination between these two initiatives.</p>
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B.6. Outline the coordination with other related initiatives:

Overall coordination of the proposed LDCF project will be provided by the National Environment Commission as the Implementing Partner for the project. The NEC is mandated as a convening and coordination agency on all national and donor-funded activities related to climate change, and thus is well placed to execute this project. They will in turn ensure close reporting to and necessary involvement of the Gross National Happiness Commission, who is the ultimate custodian of all development activities in Bhutan. The NEC is the chair of the National Coordination Committee on Climate Change of which all of the responsible parties in this project is a member. This existing platform will be used actively to coordinate activities in the project and share information on progress, challenges and opportunities.

As outlined in Section B.1, the proposed LDCF project will build on a number of national and donor-funded initiatives and thereby coordination with the following initiatives will be ensured through the platform described above.

The ongoing **first LDCF project** (the GLOF project), supported by UNDP, has provided a GLOF-focused EWS infrastructure in the Punakha-Wangdue valley and is pilot testing the CBDRM approach in select Dzongkhags and communities. The technical specifications of the EWS have proven robust in the harsh conditions of Bhutan and thus the proposed JICA’s Technical Corporation Assistance is also expected to adopt the same design standard. This will be fully reflected in the design of the nation-wide integrated EWS in the proposed LDCF project, under Component 3. The project will also build on, and expand, the CBDRM approach piloted in the GLOF project. The DDM is the responsible party for the CBDRM components in both the projects, thus ensuring maximum level of continuity. In particular, this proposed project will heavily draw on specific approaches adopted in the GLOF project in areas of community level trainings and awareness raising. The CBDRM Guideline and Dzongkhag Disaster Management Awareness and Planning Team adopted by the GLOF project, for example, offer an immediate benefit to the proposed project. Also CBDRM initiatives that were kick-started in the three Dzongkhags will give the project team a sense of the degree of training needs at the community level after a few years of support. It is expected that by the time this proposed project will be implemented, the GLOF project will have been completed and thus additional needs in promoting CBDRM in these three Dzongkhags will have been identified. The proposed second LDCF project could potentially target one of these Dzongkhags so that the “staggered” approach (i.e. a few Dzongkhags with advanced progress) would allow a few “CBDRM role model” Dzongkhags. **The Joint Support Programme**, supported by UNDP, UNEP, DANIDA and UNCDF also has components focusing on developing comprehensive integrated and sustainable water resource management policy/plan, which include assistance in small-scale irrigation schemes for livelihood support, and training disaster focal points on CBDRM and provision of district block grant for capacity development in up to five pilot Dzongkhags. In this regard, under Component 2, close collaboration with the JSP will be ensured in the context of 1) aligning the integrated and sustainable water resource management policy/plan (a JSP output) with the production of water resource inventory (an LDCF output); and 2) aligning locations and activities related to CBDRM capacity building. Furthermore, the JSP has been successfully applying a tool that gauge the progress of various capacity building exercises. This tested tool will be also used at relevant stages of the LDCF project.

The project will coordinate closely with **the Capacity Building Programme for DRM**, which will be assisted by UNDP’s Bureau for Crisis Prevention and Recovery. The project is likely to contain a component focusing on institutional support for implementation of the Disaster Management Bill, mainly targeting MoHCA/DDM and community level groups. Within UNDP Bhutan, the DRM and environment portfolio are managed by the same unit. This ensures effective alignment and complementarity with the LDCF project.

As described in the co-financing section, an initial discussion has already started between the World Bank/GFDRR and UNDP to ensure that the support on CBDRM and the implementation of the DM Bill is well coordinated and complementary, with a potential of jointly implementing the Capacity Building Programme for DRM (UNDP) and the Phase II of **the Bhutan Disaster Risk and Recovery Programme** (World Bank/GFDRR). This ongoing discussion will be fully guided by the proposed project framework presented in this PIF so that these three projects will be designed with a clear geographical and/or thematic demarcation.

