

Concept Note

Building Resilience to High-Impact Hydro meteorological Events through the Strengthening of Multi-Hazard Early Warning Systems in Bhutan

Bhutan | WWF

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**GREEN
CLIMATE
FUND**

Simplified Approval Process Concept Note

Project/Programme title:	Building Resilience to High-Impact Hydro meteorological Events through the Strengthening of Multi-Hazard Early Warning Systems in Bhutan
Country(ies):	Bhutan
National Designated Authority(ies) (NDA):	Gross National Happiness Commission (GNHC)
Executing Entities:	National Center for Hydrology and Meteorology (NCHM), Royal Government of Bhutan
Accredited Entity(ies) (AE):	World Wildlife Fund, Inc.
Date of first submission/ version number:	11/5/2019 V.1
Date of current submission/ version number	11/5/2019 V.1



Eligibility for SAP is determined by the review of the concept note and the ESS screening.

A. Project / Programme Information (max. 1 page)

A.1. Project or programme	<input checked="" type="checkbox"/> Project <input type="checkbox"/> Programme	A.2. Public or private sector	<input checked="" type="checkbox"/> Public sector <input type="checkbox"/> Private sector	A.3 RFP	Not applicable
A.4. Indicate the result areas for the project/programme	<p><u>Mitigation:</u> Reduced emissions from:</p> <input type="checkbox"/> Energy access and power generation: 0% <input type="checkbox"/> Low emission transport: 0% <input type="checkbox"/> Buildings, cities and industries and appliances: 0% <input type="checkbox"/> Forestry and land use: 0%				
A.5. Impact potential		A.5.1. Estimated mitigation impact (tCO ₂ eq over project lifespan)			
		A.5.2. Estimated adaptation impact (number of direct beneficiaries)	200,000 direct beneficiaries		
		A.5.3. Estimated adaptation impact (number of indirect beneficiaries)	400,000 indirect beneficiaries		
		A.5.4. Estimated adaptation impact (% of total population)	70% of the country's total population		
A.6. Financing information					
A.6.1. Indicative GCF funding requested (max 10M)	Amount: 10,000,000 Currency: USD Financial Instrument: Grants				
A.6.2. Indicative co-financing	Amount: 16,000,000 Currency: USD Financial Instrument: Other (Instrument Description: Planned budget) Institution: ROYAL GOVERNMENT OF BHUTAN				
A.6.3. Indicative total project cost (GCF + co-finance)	Amount: 26,000,000 Currency: USD				
A.6. Estimated duration of project/ programme:	disbursement period: 60 repayment period, if applicable:	A.7.2. Estimated project/ Programme lifespan	60		
A.8. Is funding from the Project Preparation Facility needed?	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	A.9. Is the Environmental and Social Safeguards Category C or I-3?	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No		
A.10. Provide rationale for the ESS categorization (100 words)	For safeguards purposes this project is considered a Category C based on WWF's Environment and Social Safeguards Integrated Policies and Procedures as it is essentially a technical assistance project to strengthen the National Centre for Hydrology and Meteorology (NCHM), the Executing Entity, and key stakeholders on the generation of risk-based, user-relevant				

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	<p>early warning information, and their application in planning and decision-making in agriculture, water resources management, public health, energy and disaster risks management. Therefore, the proposed project will not finance any renovation/rehabilitation civil works that could cause damage to the environment and/or people, this includes roof replacement, reinforcement of structures, replacement of partitions, multiple replacements of doors and windows and/or impact any persons adversely. However, the project may finance purchase and installation of early warning equipment including to be installed in existing buildings and minor repair works such as wall plastering and painting, installation of access floors (cable floors). The proposed project may also include minor civil works such as installation of equipment in riverbeds and small concrete works and establishment of meteorological stations that would work in an existing footprint and include minor concrete works.</p>		
<p>A.11. Has the CN been shared with the NDA?</p>	<p><input checked="" type="checkbox"/> Yes <input type="checkbox"/> No</p>	<p>A.12. Confidentiality</p>	<p><input type="checkbox"/> Confidential <input checked="" type="checkbox"/> Not confidential</p>
<p>A.13. Project/Programme rationale, objectives and approach of programme/project (max 100 words)</p>	<p>Bhutan has a fragile mountainous landscape situated in a regional climatic region characterized by diverse influences that leave the country exposed to high weather variability and extreme events. With climate change, variability in both temperature and precipitation as well as the frequency and intensity of extreme events is increasing. Rising average temperatures, already recorded, and erratic rainfall exacerbate the risks from major hydrological hazards facing Bhutan, including glacial lake outburst floods (GLOFs), flash floods, riverine floods, landslides, landslide dam outburst floods, forest fires, droughts, and windstorms. Between 1994 and 2011, approximately 87,369 people were adversely affected by such events, resulting in 304 deaths. Seventy percent (70%) of Bhutanese settlements are located along river basins and are exposed to floods and other hydro-meteorological hazards. The economy is heavily dependent on climate sensitive sectors, with 58% of the working population in Bhutan engaged in agriculture, 30.5% of whom are female. The livelihood systems of approximately 300,000 smallholder farmers are at increasing risk, 90% of whom are subsistence farmers. The country has also invested heavily in hydropower, which is directly affected by change in precipitation and temperature patterns.</p> <p>Under these circumstances, the risks from increasing variability of temperatures and precipitation as well as extreme weather events could be reduced through improved early warning systems for hydro-meteorological disasters tied to better analysis of and targeting of vulnerable populations. The project will be executed by the Royal Government of Bhutan's National Center for Hydrology and Meteorology (NCHM). The project will build resilience of the vulnerable population through strengthening multi-hazard early warning systems for climate change induced hazards. The need for climate services and early warning information varies across gender, age groups, and level of vulnerability. Such factors necessitate the preparation of dynamic risk maps to aid decision-making in planning and response -</p>		