GNHC's national initiative, **the Rural Economy Advancement Programme (REAP)**, is currently operational at a pilot scale (10 villages) but will expand to 116 villages covering all Dzongkhags from 2013. The rollout of the REAP and implementation of CBDRM under the LDCF project will be aligned to the extent possible. This is particularly important because the REAP is designed to address non-climatic sources of vulnerability of poor communities to climate change (i.e. poverty) while the proposed project is designed specifically to address climate change-induced vulnerability. Potential thematic synergy is also expected as one of the focus of the REAP is the promotion of agricultural production for poor farmers and the resources from LDCF can increase the capacity of these farmers to cope with emerging water scarcity. Tarayana is the responsible party for the rural infrastructure components in both the LDCF and REAP, and thus maximum level of coordination can be anticipated. Moreover, the target area selection during the PPG phase will seek alignment between the two to enhance both the thematic and logistical synergies especially for Component 2.

The RGoB and JICA are now in the final stage of agreement for a **Technical Assistance Cooperation on development of an integrated GLOF EWS**, which envisages covering some parts of the Mande Chhu and Chamkhar river basins. The initial discussions between UNDP and JICA have already started to ensure that 1) technical standards are well aligned and 2) the data collected through the two AWSs established in the JICA programme are transmitted smoothly to the National Weather and Flood Forecasting and Warning Centre, whose data management capacity will be assisted by the proposed LDCF project. JICA is currently planning to send a team of technical experts to Bhutan in August 2012 to finalize the scope of the Cooperation, during which time another detailed discussion will be held among the RGoB, UNDP and JICA. Both JICA and UNDP have permanent resident offices in Thimphu and close coordination through the PPG and implementation can be expected.

Lastly, the proposed LDCF project envisages establishing a nation-wide EWS based on more accurate, real-time weather monitoring system. Once the infrastructure is in place, this will pave the way for the country to garner a technical prerequisite for the provision of **index-based weather insurance**. Currently, the RGoB is exploring this opportunity through the **GEF Technical Needs Assessment** with potential for a follow-up project. The project will coordinate closely with the work on TNA (also under the purview of the NEC) so that the LDCF investment will in turn be a critical conduit for a transformational change in fostering a social/economic safety net for marginal farmers.

C. DESCRIBE THE GEF AGENCY'S COMPARATIVE ADVANTAGE TO IMPLEMENT THIS PROJECT:

UNDP's comparative advantage in implementing this project is underpinned by the UNDP Country Programme Document – Bhutan for the current cycle (2008-2013) in which Environment and Disaster Management constitutes one of the three strategic pillars for UNDP's assistance in Bhutan. That assistance in these two areas (environment and DRM) in the context of achieving sustainable development is jointly provided within UNDP's strategic framework is out of the acute realization that these two issues are inseparable in Bhutan. UNDP's past support in the nexus of climate change and DRM is characterized by its dual focus on both policy assistance as well as community-based actions. On the former, the past Thimphu Valley Earthquake Risk Reduction project, Earthquake Risk Reduction project, Regional Climate Risk Reduction project, Bhutan Recovery and Reconstruction project, and the first NAPA implementation projects collectively contributed to the formulation and operationalization of the National Disaster Risk Management Framework and the subsequent Disaster Management Bill. On the latter, the first NAPA project also has a component on strengthening local community capacity in DRM through establishment of District, Gewog and Chiwog level DMCs and pilot testing of CBDRM in three project target districts (Punakha, Wangdue Phodrang, and Bumthang). This effort has become a conduit of the emerging national support for building local capacity for disaster risk management, which now receives legislative backing with the Disaster Management Bill/Act. UNDP's assistance in the area of DRM, during the current CPD cycle, has been characterized by the continuous collaboration with various government agencies in building capacities of national and local agencies for multi-hazard risk management including climate change. The Earthquake Risk

Reduction and Recovery Preparedness Project (2007-2010), Coordination and Recovery Support following 2011 Earthquake (2011-2012) and the proposed DRM Capacity Building Project (Starting in 2012/13), allow continuous and seamless support which incorporates lessons from the previous projects. With the new DRM Capacity Building Project and the proposed LDCF project, UNDP will be best placed to assist the RGoB and its communities in making a transformational shift in how they address disaster risks that are compounded by climate change. The PEI and the subsequent JSP provides not only part of the development baseline, but also a critical platform to mainstream outcomes and outputs from the LDCF project into national and local development planning processes in a coherent manner. In the medium to long-run, this will pave the way for the RGoB to equip themselves for medium- to long-term adaptation planning and resilience building. The level of alignment the LDCF will ensure in the provision of the nation-wide EWS with the ongoing initiatives should not be underestimated. Through the GLOF project, UNDP has already assisted the DHMS in identifying the necessary technical specifications that are feasible under the conditions of Bhutanese weather and terrains and the same specifications, with minor modifications if necessary, will be adopted to ensure compatibility.

UNDP also has a demonstrated track record in assisting national coordinating agencies – the GNHC (the former Planning Commission) and NEC – in various platforms that are cross-sectoral in nature such as the NAPA formulation process (with NEC; 2006), support to INC (with NEC; 2000), SNC (with NEC; 2011), and stocktaking of the NAPA (2012), and the Poverty-Environment Initiative and JSP (with GNHC; 1st phase – 2007-2008; 2nd phase – 2010-2013), where climate change risks are being integrated into the national, district and local development planning. The long-standing partnership between UNDP and GNHC/NEC is likely to alleviate the potential coordination challenges during the implementation stage which envisages involvement of a wide range of partners. And in turn it will provide an opportunity to affect catalytic impacts on multiple sectors and at different levels of society, not only through the coordination with GNHC/NEC, but also through working closely together with the JSP and first NAPA implementation project for synergies.

C.1 Indicate the co-financing amount the GEF agency is bringing to the project:

UNDP will provide \$538,000 in parallel grant co-financing to the proposed project through the Joint Support Programme and Capacity Building Programme for Disaster Risk Management in Bhutan (please see footnote 20 for additional co-financing that will be sought during the PPG stage).

C.2 How does the project fit into the GEF agency's programme (reflected in documents such as UNDAF, CAS, etc.) and staff capacity in the country to follow up project implementation:

The proposed project is fully aligned with the UNDAF for Bhutan for 2008-2013. It corresponds, inter alia, with UNDAF Outcome 5 "By 2012, national capacity for environmental sustainability and disaster management strengthened."

UNDP Country Programme Document operates within the broader framework of UNDAF, and the new assistance framework cycle will begin from 2014, which is likely to inherit the key principles of development assistance. UNDAF and CPD, by design, are set out to address the Government's development priorities and thus high degree of conformity can be found between the proposed LDCF project and UNDP's overall guiding framework. This project is aligned with CPD Output 2.1 "Capacity of national and local focal agencies and other stakeholders strengthened to implement disaster management framework including prevention, mitigation, relief and reconstruction." It should be noted that the CPD specifically points out Phuentsholing as one of the highly vulnerable target intervention sites. Due to UNDAF and CPD's close alignment with the national five year plan (2008-2013), and in turn the five year plan with the medium-term plan (up to 2020), the next cycle of the development (assistance) framework for both RGoB and UNDP will likely draw significantly on the past development efforts.