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including user-focused services that take account of gender-based needs and the special requirements of all target groups. The gender mainstreaming procedures and plan at the national and local administration level[1] will enable the project to provide equitable access to and participation of all vulnerable communities.

[1] Japan International Cooperation Agency (JICA), Survey of Country Gender Profile (Kingdom of Bhutan) 2017.

B. Project / Programme details

B.1. Context and Baseline (500 words)

Bhutan's physical environment, being a least developed country and largely rainfed agrarian economy leave it highly vulnerable to the adverse impacts of climate change. The fragile mountainous landscape includes many glaciers and glacial lakes subject to the effects of rising average temperatures. The country is exposed to a diversity of hydrological hazards, including cyclone induced storms, flash floods, landslides, landslide dam floods, glacial lake outburst floods (GLOFs) and droughts. Heavy seasonal monsoon rains and glacial melt are the most common causes of flooding and landslides. With climate change, variability in both temperature and precipitation as well as the frequency and possibly intensity of extreme events is increasing[1]. Such patterns exacerbate the risks from major hydrological hazards facing the country. Over 70% of settlements and most infrastructure and fertile agricultural land are located along the main drainage basins, placing them at high risk of flooding[2]. Damages associated with Cyclone Aila (2009)[3] were estimated to be USD 17 million[4]. Flash floods are a recurrent phenomenon in Bhutan and cause extensive damage to infrastructure and agricultural lands. The 2016 flash floods, alone, in Sarpang Dzongkhag and Phuentsholing Thromde displaced more than 200 families[5]. With frequency and intensity of climate and weather hazards expected to increase as a result of climate change, this will have potentially devastating consequences for vulnerable communities and sectors. Moreover, rising mean temperatures have already impacted Bhutan, causing accelerated glacier retreat and increased risk from GLOFs. Most recent GLOF events include Lemthang Tsho outburst from the head water of Mo Chhu on 28 June 2015 and Thorthormi Lake's subsidiary, Lake II, outburst on 20 June 2019.

The country is currently in the process of preparing a National Adaptation Plan. This will build on and take full account of the first National Adaptation Plan of Action and the climate change impact and adaptation elements of the country's Second National Communication to the UNFCCC completed in 2011 as well as the Technology Needs Assessment and Technology Action Plans for Climate Change Adaptation completed in 2013[6]. The latter identified key concerns and some actions to address them, including: better integration of climate risk management into development planning, protection of agricultural production through use of alternative technologies, and increasing the capacity of the National Centre for Hydrology and Meteorology (NCHM) to meet growing demands for its services given the changing climate. Due to the country's high vulnerability, Bhutan's first statement of Nationally Determined Contributions (NDC) to the UNFCCC and incorporated into the Paris Agreement also highlights these adaptation needs and actions.

While the Department of Disaster Management (DDM), established in 2008, is the national coordinating agency for disaster risk management (DRM), the NCHM is mandated to provide scientific and technological services in hydrology, water resources, meteorology, and the cryosphere to ensure the safety and socio-economic well-being of people is maintained and to support related national and

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international information needs. The NCHM was accorded higher status through a reorganization in 2017, when it was established as an autonomous scientific and technical organization of the Royal Government of Bhutan responsible for understanding the behaviours of the atmosphere, its interaction with the cryosphere and water bodies, the weather and climate, and the distribution of the country's water resources. The development of climate and early warning information services by NCHM will also support the goals of the Global Framework for Climate Services (GFCS) and other global initiatives of the World Meteorological Organization.