The UNDP Bhutan Country Office is sufficiently well resourced to provide the oversight necessary to support the RGoB in implementing its second LDCF NAPA follow up programme. As described earlier, UNDP's assistance in disaster risk management and climate change falls under the responsibility of one unit ensuring the highest level of cross-practice collaboration. The programme will primarily engage programme officers from the unit, as well as the Deputy Resident Representative and Assistant Resident Representative for programming. In addition, since 2010, UNDP has deployed an additional national climate change policy advisor within the Country Office. The role of the climate change policy advisor includes advisory services to the government in climate change policy areas as well as extracting and synthesizing relevant lessons

from ongoing adaptation (and mitigation to a lesser extent) projects so that climate change related policies are substantiated by on-the-ground activities. One of the responsibilities of the advisor is to identify outcomes and outputs from the ongoing climate change programmes that have bearing on larger policy and strategic implications beyond the project sphere, and the contributions that this LDCF project has on, inter alia, building medium- to long-term resilience of the country will be continuously sought.


A regional technical adviser on climate change adaptation based in Bangkok will provide ongoing implementation oversight and support throughout the project, as well as the UNDP lead adviser on adaptation, also resident in Bangkok.

PART III: APPROVAL/ENDORSEMENT BY GEF OPERATIONAL FOCAL POINT(S) AND GEF AGENCY(IES)

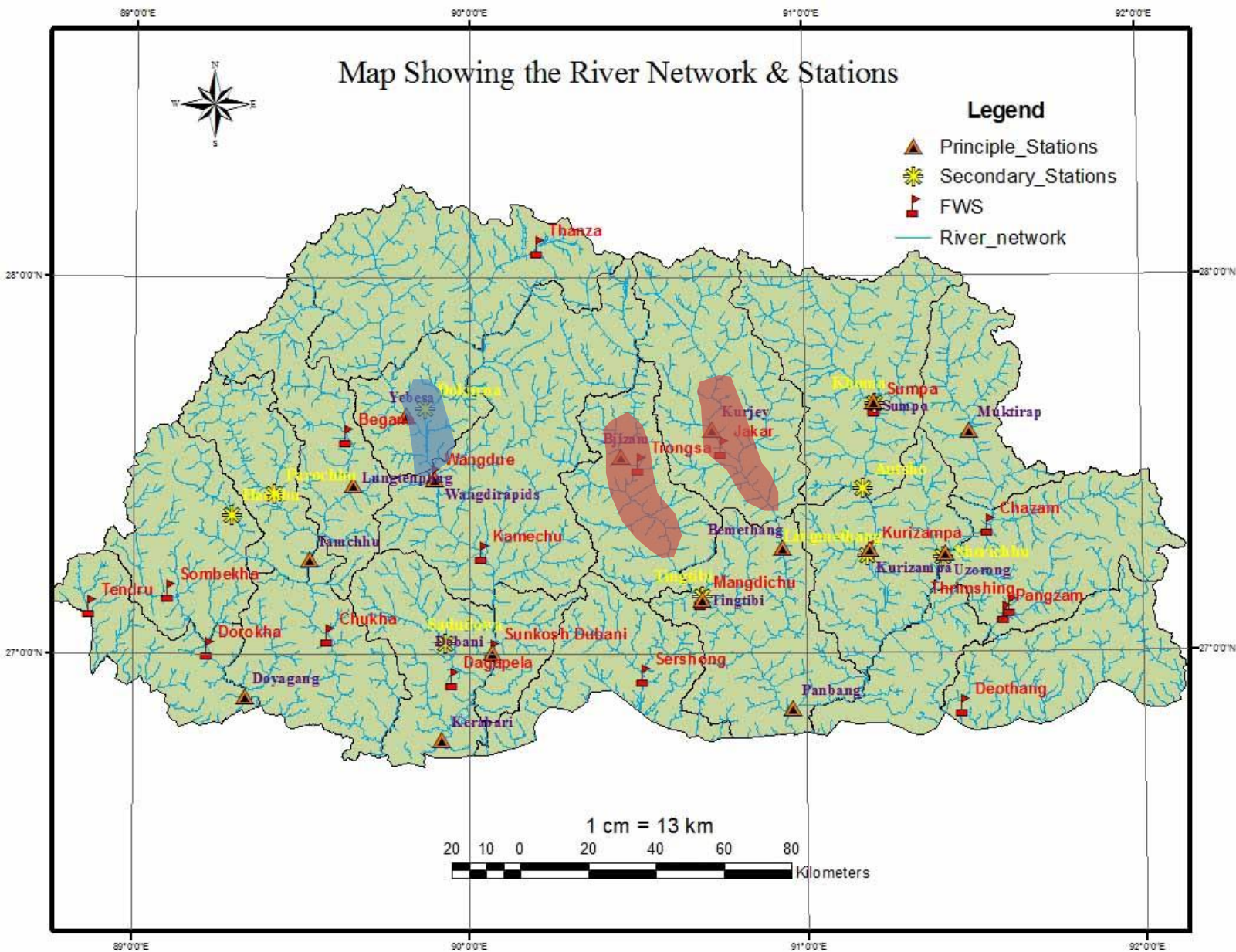
A. RECORD OF ENDORSEMENT OF GEF OPERATIONAL FOCAL POINT (S) ON BEHALF OF THE GOVERNMENT(S): (Please attach the [Operational Focal Point endorsement letter\(s\)](#) with this template. For SGP, use this [OFP endorsement letter](#)).

NAME	POSITION	MINISTRY	DATE (MM/dd/yyyy)
Karma Tshiteem	Secretary	GROSS NATIONAL HAPPINESS COMMISSION	04/19/2012

B. GEF AGENCY(IES) CERTIFICATION

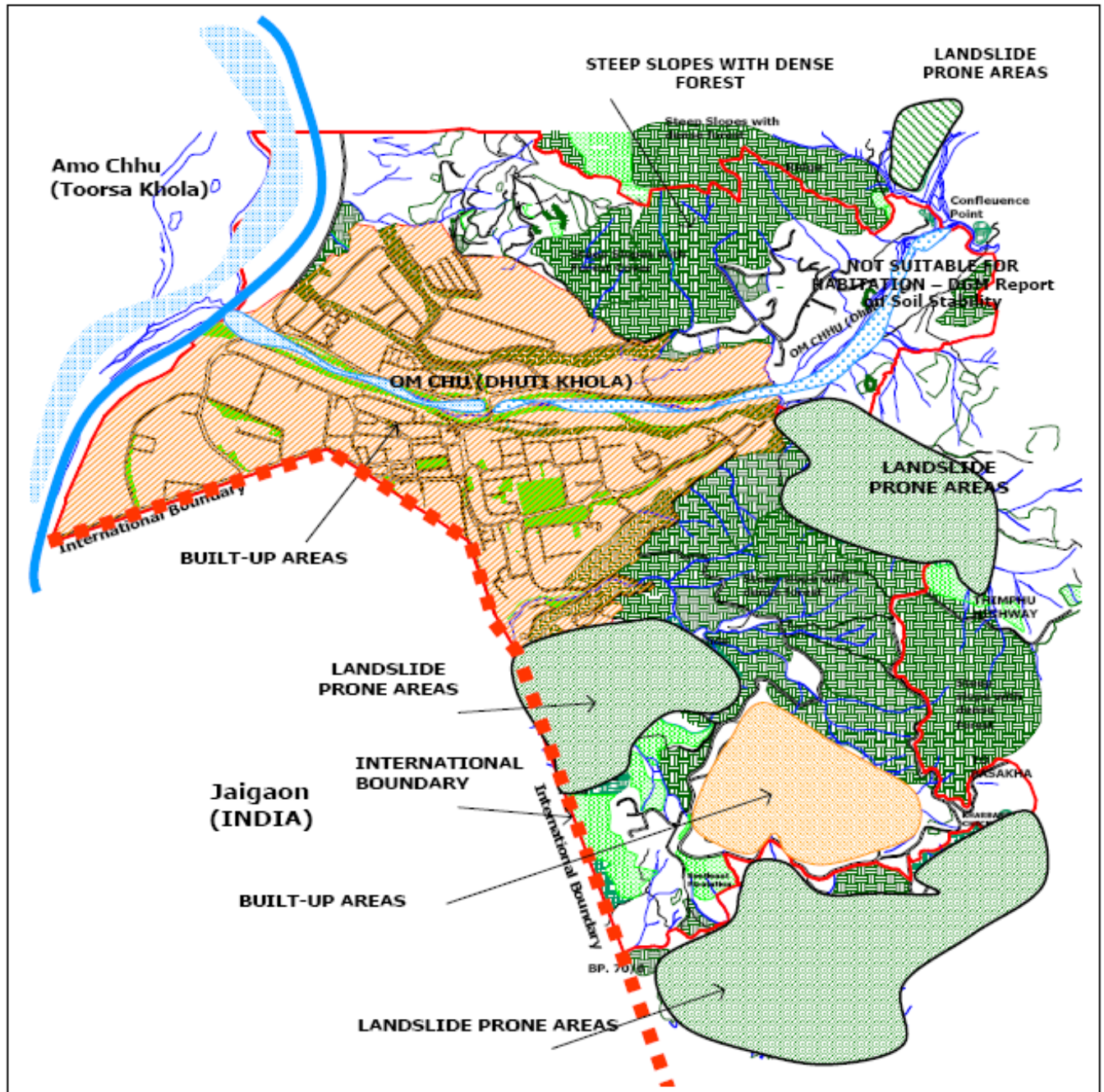
This request has been prepared in accordance with GEF/LDCF/SCCF/NPIF policies and procedures and meets the GEF/LDCF/SCCF/NPIF criteria for project identification and preparation.					
Agency Coordinator, Agency name	Signature	DATE (MM/dd/yyyy)	Project Contact Person	Telephone	Email Address
Yannick Glemarec Executive Coordinator, UNDP/GEF		May 1, 2012	Yusuke Taishi (Green-LECRDS)	+66 (2) 304 9100 ext 5015	yusuke.taishi@undp.org