The high-priority status of DRM and the NCHM is reflected in a supporting architecture of legislation, frameworks, and rules and regulations. The country is also a member of the Sendai Framework for Disaster Risk Reduction. The challenge for Bhutan lies in its weak implementation capacity at the national and local levels. To further reduce risks associated with a changing climate and to advance its disaster risk reduction and climate change adaptation (CCA) agenda, government priorities include:

Strengthening national capacity to issue reliable and timely weather and flood forecasts, and to assess the impacts of climate change;

Assessment of glacier lake risks and establishment of a GLOF early warning system along the vulnerable river basins;

Improving regional collaboration for monitoring, understanding, and predicting weather and climatic hazards; and,

Increasing the geo-hazard and landslide risk management capacities of government agencies and communities to strengthen infrastructure resilience and ensure public safety.

Impact-based forecasting requires innovative institutional, legal, policy, and coordination mechanisms among different stakeholder institutions at national, district, and community levels. While these capacity gaps in terms of observation monitoring, data processing, modelling risk assessment and data communication were articulated to users in National Climate Outlook Forums (NCOFs), there is also a need to develop and provide gender-responsive climate services that will be inclusive of the needs of men, women and children at the community level. This will be addressed with the involvement of NGOs, CSOs, private sectors and the National Commission for Woman and Children.

This project should help the country address these gaps and meet user demands effectively. This project also will afford an opportunity to meet the demands of all climate-sensitive user sectors through the development and integration of a decision support system (DSS) to meet the specific needs of different user institutions and communities.

[1] National Center for Hydrology and Meteorology 2019, Analysis of Historical Climate and Climate projection for Bhutan

[2] <https://www.gfdrr.org/bhutan>.

[3] Royal Government of Bhutan and World Bank (2015), Modernizing Weather, Water, and Climate Services 2015.

[4] World Bank Country partnership Strategy: Report Number: 88597, August 2014.

[5] Office of the Resident Coordinator Situation Report No. 2 2016, Bhutan: Flash Floods

[6] National Environment Commission 2013, Technology Needs Assessment and Technology Action Plans for Climate Change Adaptation

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The proposed project shall enhance early warning and service delivery systems through building the capacity to produce and utilize impact-based forecasting. This includes the following components:

Component 1: Integrated monitoring and early warning infrastructure and communication to manage risks due to hydro-meteorological events

1. Enhancement of hydro-met observational networks in high-risk/highly vulnerable areas and other climate-sensitive areas. To provide early warning information on the impending GLOFs, GLOF early warning systems have been established in the river basins of Punakha-Wangdue and Chamkhar-Mangde. To meet the increasing demand and monitor the increasing risks from GLOFs and heavy rainfall triggered floods, an upgrade is required to the existing GLOF/Rainstorm Early Warning System (EWS) in Punakha-Wangdue and Chamkhar-Mangde valley to improve the effectiveness of the Early Warning Services and their integration into the Central Decision Support System (DSS). In addition, the establishment of new monitoring systems is required to protect several identified high-risk communities.

2. Develop a central database for collecting, processing, and archiving of historical climate and hydrological data, forecasts, projections, water and hydrological data, cryosphere data and guidelines for their application. This database will be connected to a web-based platform and DSS that allows data sharing (e.g., hydro-meteorological hazards data from NCHM and exposure/vulnerability data from DDM and other concerned agencies to develop multi-hazard risk assessments), thereby enabling co-development of impact-based forecasts and response advisories for integration of climate risk information in planning and decision-making for various sectors and users.

3. Improvement of information flow, communication, and IT systems through the creation of synergized Standard Operating Procedure (SOP) between NCHM and agencies in climate-sensitive sectors (e.g., water, agriculture, disaster management). Development of sector-specific DSS that provide real/near-real-time impact-based forecasts and response advisories to guide and enhance the use of forecast information. The DSS/tools will have built-in bulletin generation and dissemination systems, using email, SMS, and other mobile applications, and may also be linked to the common alerting protocol (CAP) that will be established for the dissemination of up to the minute information.

4. Develop and set up a National Climate Data and Information Centre (NCDIC) and National Hydrological Data and Information Centre (NHDIC) including the Cryosphere for processing and analysis, archiving, monitoring, assessing, and providing public access to the nation's treasure of climate science and historical hydrological and cryosphere data and information. This will also include the search and rescue of historical data.

Component 2: Generating high-impact products and services through the transfer of technology

1. Improvement of the Numerical Weather Prediction System with models tuned to the country's unique climate context in terms of resolution and skill for weather forecasting, seasonal predictions and for climate projection (a seamless forecasting system).

2. Enhancement of the forecasting capabilities of the National Weather and Flood Warning Centre (NFWFC) in Thimphu to develop models, tools, data, products and services.

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3. Downscale global climate model/regional climate model (GCM/RCM) projections to 10 to 5 km grid resolution using a combination of dynamical and statistical approaches to provide high confidence scenarios of future climate change for adaptation and decision support. The high-resolution outputs could be used in modelling glacial melt and hydrological models for water resources assessment. Support the implementation of specific vulnerability and adaptation measures in other user sectors with highly integrated impact models developed using layers of other data (land use and land cover, soil, evapotranspiration and population).

4. Application of climate change impact projections on the cryosphere and water resources including risks assessment for GLOF from critical glacial lakes in vulnerable river basins.

5. Capacity building of NCHM on generation and dissemination of downscaled climate outlook, extended and long-range weather forecasts, and impact-based sector-specific forecasts and response advisories (in collaboration with participating sectoral institutions) for planning and decision-making. This includes training on data assimilation, model development, glacio-hydrological models, melt models, integrated GLOF models, GIS-based data visualization, and system (model and tool).

Component 3: Enhancing user capacity for efficient climate application

1. Strengthening governance arrangements and coordination/communication mechanisms within NCHM, DDM, line ministries, stakeholders and users.

2. Capacity building of users at the national and local levels on the use of climate information (historical, trends, new-generation forecast products, and projections), products, and tools in sectoral planning and decision-making, including in the design of facilities. The design of the training plans will be based on the gender analysis and action plan and the existing knowledge and awareness of the users and stakeholders about the climate and early warning information services. This includes training on translating forecasts and early warning information on GLOF and floods into potential impacts and impact management advisories, and demonstrations of climate applications at national and local (pilot sites) levels. The demonstrations on the application of climate application will be through existing farm schools, national climate forums and mob drills on early warning information.

3. Enhancement of climate applications supports mechanisms, including strengthening of the multi-hazard NCOF for more meaningful stakeholder involvement, and the introduction of appropriate financial instruments (e.g. subsidy, microcredit, insurance), to encourage and sustain climate applications.

4. Provision of technical assistance to national stakeholders for customized impact-based products and services.

NCHM business delivery model, quality management system toward World Meteorological Organization (WMO) quality management certification, procurement management plan and sustainable operation and maintenance plan shall be detailed in the full proposal.

Project risks, if any, are very low, due to the following factors: a) project approach to involve communities, government institutions, and private sectors in upgrading, security, and maintenance of observing and monitoring stations; b) existing cadre of young and technically competent operational

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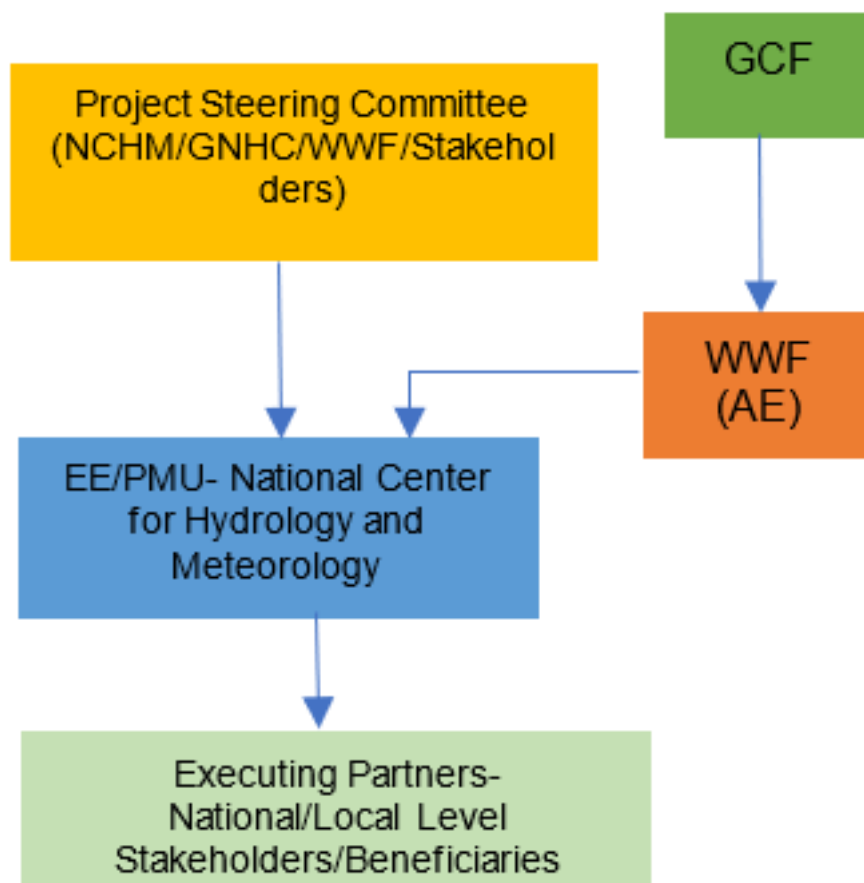
staff at NCHM who can absorb the planned capacity building and further develop products and systems; c) assessing and generating gender-responsive climate information and services; and d) ongoing NCHM engagement with sectoral institutions, private sector, NGOs, CSOs and local authorities in the NCOF, facilitating their participation in proposed activities. The sector agencies are already linked with the NCOF and South Asian Climate Outlook Forum (SASCOF) process anchored by NCHM. These linkages will be elaborated in the full proposal.

WWF, as the *Accredited Entity (AE)* shall be responsible supervising execution of the Project. This includes the oversight of monitoring and evaluation, overseeing the preparation of the annual performance report to the Green Climate Fund, and undertaking independent mid-term and terminal evaluations. A *Project Steering Committee (PSC)* shall be constituted as per the existing procedures of the Royal Government of Bhutan. The PSC shall be responsible for semi-annual evaluation against the M&E plan, and for providing feedback as well as guidance to NCHM including efforts to sustain project initiatives and outcomes.

The Project Management Unit (PMU) will be housed within NCHM, *the Executing Entity (EE)*, and shall be responsible for achieving project outcomes and effective use of resources. They will be accountable to the AE for managing the project, including quality check of project outputs; results documentation; quarterly evaluation against the work plan, budget, and M&E plan; quarterly reporting of project progress and financial performance to the AE; semi-annual reporting to the Project Steering Committee (PSC); and preparation of annual work plan and budgets. The figure to the right shows these relations.

The project implementing team, led by the EE, shall meet quarterly to review project progress, share problems met and identify corresponding solutions, highlight successes and lessons, and plan and coordinate for the next quarter activities. The PSC, convened by the EE, shall meet semi-annually.

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B.3. Expected project results aligned with the GCF investment criteria (500 words)

Impact potential. The proposed project shall enable the development and management of effective early warning systems and response mechanisms at community and national levels which will positively affect the lives of a large portion of the country's population. Technical support on the design of impact-based multi-hazard early warning systems, impact-based forecasting models, and risk information and dissemination mechanisms and procedures will help NCHM develop an integrated observation, forecasting and communication system that is suitable for the country. The central database, web-based platform, and DSS/tools will provide easy access to and enhanced integration of forecast information, for planning and decision-making. These would benefit about 150 user institutions at national, sub-national, and local levels and about 200,000 individual end users as direct beneficiaries, with at least 400,000 people as indirect beneficiaries. It is estimated that more than 70% of the population will benefit either directly or indirectly from this project.

Paradigm shift potential. Introduction of impact-based forecasting, a central database web/GIS-based platform and DSS/tools, synergized SOPs, and innovative dissemination mechanisms (e.g., mobile app, NCOFs) will help NCHM frame forecasts in formats that are easily understood and acted on by institutional and community end users, to increase community resilience and adaptive capacities. The project takes a capacity building approach to stakeholder inclusion, from the model and DSS/tool development to testing in an operational environment, model and tool transfer, and backup operational support from Regional Integrated Multi-Hazard Early Warning System (RIMES)

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until systems, tools, and product application are fully integrated into NCHM and institutional and end-user environments. DSS/tools proposed are expert systems that translate real/near-real-time science-based forecast information into potential impacts and response advisories for agriculture, health, tourism, hydropower and disaster management sectors. Similarly, the proposed web-based portal consolidates climate information and application for easy access and reference by various users. As Bhutan is an active member of regional networks developing such data collection and forecasting systems, the project can serve as a valuable learning laboratory for the design and effective utilization of early warning systems as a response to increasing risks from climate change, especially in Hindu Kush Himalayan (HKH) region, which faces high risks from GLOF and similar climate related disasters. The project therefore has the opportunity to inform development and implementation of National Adaptation Plans of other countries, particularly the developing ones.

Sustainable development potential. Economic co-benefits of the proposed project arise from avoidable economic and asset losses due to better preparedness for extreme events with the use of improved forecast and warning information, and from climate risk-informed programs and activities. Economic gains are also expected from better management of resources due to the use of impact-based forecasts in agriculture and other economic sectors. These benefits translate to better national capacity to invest in climate-resilient development. Social co-benefits include improved public safety due to early warning, better healthcare services for vector-borne diseases as their outbreak could be predicted, and general well-being with better access to food and fresh water from forecast-informed production. Other co-benefits, such as energy conservation through targeted precision agriculture will be articulated in the full proposal.

Responsive to recipients' needs. The proposed project shall address priority gaps and identified needs of NCHM and key stakeholders, including specific needs of women and other vulnerable groups in developing capacities for impact-based forecasting, and early warning and forecast application in agriculture, water, public health, and disaster management sectors to manage risks/ resources and enhance resilience against climate variability and change. These sectors are all climate-sensitive, with agriculture and hydropower being economically important. The project shall also contribute to addressing gaps in monitoring data availability and user capacity and confidence in using existing and new technologies to build climate resilience, as identified in the country's Second National Communication to UNFCCC. Lack of financial resources to implement priority adaptation actions is also a major constraint. The country has accessed donor and climate funds since 2010 to support mitigation actions and adaptation in the water sector through integrated water resource management. GCF support to the proposed project is strategic, in terms of creating an enabling environment for adaptation in seven climate-sensitive sectors.

Country ownership. The project has the strong support of the Government and is in direct response to demands of the national plans and from the populace for better disaster warning systems. *Bhutan Second National Communication (2011)*, National Adaptation Plan (2017), 11th (2013-18) and 12th (2018-23) Five Year National Development Plans, Gross National Happiness Commission Strategy, Climate Change Adaptation Program of Ministry of Agriculture and Forests (2016), Climate Smart Agriculture (2017) DRM Policies and Programs, all prioritized climate resilience for action and fulfils the national plan actions. This project builds on that commitment through direction action to disaster risk reduction and improved forecast and warning information for multiple economic sectors.

Efficiency and effectiveness. Requested grant resources shall help remove the investment barrier

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facing investments in climate adaptation. Private investment may not be possible, since proposed project activities are geared toward the provision of public products and services as public goods. The project makes use of existing mechanisms and builds on previous and ongoing climate risk management/adaptation initiatives, building on existing capacities while engaging participating sectoral agencies and other stakeholders. The introduction of synergized SOPs for impact-based forecasting between NCHM and key agencies, a central database and web/GIS-based portal with DSS/tools, and innovative dissemination methods will enhance forecast generation and dissemination and improve the use of forecast information in planning and decision-making. National and local stakeholder participation in the project will bring domain knowledge for decision-support tool development and facilitate community engagement processes, reducing requirements for technical consultants and, thus, project costs.

C. Indicative financing / Cost information (max. 2 pages)

C.1. Financing by components

Please provide an estimate of the total cost per component and disaggregate by source of financing.

Component	Output	Indicative cost (USD)	GCF financing		Co-financing			
			Amount (USD)	Financial Instrument	Type	Amount (USD)	Financial Instrument	Name of Institutions
1. Integrated monitoring and early warning infrastructure and communication to manage risks due to hydro-meteorological events		9,900,000	3,400,000	Grant	Public	6,500,000	Other	RGoN
2. Generating high-impact products and services through the transfer of know-how technology		9,000,000	3,500,000	Grant	Public	5,500,000	Other	RGoB
3. Enhancing user capacity for efficient climate application		6,600,000	2,600,000	Grant	Public	4,000,000	Other	RGoB
Project Management		500,000	500,000	Grant		0	Other	

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Indicative total cost (USD)	26,000,000	10,000,000	16,000,000
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For private sector proposal, provide an overview (diagram) of the proposed financing structure.

C.2. Justification of GCF Funding Request (300 words)

Bhutan's economy is highly reliant on Agriculture[1] which amounts to 12% of GDP. And considering 60% of the country's 750,000 population are dependent on this sector, shocks to Agriculture and allied sectors would have serious impacts on the country's economy. Even more so Agriculture, livestock and forestry are sectors that are at high risk of climate variability and change, as they are very much dependent on climatic seasonality and fragile production environments. While the country continues to investment in infrastructure, including hydropower, the exposure to climate risks also increases. Reduction and adaptation to such risks are therefore paramount.

High public debt, with a high risk of external debt distress[2], constrains public financing for adaptation. The country has, in fact, accessed external financial assistance from 2012 to support mitigation and adaptation efforts. However, impact-based climate and weather forecast and early warning services were not established as most of the previous work involved establishing and strengthening of monitoring and observing networks. With the impacts of climate change already being experienced, impact-based products and information is vital for adaptation and reduction of climate change induced hazards. GCF assistance would be of great value in this regard to strengthen the resilience of the vulnerable Bhutanese communities to the impacts of climate change. Maximum concession through a grant would be very much desired over the loan or other debt instruments, considering the country's high public debt. Private sector financing may be difficult to obtain, as the proposed project involves the provision of improved climate products and services, which are considered public goods.

However, public and private sector economic benefits anticipated from the project due to better management of resources and risks from the application of improved climate products and services could stimulate or catalyse further investments in climate-resilient development. Demonstration of avoided cost from impact-based forecasting and response advisories could create incentives for the government to increase its funding/investments or develop favourable policies for climate information and early warning services. Similarly, the recognition of climate risks and impacts by the private sector and the communities could lead to the establishment of an insurance market, as impact forecast could lead to better risk reduction and lowering of insurance premium rates. It should be noted though that such investments could be realized only after demonstration of the benefits from the use of improved climate products and services, which this project proposes.

[1] <http://documents.worldbank.org/curated/en/737921507887264006/pdf/120417-WP-PUBLIC-CountrySnapshotMaldives-Final-merged.pdf>

[2] <http://documents.worldbank.org/curated/en/737921507887264006/pdf/120417-WP-PUBLIC-CountrySnapshotMaldives-Final-merged.pdf>

C.3. Exit Strategy and Sustainability (300 words)

Stakeholder participation, capacity building, highly scalable tools, demonstration approach, and linkage with RIMES are the strategies for project sustainability and replicability.

Proposed interventions are based on needs and demands from institutions that participate in the

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NCHM-convened NCOF. Model and tool development, and climate application demonstrations shall involve key personnel from NCHM and participating institutions, such as Ministry of Forest and Agriculture, National Environment Commission, Ministry of Health, National Disaster Management Center, and their line agencies, including local institutions at the pilot sites, to facilitate ownership of processes, products, and outcomes. The NCOF shall be used as a platform for monitoring and reporting of project milestones, and for evaluation of the effectiveness of climate services and applications in developing adaptive capacity.

Models and tools shall be developed with the involvement of NCHM and concerned institutions to facilitate technology transfer, and enable them to operate, maintain, and further develop these systems on their own, with remote assistance from RIMES if required. These systems shall be transferred to NCHM and institutional users and integrated into their operational systems. RIMES shall provide handholding and backup support even after project-end, as may be required until this integration is realized. Decision support systems are highly scalable - although developed for the pilot sites, systems can be easily scaled with the input of site-specific data for additional locations. Engagement with and support to users for applications shall be undertaken through a demonstration approach to guide user institutions in facilitating capacity building processes with end users. Climate application demonstration outcomes shall be documented, with benefits quantified, to generate evidence for convincing policy- and decision-makers to invest in climate adaptation/ resilience and scale the impacts of the project.

Ownership of observing systems that will be established under the project shall be transferred to NCHM. NCHM shall collaborate with the Ministry of Agriculture, Hydropower and other user sector Ministries under an Agreement framework, for operation, maintenance, and security observing systems. The proposed project budget has provision for spare sensors, to allow NCHM time to integrate maintenance costs into its operational budget. The design, procurement, establishment of observation systems, forecasting models, information and communication infrastructure, DSS/tools and web/GIS-based platforms, protocols and procedures are all based on a comprehensive assessment of current capacities and requirements, as well as identified needs and resource capacity to operate, maintain and sustain the system, to maximize their long-term benefits. Cost-effective systems suitable for the country will be prioritized for implementation. The provision of enhanced and targeted forecasting analyses to agencies and private sector clients on a fee basis will be explored under the project.

C.4 Stakeholders engagement in the project or programme (300 words)

The project concept was developed with inputs from institutions that are participating in the User Forum. Stakeholders of the proposed project are also key stakeholders of the User Forum, which NCHM convenes. In developing the concept into a funding proposal, meeting with stakeholders shall be organized to obtain further inputs from key stakeholders, ensure that priority needs are integrated into the proposal, determine baselines, and finalize the Monitoring and Evaluation (M&E) plan. All stakeholder consultations will be organized and conducted using a gender-responsive and inclusive approach to ensure a participatory and equitable consultation and engagement process through the project cycle.

The development of a central database and web/GIS-based platform with DSS/tools will allow NCHM, key stakeholders and representatives of at-risk communities to co-design and co-deliver impact forecasts and response advisories up to the last mile. Indigenous knowledge and other traditional methods for forecasting and/or response will be integrated during the co-design process.

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A Stakeholder Engagement Plan will be prepared for the project during the development of the funding proposal.

D. Annexes

- ESS screening check list (Annex 1)
- Map indicating the location of the project/programme (as applicable)
- Evaluation Report of previous project (as applicable)

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Annex 1: Environmental and Social Screening Checklist

Part A: Risk Factors

Please indicate your answers to the questions below and provide an explanation on the response selected. In cases when the TBD response has been selected please explain briefly why you are not able to determine now and when in the project cycle the question will be addressed.

If the criteria is not applicable to the project you may write N/A in the justification box.

Exclusion criteria	YES	NO
Will the activities involve associated facilities and require further due diligence of such associated facilities?	<input type="checkbox"/>	<input checked="" type="checkbox"/>
N/A		
Will the activities involve trans-boundary impacts including those that would require further due diligence and notification to affected states?	<input type="checkbox"/>	<input checked="" type="checkbox"/>
N/A		
Will the activities adversely affect working conditions and health and safety of workers or potentially employ vulnerable categories of workers including women and children?	<input type="checkbox"/>	<input checked="" type="checkbox"/>
N/A		
Will the activities potentially generate hazardous waste and pollutants including pesticides and contaminate lands that would require further studies on management, minimization and control and compliance to the country and applicable international environmental quality standards?	<input type="checkbox"/>	<input checked="" type="checkbox"/>
N/A		
Will the activities involve the construction, maintenance, and rehabilitation of critical infrastructure (like dams, water impoundments, coastal and river bank infrastructure) that would require further technical assessment and safety studies?	<input type="checkbox"/>	<input checked="" type="checkbox"/>
The proposed project may include some minor rehabilitation work to already existing structures. But these would not require any technical assessments or feasibility studies.		
Will the activities potentially involve resettlement and dispossession, land acquisition, and economic displacement of persons and communities?	<input type="checkbox"/>	<input checked="" type="checkbox"/>
N/A		
Will the activities be located in or in the vicinity of protected areas and areas of ecological significance including critical habitats, key biodiversity areas and internationally recognized conservation sites?	<input type="checkbox"/>	<input checked="" type="checkbox"/>
N/A		
Will the activities affect indigenous peoples that would require further due diligence, free, prior and informed consent (FPIC) and documentation of development plans?	<input type="checkbox"/>	<input checked="" type="checkbox"/>
N/A		
Will the activities be located in areas that are considered to have archaeological (prehistoric), paleontological, historical, cultural, artistic, and religious values or contains features considered as	<input type="checkbox"/>	<input checked="" type="checkbox"/>

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critical cultural heritage?		
N/A		

Part B: Specific environmental and social risks and impacts

Assessment and Management of Environmental and Social Risks and Impacts	YES	NO	TBD
Has the E&S risk category of the project been provided in the concept note?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
Has the rationale for the categorization of the project been provided in the relevant sections of the concept note?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
Are there any additional environmental, health and safety requirements under the national laws and regulations and relevant international treaties and agreements?	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
N/A			
Are the identification of risks and impacts based on recent or up-to-date information?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
The project Executing Entity provided the GCF Agency Safeguards office with necessary information to conduct a preliminary risk and impact screening.			
Labour and Working Conditions	YES	NO	TBD
Will the activities potentially have impacts on the working conditions, particularly the terms of employment, worker's organization, non-discrimination, equal opportunity, child labour, and forced labour of direct, contracted and third-party workers?	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
N/A			
Will the activities pose occupational health and safety risks to workers including supply chain workers?	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
N/A			
Resource Efficiency and Pollution Prevention	YES	NO	TBD
Will the activities generate (1) emissions to air; (2) discharges to water; (3) activity-related greenhouse gas (GHG) emissions, (4) noise and vibration; and (5) wastes?	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
N/A			
Will the activities utilize significant amount of natural resources including water and energy?	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
N/A			
Will there be a need to develop detailed measures to reduce pollution and promote sustainable use of resources?	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
N/A			
Community Health, Safety, and Security	YES	NO	TBD
Will the activities potentially generate risks and impacts to the health and safety of the affected communities?	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>

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N/A			
Will there be a need for an emergency preparedness and response plan that also outlines how the affected communities will be assisted in times of emergency?	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
N/A			
Will there be risks posed by the security arrangements and potential conflicts at the project site to the workers and affected community?	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
N/A			
Land Acquisition and Involuntary Resettlement	YES	NO	TBD
Will the activities likely involve land acquisition and/or physical or economic displacement?	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
The proposed project will not involve acquisition of land or physical or economic displacement.			
Biodiversity Conservation and Sustainable Management of Living Natural Resources	YES	NO	TBD
Will the activities potentially introduce invasive alien species of flora and fauna affecting the biodiversity of the area?	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
The proposed project is a technical and institutional capacity project and there are no potential impacts envisaged on ecosystems services.			
Will the activities have potential impacts on or be dependent on ecosystem services including production of living natural resources (eg. agriculture, animal husbandry, fisheries, forestry)?	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
The proposed project is a technical and institutional capacity project and there are no potential impacts envisaged on ecosystems services.			
Indigenous Peoples	YES	NO	TBD
Will the activities potentially have any indirect impacts on indigenous peoples, ethnic minorities, or vulnerable and marginalized groups?	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
The proposed project is a capacity building project and does not involve any indirect impacts on IPs, vulnerable, or marginalized groups.			
Cultural Heritage	YES	NO	TBD
Will the activities restrict access to the cultural heritage sites and properties?	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
N/A			
Will there be a need to prepare a chance-find procedure in case of the discovery of cultural heritage assets?	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
N/A			
Stakeholder engagement and grievance redress	Yes	NO	TBD
Will the activities include a continuing stakeholder engagement process and a grievance redress mechanism and integrated into the management/implementation plans?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
According to WWF's Environment and Social Safeguards Integrated Policies and Procedures (SIPP), a Stakeholder Engagement Plan will be developed during the proposal development			

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stage. The Stakeholder Engagement Plan will include the necessary GRM system for the proposed project.			
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Part C: Sign Off

Sign-off: *Specify the name and designation of the person responsible for the environmental and social screening and any other approvals as may be required in the accredited entity's own management system.*

Anushika Karunaratne, Lead Specialist, Safeguards David McCauley, WWF GCF Executive Coordinator and Senior Vice President