ANNEX I – Existing weather station network and the coverage of EWS under the GLOF project and proposed JICA assistance



Early warning coverage: The blue shaded area – the GLOF project; the red shaded area – the proposed JICA assistance.

ANNEX II – Map of Phuentsholing



ANNEX III – Sample hazard zonation maps produced as part of the first LDCF project

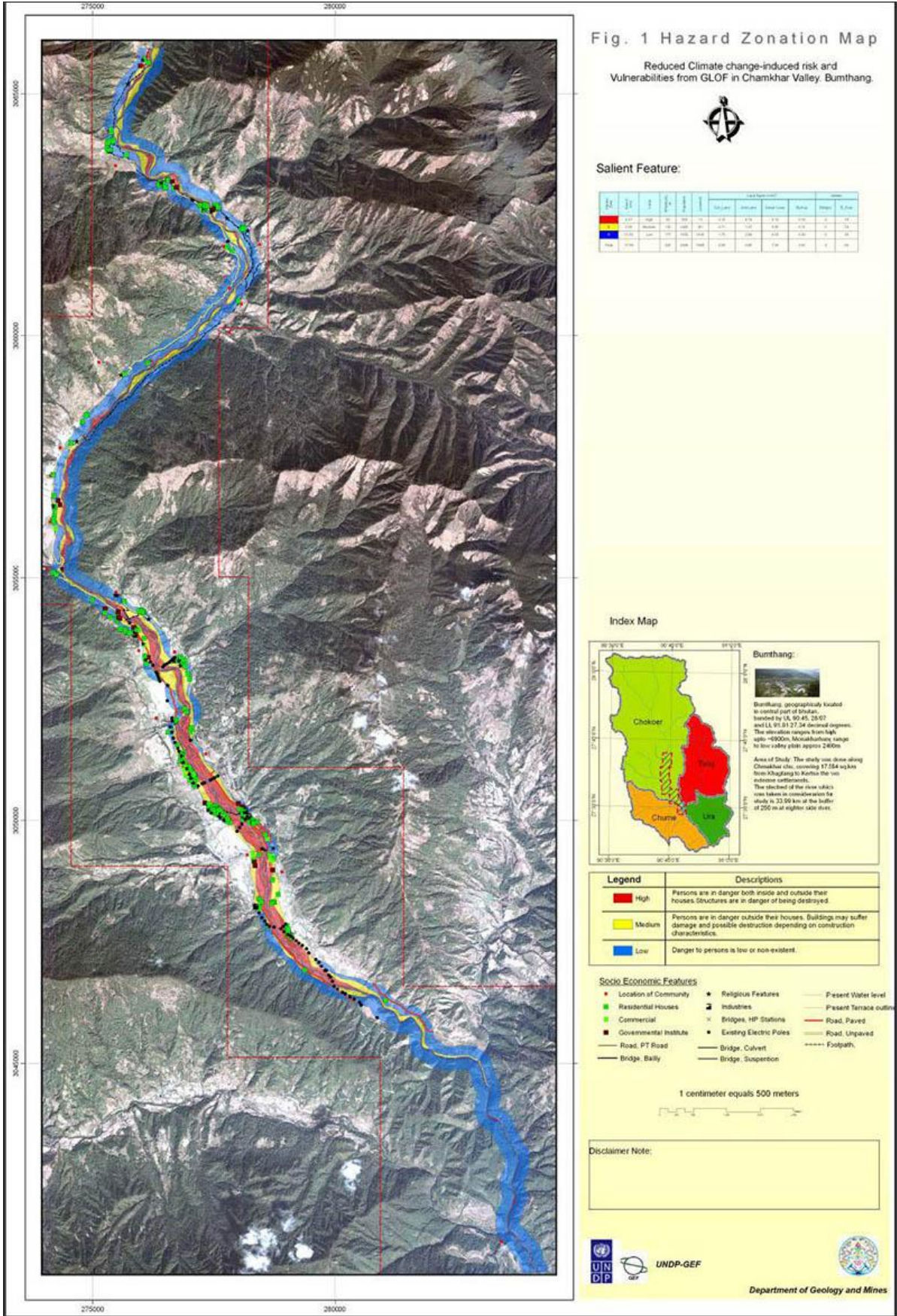


Fig. 1 Hazard Zonation Map

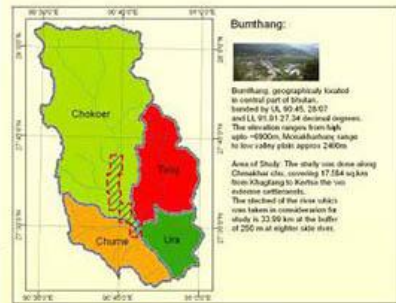
Reduced Climate change-induced risk and Vulnerabilities from GLOF in Chamkhar Valley, Bumthang.



Salient Feature:

No.	Name	Area (sq. meters)		Volume (cu. meters)		Risk	Impact	V. Index
		High	Low	High	Low			
1	High	100	100	100	100	High	High	100
2	Medium	100	100	100	100	Medium	Medium	100
3	Low	100	100	100	100	Low	Low	100

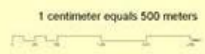
Index Map



Legend	Descriptions
High	Persons are in danger both inside and outside their houses. Structures are in danger of being destroyed.
Medium	Persons are in danger outside their houses. Buildings may suffer damage and possible destruction depending on construction characteristics.
Low	Danger to persons is low or non-existent.

Socio-Economic Features

• Location of Community	• Religious Features	— Present Water level
• Residential Houses	• Industries	— Present Terrace outline
• Commercial	• Bridges, HP Stations	— Road, Paved
• Governmental Institute	• Existing Electric Poles	— Road, Unpaved
— Road, PT Road	— Bridge, Culvert	— Footpath
— Bridge, Bailey	— Bridge, Suspension	



Disclaimer Note: