Version: 1

ADAPTATION FUND

PROPOSAL FOR A REGIONAL PROJECT/PROGRAMME

Title of Project/Programme: Hydrological Status and Outlook system for integrated water resources management and climate resilience in Bangladesh and Nepal (HydroSOS-BaNe)

Countries: Bangladesh, Nepal

Thematic Focal Area[1]: Disaster risk reduction and early warning systems

Type of Implementing Entity: Multilateral Implementing Entity

Implementing Entity: World Meteorological Organization

Executing Entities: World Meteorological Organization, Bangladesh Meteorological Department (BMD), Bangladesh Water Development Board (BWDB), Department of Hydrology and Meteorology of Nepal

Amount of Financing Requested: 12,090,000 (in U.S Dollars Equivalent)

Project Formulation Grant Request: Yes ☒ No ☐

Amount of Requested financing for PFG: 0 (in U.S Dollars Equivalent)

Letters of Endorsement (LOE) signed for all countries: Yes ☒ No ☐

NOTE: LOEs should be signed by the Designated Authority (DA). The signatory DA must be on file with the Adaptation Fund. To find the DA currently on file check this page: https://www.adaptation-fund.org/apply-funding/designated-authorities

Stage of Submission:

☐This project proposal has been submitted before

☒This is the first submission ever of the project proposal

In case of a resubmission, please indicate the last submission date: N/A

[1] Thematic areas are: Food security; Disaster risk reduction and early warning systems; Transboundary water management; and Innovation in adaptation finance.

Executive Summary

Bangladesh and Nepal cover a major portion of the Ganga Brahmaputra Meghna (GBM) River Basin that spreads over 1.7 million sq. km. This targeted region with a population of more than 500 million is one of the most populated river basins across the world. Both Bangladesh and Nepal[2] face increasing climate change-related events impacting its socio-economic and ecological context including water resources management. The worst affected are those dependent on the agricultural sector, estimated to be 60-70% of the total population. The socio-economic baseline vulnerability conditions are being exacerbated by a climate that has undergone considerable change in recent decades and is expected to continue further. Based on the national consultations carried out by the World Meteorological Organization during 2019-2020 with the stakeholders of the GBM-targeted countries, the immediate need for alternating flood and water shortages monitoring and forecasting systems and associated water resources information are highlighted of a growing economy and population.

The proposed project seeks to increase the climate adaptive capacities and resilience of beneficiary communities to hydro-climatic risks. Furthermore, it will enhance local, national, and regional adaptation strategies and implementation mechanisms based on an approach of integrated monitoring and management of water resources. Floods and drought being a common feature in the two countries, the project envisages strengthening the capacities of the National Meteorological and Hydrological Services (NMHSs) through an innovative, robust, and tailored Regional Hydro-Meteorological Early Warning System (providing short-term and seasonal status) embedded into a Long-term Integrated Water Resource Information System with concrete adaptation actions developed through a participatory process and executed in an integrated manner.

The HydroSOS BaNe project is aligned with the Adaptation Fund objective to "reduce vulnerability and increase adaptive capacity of communities to respond to the impacts of climate change at local, national and regional level" and also it will support the United Nation Early Warning System for All initiative which is led by the World Meteorological Organization with other international partners to cover everyone on the planet (Bangladesh and Nepal are part of first 30 priority countries) with the Early Warning system in the next five years. Implementing climate adaptation strategies and improving the management of water resources are recognized by the two GBM riparian countries as one of the major challenges. The project will tackle climate adaptation issues, ensuring transversal solutions from governance to technical and decision-making. It will develop the underlying capacity of national and regional institutions to maintain long-term sustainability and to scale up the results. It will support stakeholders at all levels by providing policy and management guidance and by sharing scientific information, knowledge and best practices for an integrated disaster risk reduction and climate change adaptation.

Risk maps, Community-based flood and drought management, Hydrological Status and Outlook systems will be implemented to strengthen integrated water resources management and early warning systems, leading to increased preparedness and resilience to floods and drought events. Furthermore, at the local scale, agricultural practices will be improved based on new knowledge and early warnings that will enable farmers to adapt their production methods. The HydroSOS BaNe project will assist the two countries in the implementation of coordinated and joint measures to improve their existing flood and drought management strategies and plans at the regional, national and local levels and to build on the lessons learned from the past and current projects related to disaster risk reduction and climate change adaptation. The two riparian countries will therefore benefit not only from a basin-wide transboundary management framework to ensure long-term social, economic and environmental development, as well as concrete solutions to alleviate a potential increase of vulnerability and to build an effective network of actors.

The World Meteorological Organization (WMO), as an Implementing and Executing Entity, will be involved in supervision and execution at several levels during the implementation of the project activities, allowing to benefit from its international as well as regional presence. At the national level, NMHSs as the Executing Entities, will fulfill the execution, coordination, and relationships with the institutions and stakeholders at the local and national levels. One of the inter-governmental regional entities will be the focal point for hosting the HydroSOS EWS including data sharing coordination and links with the national structures. ICIMOD has provided a support letter to lead the regional cooperation and coordination ensuring technical tools, lessons learned, good practices, and sustainability will be developed and/or shared.

The long-term sustainability of the project achievements is supported by the NMHSs of the two targeted countries sharing the meteorological, hydrological and climatological data and related products for the HydroSOS EWS. NMHSs and other agencies in charge of disaster management and environmental protection have already provided their support to ensure the long-term transfer of information from the national database to continue operations of the proposed HydroSOS EWS coordination unit at the inter-governmental regional entity. Furthermore, identification and defining the roles and responsibilities of various stakeholders at national and regional levels will be carried out in the final proposal development and inception phase.

[2] During the project development phase, WMO continuously consulted India, Bhutan and People's Republic of China (PRC) for their participation as the executing entities for the proposed HydroSOS project. However, India, Bhutan and PRC have not submitted endorsement and commitment letters. So, the proposed project is again submitted only for the two countries: Bangladesh, and Nepal. Once the project is approved and moves into implementation, National agencies of India, Bhutan and PRC will be invited as observers or technical partners to participate and develop HydroSOS system and after the completion of the project, it is expected that the HydroSOS EWS will be scaled up to cover the entire GBM region possibly through national investments or international funding mechanism

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PART I: PROJECT/PROGRAMME INFORMATION

Title of Project/Programme:	Hydrological Status and Outlook system for integrated water resources management and climate resilience in Bangladesh and Nepal (HydroSOS-BaNe)
Countries:	Bangladesh, Nepal
Thematic Focal Area[3]:	Disaster risk reduction and early warning systems
Type of Implementing Entity:	Multilateral Implementing Entity
Implementing Entity:	World Meteorological Organisation (WMO)
Executing Entities:	World Meteorological Organisation (WMO) and National Meteorological and Hydrological Services of the targeted two countries (Bangladesh Meteorological Department, Bangladesh Water Development Board (BWDB), Department of Hydrology and Meteorology of Nepal)
Amount of Financing Requested:	12,090,000 USD ($)

Project / Programme Background and Context:

Project Overview

Approx. 1.9 billion people, or a quarter of the world's total population live in South Asia. It includes 216 million extremely poor constituting 29% of the world's total poor population[4]. The South Asian region is amongst the most vulnerable from a climate change point of view, making it further challenging for the sustenance of growth and development. There is a heavy dependence on climate-sensitive livelihoods such as agriculture, fishing, forestry etc. and the region is experiencing impacts of climate change including flooding, Glacial Lake outburst flood (GLOF), forest fires, soil erosion, and saline water intrusion. A key focus that has received significant prominence in recent times is the effective use of available water resources and its efficient management to withstand impacts of future climatic change and sustain hard-earned developmental gains. Due to climatic changes, water resources face a variety of stresses such as variations in rainfall, rising surface temperatures, population growth, rapid urbanization, and industrialization. At the same time, an effective water resource management mechanism carries enormous potential for poverty alleviation, reducing impact of floods and droughts, and realization of various water resources projects such as hydropower, irrigation, navigation etc.

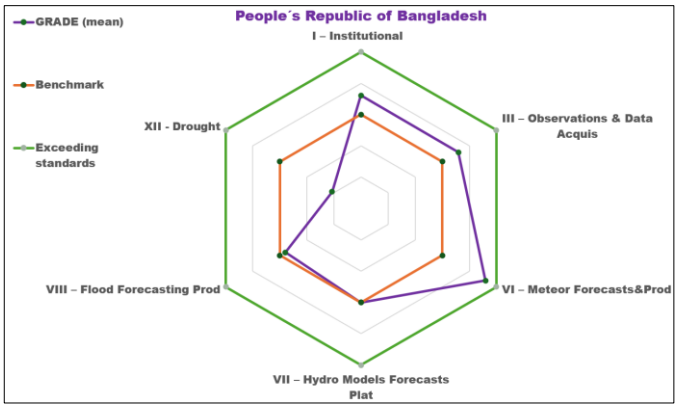
Bangladesh and Nepal cover a major portion of the Ganga Brahmaputra Meghna (GBM) River Basin. The GBM basin spread over an area of over 1.7 million sq. km and has a population of more than 500 million, making it one of the most populated river basins in the world. Both Bangladesh and Nepal face challenges stemming from its socio-economic and ecological context leading to inadequate water resources management. Climate extremes specifically, floods and droughts are common phenomenon with enormous environmental, social, and economic consequences. Despite abundant natural resources, the number of people living under the poverty line and highly vulnerable to climate change events in these two countries are estimated to be around 10 million (ADB, 2019). The monsoon flooding during 2017 in the GBM basin, resulted in ~1200 deaths[5]. Around 80% of Bangladesh is floodplain, with major floods affecting millions of people every six years or so. Nepal relies on the monsoon system for its agriculture; and significant rainfall variation leads to drought, flood, landslides etc. putting much stress on the country's food distribution system. More than 10 glacial lakes of Nepal are identified as Potentially Dangerous Glacial Lake (PDGL) which may outburst causing floods and endangering human lives with major impact on agriculture, infrastructure, ecosystem and environmental services. Nepal faces a range of water induced hazards including glacier lake outburst flood (GLOF), landslides, debris flow, riverine flooding, flash floods and urban floods. It experiences increased water availability during the monsoon but a scarcity during the winter and pre-monsoon season impacting agriculture that is mostly monsoon dependent. Studies conducted for the GBM region suggest that there will be significant variation in flow and quality of water over a medium to long term with a strong impact on population, water for public use, demand for irrigation, hydropower, industry etc. The overall trend in the GBM region points towards a growing anthropogenic development combined with climatic changes resulting in additional demands on water resources and triggering challenges such as ecosystem degradation, erosion, salinization, water logging, displacements and migration. When water shortages or drought events occurs, impacts to agricultural yields, threatening food security and widespread migration across the sub-region can be witnessed.

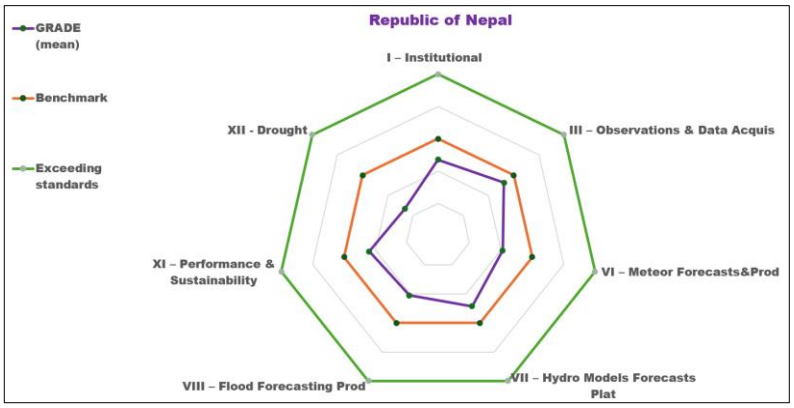
The prevailing conditions make it imperative that there should be adequate capacity at a regional, national and local level in terms of technical knowledge and decision making for shared water resources and risk management mechanism for climate extremes. Based on a recent assessment and participative consultations carried out by the World Meteorological Organization (WMO) with the National stakeholders of the two targeted GBM basin countries, immediate need for alternating flood and water shortages monitoring and forecasting systems during the monsoon and dry seasons and associated water resources information are highlighted of a growing economy and population. Other main conclusions highlighted were to build upon the current context and on-going work to prepare the region for future socio-economic development and environmental changes, such as integration of disaster risk reduction in the national adaptation and management plans (National Adaptation Plans (NAPs) and National Adaptation Programme of Action (NAPA) identified under the National Determined Contribution's (NDC) for the GBM countries. It thus calls for innovative frameworks and policies, enhancement of synergy, complementarities and coordination at regional level to foster integrated flood and drought management including ecosystem based adaptations, availability of standardized interoperable Hydro-meteorological data, especially on real time basis, coordination of information channels and procedures for

[3] Thematic areas are: Food security; Disaster risk reduction and early warning systems; Transboundary water management; Innovation in adaptation finance.
[4] https://worldbank.github.io/SARMD_guidelines/poverty-measures.html
[5] https://iopscience.iop.org/article/10.1088/1748-9326/ab10ee/meta

end-to-end early warning systems, and increase in knowledge availability with community members on social-economic and environmental risks and their participation in decision making.

During the proposal development phase, WMO carried out the initial assessment for the two targeted countries to understand National Meteorological and Hydrological Services (NMHSs) current capacities, gaps and needs for the strengthening of the end-to-end flood and drought forecasting and early warning system (preliminary assessment reports are available here Bangladesh and Nepal). The initial findings visualized through the below spider graph highlights limited capacities (purple graph not touching the benchmark) and needs (objective is to make purple graph touches the points of orange or beyond that) in the strengthening of the entire value chain of the flood and drought forecasting and early warning systems which is being supported by the HydroSOS BaNe project.





There is a need for improving and complementing the adaptation plans, guidelines and policies on the climate-based threats especially for floods and drought events in GBM countries such as Bangladesh and Nepal. At the national level, Bangladesh and Nepal have existing climate change adaptation action plans and strategies or are in the process of implementing National Adaptation Plans (NAPs) and National Adaptation Programme of Action (NAPA) enhancing the climate change adaptation efforts of the national agencies and their communities. Furthermore, both countries have listed activities on integrated water resources management, early warning and climate adaptation in their intended nationally determined contributions (INDCs). The main areas for INDCs listed by the two GBM riparian countries are summarized in Table 1 for the topics closely related to the major fields of the HydroSOS BaNe project. The countries are dedicated to find support for achieving the targets.

Table 1: INDC areas of the GBM countries

GBM project countries / INDC contribution to	Bangladesh	Nepal
Surface Water Use and Rainwater Harvesting	☒	☒
Water Resources Management	☒	☒
Flood management	☒	☒
Agriculture and Food Security	☒	☒
Disaster Management	☒	☒
Capacity Building and Strengthening of relevant stakeholders	☒	☒

Source : https://unfccc.int/NDCREG

Geographical Context

The GBM river basin is located between latitude 21°25′N to 31°50′N and longitude 73°25′E to 98°75′E. (Figure 1). It is a transboundary river basin covering an area of 1.7 million sq. km., distributed between five countries: Bangladesh (7%), Bhutan (3%), China (18%), India (64%)

and Nepal (9%)[6]. The GBM basin is the third largest freshwater outlet to the ocean and each of its three main rivers have important tributaries, some of them being transboundary themselves. The three main rivers converge a few hundred km. upstream in Bangladesh before flowing into the Bay of Bengal.

Both Ganga and Brahmaputra rivers originate in the Himalayan Mountain Range. The Ganga River emerges from the Gangotri Glacier and joins the Bay of Bengal after traversing a distance of 2758 km. The Brahmaputra River which is known as Yalung Zangbo in China originates in the northern slope of Himalaya and after flowing through India enters into Bangladesh where it is called Jamuna. It traverses a total length of 2260 km[7] and both Ganga and Brahmaputra join together in the Sundarbans of Bangladesh. The tributaries of Meghna River originate in the mountains of eastern India. A prominent tributary for example is Barak River and these tributaries flow southwest into Bangladesh to join Ganga and Brahmaputra. As a result of this confluence, a large delta is formed comprising 80% of Bangladesh and part of Bengal (India) before they flow together into the Bay of Bengal. The GBM basin as shown under Figure 1 shows distinct climatic features due to Monsoon variability and unique topographic features. For example, it includes elevation up to 8848.86 m in the upper Himalayan region and the plains of Ganges, Terai, Northeast India and Bangladesh. Mount Everest, the highest peak in the world and Cherrapunji the second wettest place anywhere, are part of the GBM region. Most of the river system in the basin is located in the monsoon belt and rainfall varies from 250 to more than 4000 mm a year. The unique topographic features of the GBM basin alters monsoonal flow shaping spatial distribution of precipitation. For example, it results in higher rainfall in the mid mountains-southern foothills of Nepal, Northeast part of India close to Bangladesh and much lower on the leeward side. The Ganga basin is known for high snowfall in the upper Himalayan region, high precipitation in the middle mountain range and plains of Ganges with very precipitation in the northwest of the upper region and very high precipitation downstream closer to the deltaic areas in Bangladesh. The Brahmaputra basin has both high precipitation zones and dry rain shadow areas while the Meghna River basin has the world's highest precipitation area. The delta region experiences strong cyclonic weather both before and after the monsoon season. The winter precipitation is mainly through the Western disturbances and Indian Monsoon alone accounts for 60-90% of the annual total rainfall in the GBM basin. The temperature as a function of altitude varies from 40 degree C in the plains of Bangladesh during summer to minus 30s degree C in the upper Himalayas.

Figure 1 https://www.researchgate.net/figure/Ganges-Brahmaputra-Meghna-GBM-Basin_fig2_326831987

Table 2: GBM Basin Area within Countries[8]

Country	Ganges basin		Brahmaputra basin		Meghna basin	
	Basin area (1000 km²)	Percentage of total area	Basin area (1000 km²)	Percentage of total area	Basin area (1000 km²)	Percentage of total area
China	33	3	293	50		
Nepal	140	13				
Bhutan			45	8		
India	861	80	195	34	49	58
Bangladesh	46	4	47	8	36	42
Total	1,080	100	580	100	85	100

Flood and Drought situations in the two GBM Basin Countries Bangladesh

The landmass of Bangladesh is formed due to the process of sedimentation of the GBM river system, and it is mostly flat terrain except the north-east and its south-east region. Bangladesh receives 72% of its rainfall during the southwest monsoon, with average rainfall being approx. 2300 mm. It experiences four types of floods: flash flood, rain-fed, riverine flood and flood due to cyclonic storm surge. Around 25-30% of the entire country reports flooding every year. There have been eight major floods during 1954-2020 with one of them in 1998 being the most impactful flooding nearly 68% of the country. The country receives large quantities of runoff sediments which makes riverbank erosion a major challenge. Apart from these, drought is a major concern. In the last five decades, Bangladesh has suffered 20 severe droughts with significant impact on its water and food security[9]. The northern region which is the food basket of the country also happens to be the most impacted from drought occurrences. In addition, in north-western part of the country, which is currently known as hotspot for drought, severe scarcity of water for domestic & agriculture purpose is a growing concern now during dry season. In recent times, major droughts have occurred in 1995, 2000, 2006 and 2009.

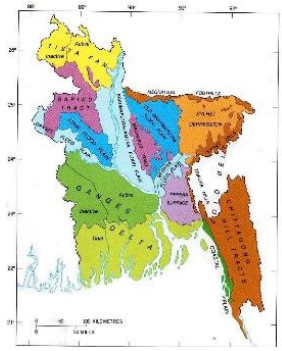


Figure 2: river basins covering Bangladesh region.

[6] FAO. 2011. AQUASTAT Transboundary River Basins – Ganges-Brahmaputra Meghna River Basin. Food and Agriculture Organization of the United Nations (FAO). Myanmar not included in the list of countries here has approx.100 sq. km. of the upper Meghna River with around 300 residents (World Bank 2015).

[7] Sharma et al. 2021. Climate Change detection and attribution in the GBM River Basin. Geoscience Frontiers. https://doi.org/10.1016/j.gsf.2021.101186

[8] Salehin, Mashfiqus & Khan, M Shah Alam & Prakash, Anjal & Goodrich, Chanda. (2011). Opportunities for Transboundary Water Sharing in The Ganges, The Brahmaputra and The Meghna Basin.

[9] Islam, S.M.S; Islam, K.M.A; and Mullick, M.R.A. 2022. Drought hot spot analysis using local indicators of spatial autocorrelation: An experience from Bangladesh. *Environmental Challenges*, 6. https://doi.org/10.1016/j.envc.2021.100410

Nepal Nepal covers most of the Himalayan Mountains or peaks and being a water abundant country experiences frequent flooding. Lately it is suffering from increasing instances of localized drought as well under the effect of climatic change. Nepal carries other hazard risks such as landslides, GLOF, urban floods etc. The country receives about 80% of its total rainfall during the monsoon (June-September) period. During monsoon, flash floods are often a major hazard with 70% of the settlements being located within the drainage basin. The country faces several glacial lake outbursts flood (GLOF) in past. There are 2070 glacial lakes with size >0.03km2 in Nepal, out of which 21 are identified as potentially dangerous for GLOF. Apart from this, there are 26 potentially dangerous glacial lakes located in China (25) and India (1), which could have a flooding impact in Nepal and downstream, if GLOF occurs. Major GLOF incidents in recent times include Bhotekoshi (2016) which damaged the headwork of Bhokekoshi Hydropower Project (45 MW) and Barun River(2017) which caused flooding and debris flow in Makalu Barun National Park area. In addition to GLOF, the river blockage due to landslides and debris flows causes formation of artificial dams and subsequent Landslide Dam Outburst Flood (LDOF) causing significant impact on downstream settlements and infrastructure. The Melamchi flood (2021) is one example of the cascading effect of GLOF, LDOF and heavy rainfall. The flooding in 2019 affected most of the districts of Terai and caused 90 deaths, and USD 584.6 Million damage to infrastructures and services[10]. There are increasing incidents of prolonged droughts with consequent risk for forest fires, agricultural losses, biodiversity losses etc.

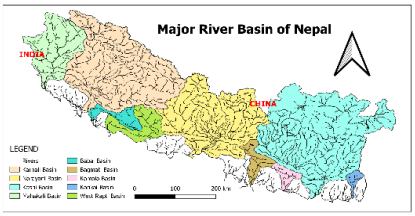


Figure 3: Major River basins of Nepal

GBM Region

The GBM basin is identified as the most flood prone basin. Bangladesh and Nepal, receives an average annual precipitation of 2200 mm and 1600 mm respectively; with floods, drought and landslides being its major concerns. Flood during and after monsoon often disrupt lives and livelihoods. In 2021 at least three major floods were reported in Nepal. Two of them occurred in June 2021, the first was a flash flood which occurred in the rain shadow northern region (Manang District) and the second, known as Melamchi disaster, was a result of intense rainfall combined with glacier deposition dislocation and landslide dam outbursts resulting in flash flood and debris flow affecting the Melamchi water supply project. The third flood incident occurred during Post Monsoon period in October 2021, and it resulted widespread damage to farm sector and caused agricultural losses to the tune of 10 million USD.

Risk hotspot

The GBM is one of the risk hotspots in South and Southwest Asia where disaster risk areas converge with poverty, population density and a low human development index. More than one third or 34.55 % of the total population in the GBM basin are at the risk of flood exposure (UN ESCAP 2020). As a matter of fact, it has a flood-drought syndrome as the rivers flood during the monsoon while they are drier during the remaining periods, causing water scarcity. A relationship is found between floods in the GBM basin and El Nino Southern Oscillation, for example six out of the seven most devastating floods have occurred during La Nina years.

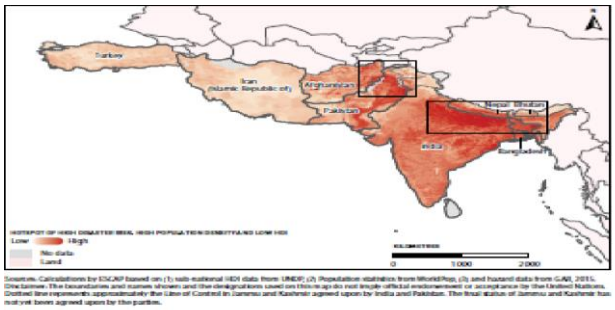


Figure 4: Risk hotspots of GBM basin

Socio-Economic Context

The estimated population living in the GBM region is more than 500 million, 70% of which are rural and together they constitute one of the world's largest pocket of poverty[11]. The population density is high for example, when compared with Africa, the latter is 18 times bigger in size with a population less than twice that of the GBM region. The intra-basin population density however varies; for example, the lowest is reported from China 6 per sq. km. followed by Bhutan 18, Nepal 195, India 432 and Bangladesh for which the highest 1013 number of people are living per sq. km. The two targeted countries falling within the basin; Bangladesh and Nepal are ranked between 129 and 143 in the global Human Development Index (HDI): a composite measure of average achievement on key parameters of a long and healthy life, education, and standard of living (UNDP 2020). The intra-basin comparison shows that only 0.79% of the population has a high HDI whereas 32.5 % fall within low and medium HDI. The vast majority of people depend on agriculture for their livelihood.

Administratively Nepal is divided into 7 Provinces, 77 Districts, 753 Local Levels (293 Municipalities and 460 Rural Municipalities). Administratively Bangladesh is divided into eight Divisions (namely: Dhaka, Mymensingh, Sylhet, Rajshahi, Chittagong, Khulna, Rangpur and Barisal), 64 districts, 492 Upazila (Sub-districts) and 4554 Unions (group of villages).

Table 3: Socio-Economic Conditions of GBM Countries[12]

Socio Economic Indicators	Bangladesh	Nepal

[10] https://un.org.np/sites/default/files/doc_publication/2018-11/PFRNA_Report_Final.pdf
[11] UN ESCAP (2020). The Disaster Riskscape across South and South-West Asia The Disaster Riskscape across South and South-West Asia: Key Takeaways for Stakeholders (unescap.org)
[12] Rasul, G. 2015. Water for growth and development in the Ganges, Brahmaputra, and Meghna basins: an economic perspective, International Journal of River Basin Management, 13:3, 390. DOI: 10.1080/15715124.2015.1012518

Estimated Population	169,828,911	29,164,578 (2021)
Population Annual Growth Rate between 2022-2023	1.11%	0.92% (2011-2021)
Population below National Poverty Line (In Percentages)	~24.3%	15.1%
GDP Per Capita (US Dollar) - 2021	$1,910	$1,399
Literacy rate - 2019	74.68%	76.2% (2021)
Life expectancy	72 years	70 years
Human Development Index	0.661	0.602
Global Gender Gap[13]	0.714 (71st)	0.692 (96th)
Annual Freshwater Withdrawal for Agriculture (Billion Cubic meters) [14]	9.5	35.9
Per Capita Energy Use (including all types of energy)	468 gigajoules (GJ) /yr	21.45 GJ per year or 5.96 MWh /yr

Environment and Ecosystem Context:

Ecosystem services such as food production, water quality for biotic organisms, purification of water etc. are increasingly under stress in major basin areas across the world including the GBM. Processes supporting ecosystem services have developed over thousands of years and the interconnected nature of its various components is such that effects in one region or area influence services across the basin.[15] In addition to biophysical factors operating at different scales, a variety of social processes attenuate or reinforce impacts and together these have bearing on sustenance of ecosystem services.

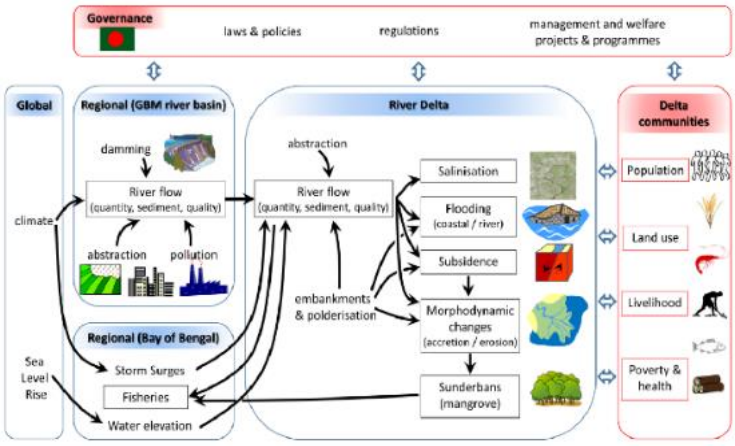


Figure 5 Interconnectedness of global scale effects on climate change

Figure 5 illustrates the interconnectedness of global scale effects such as sea level rise and climatic change with regional and local scale effects alongside social factors. The GBM basin's river flow, water elevation, damming, embankment, flooding, salinization, subsidence, loss of mangroves, fisheries etc. are thus closely intertwined with population increase, land use, poverty, migration, livelihood etc. Bio-physical factors and social factors influencing ecosystem services in the Delta region (Source: Nicholls et al., 2016[16])

Water related Development in Bangladesh and Nepal

[13] https://www3.weforum.org/docs/WEF_GGGR_2022.pdf
[14] https://data.worldbank.org/indicator/ER.H2O.FWTL.K3?end=2020&locations=NP&start=2020&view=bar
15 Adger et al. 2018. Ecosystem services, Well-being and Deltas: Current Knowledge and Understanding, In Nocholis et al. (Eds) Eco-system Services for Well-Being in Deltas. https://doi.org/10.1007/978-3-319-71093-8

16 Nicholls, et al. 2016. Integrated assessment of social and environmental sustainability dynamics in the Ganges-Brahmaputra-Meghna delta, Bangladesh. __soton.ac.uk_ude_PersonalFiles_Users_sf1f15_mydocuments_FEE_CMEES_ePrints_estuarine%20and%20coastal%20shelf%20science%2009%20August%202016_R%20Nicholls.pdf

The GBM region carries immense potential for development through water resources for example, irrigation, dams, hydro-power etc. The practice of irrigation through flood water, canals dates back to historical times and these have found mention in ancient mythological books and scriptures. It was developed further from the twelfth century onwards and subsequently by the British during the colonial period or mid-19th to mid-20th century. The estimated irrigated area in the GBM basin is around 35 million ha that includes groundwater and surface area irrigation. The distribution among the two targeted nations are as follows; Bangladesh (14%), and Nepal (3.3%)[17]. The potential for gravity irrigation system in Bangladesh is quite limited mainly due to its flat topography and instability of rivers. In 2008, the total irrigation coverage in Bangladesh was 5.05 million ha out of which 4.93 million ha was in the GBM region. 75% of it is groundwater while the remaining is surface irrigation. Nepal fully located within the Ganga basin had an estimated 1.5 million ha irrigated area out of which 75% was surface water and the remaining ground water.

The GBM basin has a number of dams, constructed for irrigation and hydro-power purposes. Nepal has only one storage hydropower project with storage capacity of 85 million m^3. Nepal hydro-electricity accounts for more than 96% of the total country's electricity generation. A number of large and small dams have been constructed in bordering countries of Nepal and Bangladesh. Bangladesh does not have any large dams and has constructed three barrages over Teesta, Tangon and Manu Rivers for irrigation purposes. Table provides details of dams and barrages in the GBM Basin[18].

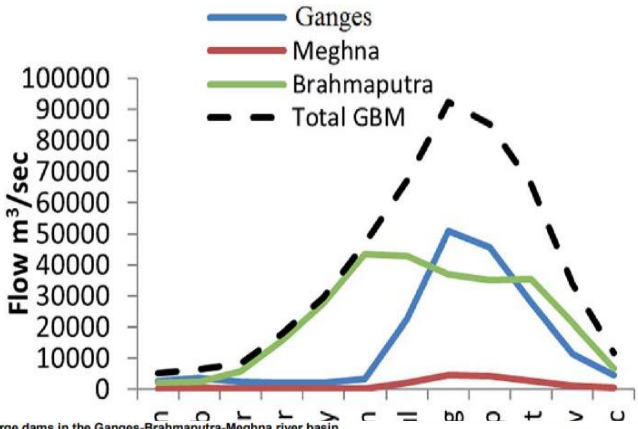


Figure 6: flow measurements in GBM river basin

Large dams in the Ganges-Brahmaputra-Meghna river basin

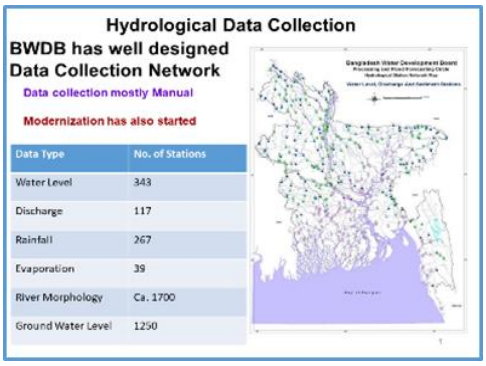
Country	Name	Nearest city	River	Year	Height (m)	Capacity (million m^3)	Main use *
Bhutan	Chhukha	Chhukha	Ti Chu	1988	40		H
	Tala-Wankha	Phuntsholing	Wang (Raidak)	2006	91		H
	Kurichhu	Gyelposhing	Kuri	2002	33		H
	Basochu						
	Punatsan						
India	Rihand						
	Farakka barrage			1974			I
	Bhimgoda			1854			I
Nepal	Gandaki						
	Kosi						
Bangladesh	Manu barrage		Manu				I
	Tangon barrage		Tangon				I
	Teesta barrage		Teesta				I

* *I = irrigation; H = Hydropower*

Figure 7 Large dams in GBM basin countries: not updated.

Status of Hydro-meteorological Observation Network

Bangladesh: A total of 46 synoptic stations are in operation under the Bangladesh Meteorological Department (BMD). In addition, BMD operates 10 Pilot Balloon stations and 4 Rawinsonde stations. Bangladesh Water Development Board (BWDB) maintains a well distributed hydrological network countrywide (manual system) where there are 360 water level stations, 137 discharge measurement stations, 272 rainfall stations, 39 evaporation stations, 1928 morphological cross-sections and 1250 ground water measurement well.



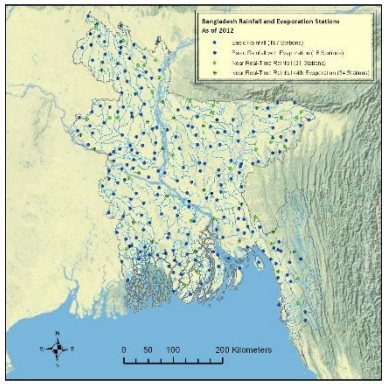


Figure 8: Available Hydrological and Meteorological stations or associated existing products in the GBM countries to be used for developing the HydroSOS system.

Nepal:

The Department of Hydrology and Meteorology (DHM), Nepal is maintaining a network of 194 hydrological stations (48 manual only, 6 telemetric only and 140 manual and telemetric). Additionally, 11 cryosphere monitoring stations (2 fully automatic) and 22 sediment monitoring stations are being operated by the DHM. There are around 500 rainfall stations (182 manual only, 34 telemetric only and 284 manual and telemetric). The stations are continuously being upgraded to telemetric systems. Additionally, the department is operating 3 weather RADARs and one radiosonde station.

[18] FAO 2011 https://www.fao.org/3/CA2138EN/ca2138en.pdf

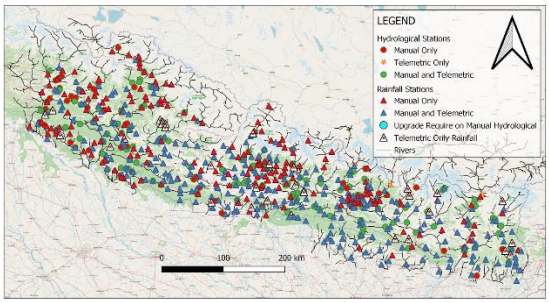


Figure 9: Location of hydro-meteorological stations of Nepal and its coverage

Status of Flood Forecasting and Early Warning Solutions:

Bangladesh

The Flood Forecasting and Warning Center (FFWC), under the Bangladesh Water Development Board (BWDB), collects hydrological data from 109 water level stations and 74 rainfall stations to provide flood warnings. FFWC is involved in the preparation of flood status reports at national level, weekly bulletin during dry season, monthly and annual flood reports and issues a range of warning/advisories which include daily statistical bulletin of floods, river situation, descriptive flood bulletin, and forecasts for 24, 48, 72, 96 and 120 hours at 61 monitoring points on the major rivers. In addition, it provides a 10-day probabilistic flood forecast at 37 monitoring points on the major rivers, and a special flood report during the monsoon season. For the pre-monsoon season, three-day flash flood forecasts are given at 25 monitoring points on the major rivers in the Northeastern region. FFWC is also connected with Flash Flood Guidance system (FFGS) and regularly gets update about flash flood warning.

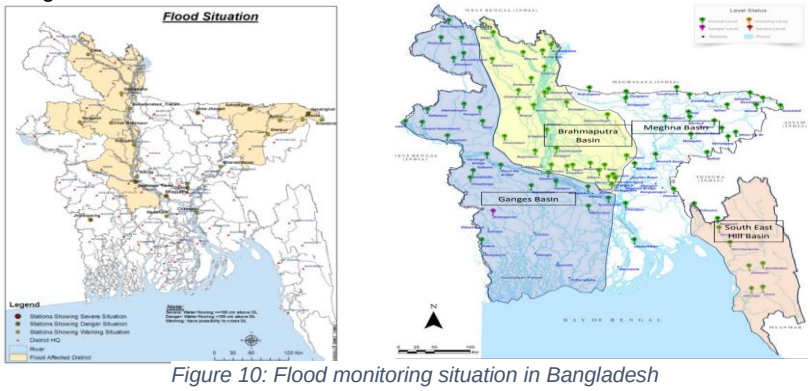


Figure 10: Flood monitoring situation in Bangladesh

Nepal

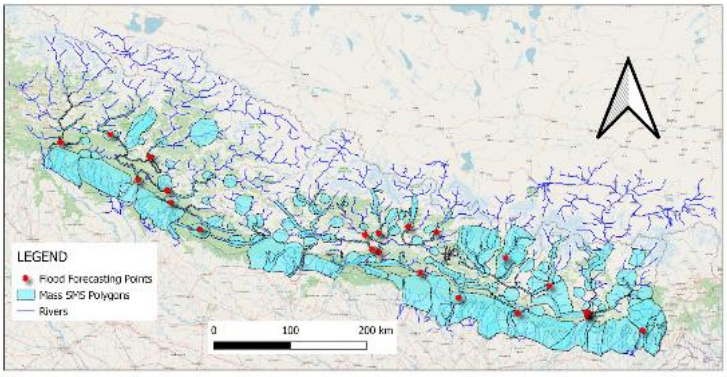


Figure 11: Existing Flood SMS Polygons and Major Flood

Based on Global, Regional and National level model output, Flash Flood Guidance System (FFGS), freely available products and technical capacity of DHM, the Flood Forecasting Division (FFD) of DHM issues the Flood Forecasting Bulletin daily in Monsoon for subsequent 3 days. District wise flash flood warning for 24 hours lead period is also issued. Further, Special Bulletins are issued throughout the year as and when there is a forecast of severe flooding in any specific regions. The rainfall and water level data from telemetric stations along with the products of RADAR and satellites are regularly monitored. The warning information for flood risk is communicated to the public in potential flood affected areas through SMS. For this purpose, 273 high flood risk zones have been identified and are being extended throughout the country. New projects have been planned such as flood forecasts and rainstorm flow EWS. Some of the key challenges include greater coverage for the northern mountainous region, modeling capacity, impact-based forecasts and last mile connectivity.

Climate Change Context

Past and present climate change

The nature of change in climate over the GBM region points towards a widespread warming across the basin during the period 1980-2013[19]. Warming is found to be more intense over the northern part of the basin with a maximum decadal increase in temperature being 0.6 °C. During the same period, there is a significant decline in the rainfall over the basin. The monsoon rainfall which occurs mostly during the period June-August is estimated to have declined by as much as 39 mm per decade during 1998-2013 in the high precipitation regions such as the northeast of India, southwest of Bhutan, Nepal and Bangladesh. The rainfall appears to be increasing though insignificantly over the Ganga basin at the rate of 12 mm per decade. This change in the monsoon precipitation is not natural and is linked to anthropogenic causes. A strong correlation is found between declining monsoon rainfall and the increase in GHG emission. For example in some of the region, confidence over attribution to GHG emission is more than 90%[20].

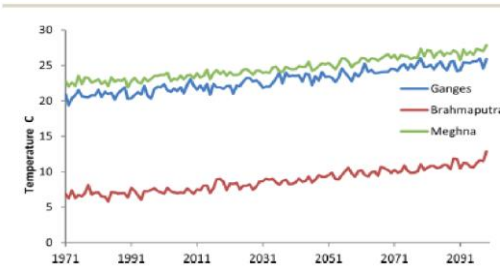


Figure: 12 Annual Mean Temp. Change over 1971-2099 in the GBM Catchment for Q0 realization (Source: Whitehead et al. 2015)

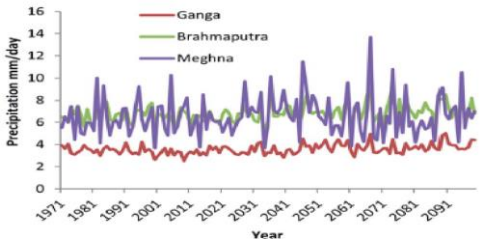


Figure: 13 Annual Mean Precipitation Change over 1971-2099 in GBM Catchment for Q0 Realization (Source: Whitehead et al., 2015)

Bangladesh is witnessing an average rise in temperature of 0.5 °C, over the period 1976 to 2019. The rise in maximum temp. is not uniform for example, as compared to 0.5°C for the central part, the rise is higher up to 0.9 °C for the eastern part. The rainfall analysis for the same period shows that during the peak monsoon season (June to August), the average monthly mean rainfall has declined by 60 mm while in the period-Sep-Oct. it has increased by 43 mm. As a result of these, the summers have become longer, winter warmer and the monsoon not only erratic but also is extended from March to October[21].

The annual maximum temperature trend in Nepal is significantly positive (0.056oC/yr) and annual minimum temperature trend is also positive (0.002oC/yr) but it is insignificant. There is no significant trend observed in precipitation in any season. Number of rainy days is increasing significantly mainly in the northwestern districts of Nepal. Trends of warm days and warm nights are significantly increasing in the majority of the districts[22].

Further during the period 1977-2010, the Himalayan ice reserve of Nepal has declined by 29% or equivalent to 129 sq. km. The glaciers have receded on an average 38 km per year and the number of glacial lakes have increased by 11%[23]. Other studies point out that the average temperature rose between 1-1.3 °C and the warming is neither uniform nor defined by the altitude.[24]. There are positive and negative movements in so far as change in precipitation is concerned although overall there is minor change during 1971-2010. The areas receiving higher rainfall are becoming wetter while those receiving less rainfall are getting drier.[25]

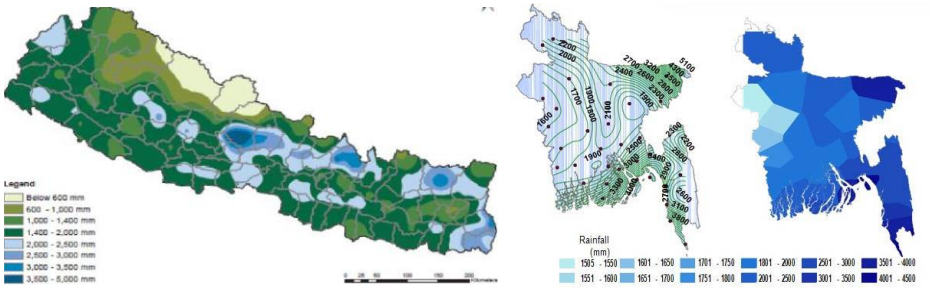


Figure 14 Mean annual precipitation in Bangladesh and Nepal

Climate variations in two other GBM countries (non-targeted at this stage but linked with Bangladesh and Nepal)

[19] Khandu et al. 2017. Change and variability of precipitation and temperature in the GBM basin based on global high-resolution reanalysis. Int. Journal of Climatology. 37:2741-59.

[20] Sharma, C., Shukla, A.K. and Zhang, Y. 2021. Climate change detection and attribution in the Ganga-Brahmaputra-Meghna river basin. Geoscience Frontiers. https://doi.org/10.1016/j.gsf.2021.101186

[21] World Bank. 2021. Climate Change in Bangladesh. Climate Change in Bangladesh: Impact on Infectious Diseases and Mental Health (worldbank.org)

[22] DHM, 2017. Observed Climate Trend Analysis in the Districts and Physiographic Regions of Nepal (1971-2014). Department of Hydrology and Meteorology, Kathmandu

[23] Government of Nepal. 2016. Ministry of Population and Environment Report. Nepal First NDC.pdf (unfccc.int)

[24] World Bank 2021. Climate Risk Country Profile Nepal. Climate Risk Country Profile: Nepal (adb.org)

[25] Bohlinger and Sorteberg. 2018. A comprehensive view on trends in extreme precipitation in Nepal. Int. Journal of Climatology, 38. DOI: 10.1002/joc.5299

Bhutan has experienced a temperature increase of just under 1°C during the twentieth century with a faster increase being reported in the last fifty years. Overall, the minimum temperature is increasing at a faster rate than the maximum. In terms of rainfall, there is a decline in the country's wettest region and a weakening of the summer monsoon over the subcontinent region[26]. Other studies also report marginal decrease in country's rainfall for the period 1996-2017.[27] The glacial area loss in Bhutan over the period 1980-2010 is 23.3% with a varying rate of reduction in different elevation zones. As a result of this loss, the number of glacial lakes has increased by 14.8%[28].

Since 1950's India has experienced a rise in average temperature, extreme temperature, rainfall events, droughts, sea level and a decline in monsoon precipitation with changes in the monsoon system. The average temperature of India over the period 1901-2018 has increased by 0.7 °C. Similarly, the summer monsoon rainfall has decreased by 6% over 1951-2015. This decline is more prominent for specific regions including the Indo Gangetic Plain. Importantly in the same period 1951-2015, the frequency and spatial coverage of droughts have increased. The frequency in certain regions including the north-east has increased to two per decade while area impacted has risen by 1.3% per decade. In addition, the country faces sea level rise which was earlier at the rate of 1.06-1.75 mm per year during 1874-2004 but has increased to 3.3 mm per year during the period 1993-2017.[29]

Past and Current Effects of Climate Change

The water level change in the GBM delta over a 45-year period, 1968-2012 is found to be faster ~ 3mm/y as compared to the global mean sea level ~2 mm/y. It is found to be accelerating since 2005 in the west of the delta and the maximum rate of delta subsidence during 1993-2012 was 1-7 mm/y.[30]

Bangladesh, under the combined impact of erratic monsoon, increased average temperature and other climatic stresses; is witnessing several kinds of effects. For example, the wetlands have dried up, incidence of extreme events have increased and so has the frequency of tropical cyclones and intensity of floods. The tropical cyclone 'Mora' in May 2017 affected 3.3 million including Rohingya refugees who were hosted in the particular region. Due to heavy rain events, the number of landslides has also increased which earlier was limited. There are regions which are increasingly becoming prone to droughts and an increase in dry months is found for the northwest region of the GBM basin area. Significant sea level rise is measured at different places; 4 mm per year at Hiron Point in the west, 6 mm per year at Char Changa and 8 mm per year at Cox's Bazar in the southeast. Bangladesh being a country which mostly lies within, less than 10 m above sea level (10% area is less than 1 m above sea level) an increasing sea level holds considerable threat for the future. The sea level rise has already led to doubling of the soil salinity and the affected region in the country has increased from 1.5 million ha in 1973 to 3 million ha in 2007.[31] One estimate is that the economic cost of climatic impact on key sectors such as agriculture, hydropower and water induced disasters is as much as 1.5 to 2 percentage of the country's GDP[32]

Nepal is experiencing several kinds of climatic change effects including drought, heat and cold waves, floods, landslide, GLOF, snow, avalanches, and forest fires. A trend analysis for drought over 32 years, 1981-2012 shows that there is an increase in severity and frequency particularly in the central region. In the absence of a distinct trend for regional average precipitation, inter annual variation however is large. The summer seasons of 2004, 2005, 2006 and 2009 and winter seasons of 2006, 2008 and 2009 witnessed widespread severe drought conditions impacting agriculture and livestock production.[33] Based on AQUEDUCT analysis, the population estimated to be annually impacted by flood (as of 2010) is 157,000 and the corresponding GDP impact is about US$ 218 million. Monsoon floods such as the one in 2009 (Koshi Embankment Breach) impacted 3.5 million in Nepal and India. Further there are over 1000 glacier lakes in Nepal and accelerated glacier melting is resulting in formation of new lakes, increasing significantly the risk of GLOFs. Overall during 1971 to 2004, more than 3.5 lakh people are found to be exposed to extreme flood[34]. Migration in the form of seasonal or long term often is the principal adaptation measures which in turn have detrimental effects on communities[35].

[26] World Bank. 2021. Climate Risk Country Profile Bhutan. Climate Risk Country Profile: Bhutan (reliefweb.int)
[27] NCHM. 2019. Report on the Historical Analysis on Climate and Climate Projection for Bhutan. Royal Government of Bhutan. Analysis of Historical Climate and Climate Change Projection.pdf (nchm.gov.bt)
[28] Bajracharya et al. 2014. The status and decadal glacial change in Bhutan from 1980s to 2010s based on satellite data. Annals of Glaciology. 55(66). doi: 10.3189/2014AoG66A125
[29] MOES. 2020. Assessment of Climate Change over the Indian Region. Government of India. 489178_1_En_Print.indd (reliefweb.int)
[30] Becker et al. 2020. Water level changes, Subsidence and Sea Level Rise in the Ganga-Brahmaputra-Meghna Delta. PNAS. 117(4):1867-76. www.pnsas.org/cgi/doi/10.1073/pnas.1912921117
[31] Ministry of Foriegn Affairs. 2018. Climate Change Profile Bangladesh. Govt. of Bangladesh. Bangladesh (1).pdf
[32] Government of Nepal. 2016. Ministry of Population and Environment Report. Nepal First NDC.pdf (unfccc.int)
[33] Dahal et al. 2016. Drought risk assessment in central Nepal: temporal and spatial analysis. Drought risk assessment in central Nepal: temporal and spatial analysis (springer.com)

[34] World Bank. 2021. Nepal Country Profile. Climate Risk Country Profile: Nepal (adb.org)

[35] Dixit, A. n.d. Impacts and Adaptive Strategies. Climate Change in Nepal: Impacts and Adaptive Strategies | World Resources Institute (wri.org)

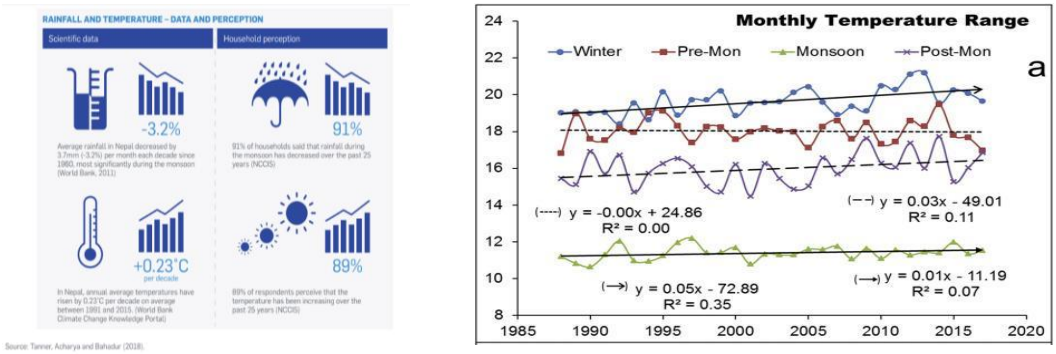


Figure 15: Bangladesh and Nepal climate change information

Climate Change Effects in other GBM Countries:

Because of rising mean temperature and resulting acceleration in glacial melting; Bhutan faces effects of climatic change in several forms including formation of supra-glacial lake and lake outbursts, monsoon floods, drought, forest fire etc. The country's entire northern region has glacial or snow fed lakes. Water levels in several of these lakes have reached a critical geostatic threshold. Following the Lemthang Tsho GLOF incident 2015, a comprehensive assessment was undertaken to identify potentially dangerous glacial lakes in the country[36]. The country is experiencing more frequent and intensified flash floods in the last decade due to an increase in intensity of rainfall and also because of deviation in the monsoon's cycle. Closely related to such floods are landslides, impact of tropical cyclones, soil erosion etc. For example, cyclone Aila 2009 caused rainfall of 76 mm over 24 hours and triggered much devastation in Bhutan. An estimated 8.6 MT soil per hectare is lost annually especially in the rainy season. Similarly, in 2010, landslides and floods damaged more than 2000 acres of farmland and impacted over 4000 households. Given that the large majority of the Bhutanese population are dependent on subsistence farming; erratic rainfall holds considerable risk leading to increasing drought incidence[37].

Climatic changes are already being seen in a variety of forms in India. It includes increased occurrences of flood and droughts, decline in ground water availability, increased risk of coastal flooding, increased stress and undermining of water, health and energy security. The Hindu Kush Himalayas (HKH) due to increased temperature is experiencing a decline in snowfall and retreat of glaciers in recent decades. Sea level rise in the North Indian Ocean (NIO) that was 1.06-1.75 mm per year during 1874-2004 has increased to 3.3. mm per year during 1993-2017. A decline in total monsoon rainfall during the last seven decades has increased the frequency and spatial extent of drought over the period 1951-2016. For example, areas such as northeast, southwest etc. of the country are experiencing 2 droughts per decade and further there is an increase in total area by 1.3% per decade. There is a significant reduction in the number of tropical cyclones in the North Indian Ocean (NIO) over the period 1951-2018. However, a frequency increase (+1 per decade) is observed in occurences of Very Severe Cyclonic Storm (VSCS) in the post monsoon cyclone season during the period 2000-2018[38].

Future Climate Change in Bangladesh and Nepal (or GBM Basin in general)

Future Effects of Climate Change

A study of climatic impact using alternate scenarios (business as usual, more sustainable and less sustainable future) shows that for 2050 and 2090 there will be significant enhancement of monsoon flow with a significant rise in flood potential (Fig: 16). Low flows are forecasted to result in an extended drought period with consequences for water and sediment supply, agricultural irrigation and saline water intrusion. One of the models which assessed likely effects of climate change on hydrology of GBM basin shows that by the end of 21st century the GBM basin will be warmer by ~3.4°C, and changes of mean precipitation as runoff will increase by 16.3 % in the Brahmaputra, 19.8% in the Ganga and 29.6% in the Meghna basin.[39] Simulation study based on a scenario of an increase of 1.5 to 2 °C temperature over

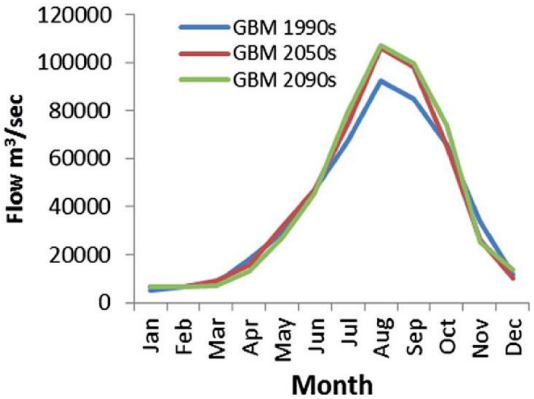


Figure 16: Flow measurements in GBM basin

[36] NCHM. 2019. Reassessment of potentially dangerous glacial lakes in Bhutan. Govt. of Bhutan. Re-assessment of Potentailly Dangerous Glacial Lakes.pdf (nchm.gov.bt)
[37] ICIMOD. 2016. Climate+Change Handbook. BMCI, Bhutan. icimodBhutanClimate016.pdf
[38] Krishnan et al. 2020. Assessment of Climate Change over the Indian region. 489178_1_En_Print.indd (iitd.ac.in)

[39] Masood et al. 2015. Model study of the impacts of future climate change on hydrology of GBM Basin. Hydrol. Earth System Science. 19. doi:10.5194/hess-19-747-2015

the GBM basin shows a considerable increase in flood risk, in terms of area and water depth for two types; one in five and one in hundred year flood category.[40]

The variation in temperature and rainfall will have significant consequences for water availability and its quality in the GBM basin. It is estimated that by 2100 even under representative concentration pathway 4.5, the subsidence could double the projected sea level rise reaching 85-140 cm across the delta[41]. In spite of the uncertainties involved, the projections highlight the extent of the flood risk and coastal inundation which the delta population is exposed to in near future. The extent of saline intrusion in the GBM basin due to climatic change is being studied[42]. It shows an increasing salinity magnitude due to reduced upstream discharge and sea level rise (Akter et al. 2019). The sixth IPCC assessment report highlights the loss of snow cover in the Tibetan Plateau since the early 21st century and retreat of glaciers since 1970's. It is projected that the whole Tibetan Plateau and the Himalayan region will experience heavy precipitation in the 21st century. The South Asian region similarly will experience more intense and frequent heat waves and annual and summer monsoon will increase in the 21st century with enhanced inter-annual variation[43].

Figures show projected changes in average daily temperature, maximum and minimum for Bhutan under different pathways[44]. This study further shows an increase in annual median rainfall over all emission pathways by 2090. For example, precipitation is projected to increase by 10% under pathway RCP 6.0 and 11% under RCP 8.5 from a baseline median. The impacts of climatic changes will aggravate flood, drought and heat wave conditions and in addition will be felt in sectors such as water, forest and biodiversity, agriculture, energy. The climatic impact on flood alone is expected to increase over $41 million on GDP by 2030 in RCP 8.5 emission pathways and this will raise annual impact due to river flooding on Bhutan's GDP to 4% [45]. Precipitation increase in the southern border with India during monsoon together with average number of days with heavy precipitation will have repercussions for flood risk, impact runoffs and rates of river discharge. The projected number of days for dry spells by the end of the century and impact of rising temperature on water resources, rate of snowmelt etc. are further challenges which require to be negotiated.

Targeted Project Areas and Beneficiaries

In the GBM region, extreme weather hazards and climate change affect people on various spatial, temporal and social scale. By alleviating the impact of flood and drought hazard, the project will benefit the overall population of the basin. In particular, the Early Warning System (EWS) will be designed to reach the civil protection services and other private and public stakeholders as well as the general public. The population segment in Bangladesh and Nepal will benefit directly from the project's outputs through the following types of activities: 1) new tools and products developed for risk reduction, such as flood and drought risk maps and climate scenarios. It will augment EWS, and climate change adaptation measures at the community level, 2) testing of the HydroSOS EWS on pilot areas to understand the applicability and effectiveness, 3) capacity building measures with an aim to updating or formulation of policies, plans and guidelines synergized with three components of the HydroSOS BaNe project.

Phase 1: Under the GBM basin especially in Bangladesh and Nepal, flood hazards are mostly reported either as pluvial flood linked to high rainfall precipitation or as riverine flood. The flood risk maps for current and future predicted climates should therefore be developed for the overall surface of Bangladesh and Nepal to account for possible pluvial floods and risk indicators on population, built-up areas, agriculture, water resources, wetlands and protected areas etc. Drought on the other hand can affect any part of the basin. Through risk maps, climate scenarios and HydroSOS EWS, the program will provide important support for a much larger population vulnerable to drought and its impact. The direct beneficiaries of the new tools within the two countries will include:

1. National Meteorological and Hydrological Services (some 500 persons from the two countries), who will be contributing to the development of the tools, providing improved or new services but also gaining in capacities and means of actions.
2. Emergency, Civil protection authorities and Disaster Management Services (estimated 500 to 1000 persons from two countries), who will be integrating new risk maps/warning into their operating procedures and crisis management.
3. Other National authorities of the countries and related departments (estimated total 200 persons) such as Health, Water, Irrigation and Agriculture.
4. Social Institutions such as schools, hospitals, fire stations etc. (estimated to several thousands of people), who will be able to prepare or improve their emergency plans;

[40] Uhe, P.F. et al. 2019. Enhanced Flood Risk with 1.5 °C Global Warming in the Ganges, Brahmaputra, Meghna Basin. Environ.Res.Lett.14: 074031. https://doi.org/10.1088/1748-9326/ab10ee

41 Becker et al. 2020. Water level changes, Subsidence and Sea Level Rise in the Ganga-Brahmaputra-Meghna Delta. PNAS. 117(4):1867-76. www.pnsas.org/cgi/doi/10.1073/pnas.1912921117

42 Akter, R., Asik, T.Z., Sakib, M. et al. 2019. The dominant climate change event for salinity intrusion in the GBM delta. Climate. 7, 69. http://dx.doi.org/10.3390/cli7050069

43 IPCC Sixth Assessment Report, Working Group Physical Science Basis PowerPoint Presentation (ipcc.ch)

44 World Bank and Asian Development Bank. 2021. Climate Risk Country Profile Bhutan. 15874-WB_Bhutan Country Profile-WEB.pdf (worldbank.org)

45 World Bank and Asian Development Bank. 2021. Climate Risk Country Profile Bhutan. 15874-WB_Bhutan Country Profile-WEB.pdf (worldbank.org)

5. Non-governmental organizations (NGO's), International Non-governmental organizations (INGO's) (estimated to be several hundreds), who will either directly use the new information to improve their resilience capacity and adaptation or transfer to their partners.
6. Community-based organizations (CBO), farmer and fishermen associations, in particular women groups etc. (estimated to be thousands of persons over the basin) who will be using the new tools and methodologies to decrease their vulnerability to extreme events;
7. Managers of industrial sites (estimated to several thousands of people over the basin), and private companies (dam's operators) who will be able to draw emergency plans and build more resilient infrastructures;
8. Individual Community members of urban and rural areas especially youths who are more familiar with Information Technologies (potentially the whole population of Bangladesh and Nepal, but in the first stage, estimated 5-10 %, or approximately up to 1 million persons) who will, get timely warning messages and possibly contribute to disseminating and crowdsourcing of information for early actions.

Phase 2: A series of pilot testing on the dissemination, use and feedback of the HydroSOS flood and drought Early Warning System will be conducted during the monsoon and dry season for selected target areas as shown below in Table 4, which involve representatives of the major groups of beneficiaries. Eight pilot-test areas, expected to be studied during year 2 and 3 of the project have already been identified on the basis of following criteria (final selection will be performed during the course of the programme):

- agricultural or urban areas on which collaborations are already established with communities and groups of citizens for example in the field of water resources management, land planning, risk reduction, exercises with civil security, any project related to the participation of citizens and communities.
- agricultural or urban areas that have been affected by extreme events (drought or flood).
- areas where Early Warning Systems have been set up (by previous projects) and are being used.
- areas preferably with mobile network coverage or with a good telecommunication system.
- areas where the effect of extreme events is known, or areas to be affected by dam operations.

Table 4: Pilot tests location for the flooding and dry season

Location of pilot sites type)	**Estimation of the number of people participating to the pilot testing exercise**	**Criteria for selection**
Kurigram, Bangladesh (Floods-Transboundary)	100,000	Kurigram district is one of the riverine flood prone areas. Over the last 25 years, a number of major flooding events have occurred impacting over a million citizens. In 2020, Kurigram experienced the worst flooding event in the last 50 years. An estimated 50'000 people were affected. Significant damage was incurred on infrastructure, agriculture, livestock and housing. The population of the region is expected to reach 3 million by 2025 with women and elderly in particular exposed to hydro-meteorological hazards, and having less access to education, employment and services. The extension of flood prone areas in this region is very large due to its flat topography. In the flood prone area of Kurigram, the development decision is conditioned by individual economic capacities and not by their level on risk knowledge.
Lalmonirhat, Bangladesh (Floods and Drought)	85,000	This district is fully dependent on the water from Teesta River for meeting its agricultural needs. Presence of Gazoldoba barrage at the upstream and continuous extraction of water from the river leaves the downstream scarce in irrigation water. Lalmonirhat is mainly affected by the flood from Teesta basin. Being a funnel shaped flashy basin, Teesta plays a very critical role in both flash and seasonal flood. Most of the basin resides outside the country and presence of a number of water control structures are available and make it extremely difficult to forecast/manage the flood events.
Faridpur, Bangladesh (Floods)	90,000	Faridpur is on the Padma basin, right after the confluence of Brahmaputra and Ganges. Flood in any one of the basins make the location vulnerable to flood.
Sunamganj, Bangladesh (Flash Floods)	85,000	Sunamganj is located in the North-Eastern region of the country, right below the Meghalaya in India. This critical position makes it vulnerable to flash flood along with monsoon flood. The pre-monsoon flash flood is a big threat to rice crop. Infrastructure & livelihood are also severely affected. In 2017, a devastating pre-monsoon flash flood

		nearly destroyed all the crops. In 2022, Sunamganj experienced the worst flooding in recorded history.
Naogaon, Bangladesh (Floods and Drought)	85,000	Both floods and droughts are frequent in this region. This area receives huge flow from transboundary Himalayan tributaries during monsoon which recedes also comparatively quickly. During the dry periods (Nov-May) due to high temperature and low rainfall the area becomes susceptible to drought. Both floods and droughts impact agriculture, drinking water and livelihood of the rural community.
West Rapti, Nepal (floods)	1,13,000	The selected location, West Rapti has faced major flooding in the previous years' impacting several thousands of people. Geographically it has a plain topography. There are several active community-based organizations which could provide support in the testing of the HydroSOS EWS. Also, this region has availability of quality historical hydrological data which is important for calibrating the models.
Kankai (Jhapa) Flood and Drought Nepal	1,00,000	The region of Kankai (Jhapa) has vulnerable populations which experienced both flash and riverine flooding. It has dense real-time observation networks which will be useful in the development of the HydroSOS EWS and later for the verification of forecasts. Also, it is a pilot site for testing drought events.
Bagmati River Nepal (Sarlahi, Rautahat) Flood and Drought	45,000	The Bagmati river in Nepal is selected for urban and riverine floods. Existing operational flood forecasting model are available and will be useful for comparison of the forecasts and warning of flooding events. Also, this is a water deficit basin during low flow period.
Tinau River (Palpa, Rupendehi) Flood and Drought	50,000	Water deficit basin with smaller size to test the accuracy of the HydroSOS forecasts and warnings. Annual Flood events observed in the downstream area with impacts to urban population and infrastructures
Tamakoshi River (Dolakha) Transboundary and GLOF	17,000	This river in Dolakha region is a transboundary river with China. This site is useful for testing of potential GLOF events. Also in this area, hydro- power projects are present which could provide results in useful of HydroSOS products in the power generation and water management.

The pilot testing will provide the opportunity to train communities and agencies during real flooding or drought situations which will help to assess the effectiveness and applicability of the HydroSOS BaNe EWS. The results of the exercises will provide lessons learned and will allow to identify gaps and challenges to improve the system and services. The knowledge gained by the communities and agencies will be helpful to implement similar activities with other stakeholders. The pilot testing communities (100-150 at each site including women and youths) and agencies (10-20 at each site working in disaster management, civil protection, irrigation department, CBO's, NGO's) are expected to disseminate this knowledge and skills in other areas, inside or outside the basin, where floods and drought management are also of growing concerns.

Figure 17: The targeted project region of Bangladesh and Nepal (area covered under the red boundary) with the potential pilot testing sites (sites are provided in table above) of the HydroSOS system and community-based initiatives are presented above. The test sites will be finalized during the inception phase of the project implementation.

Phase 3: Capacity development activities will be carried out for agencies at local/national and regional level and communities which are affected by floods and drought events during the different phase of the project on following areas:

- Extreme events, risks maps and climate change adaptations
  - Flood and Drought Risk assessment and information on risk profile through a national/regional database;
  - Floods and drought risk maps development at national and transboundary level;
  - Information on future social and environmental risk scenarios and risk management strategies.
- Early Warning System for floods and drought and measures to reduce risk
  - End-to-End Early Warning System;
  - Dissemination of early warnings to agencies, IOs, NGOs, communities and citizens;
  - Natural and nature-based solutions for floods considering ecosystem sustainability.
- Governance
  - Mainstreaming Gender in Flood Management.
  - Identification of gaps and needs for the long-term strategies for floods and drought management and climate change adaptation by local and national stakeholders of GBM countries.
  - Revision, or development, of plans, policies and guidelines for risk reduction in the view of future climate change by national and regional policymakers.

Project / Programme Objectives

The proposed project objective is to increase the climate adaptive capacities and resilience of beneficiary communities to hydro-climatic risks. Furthermore, the project will develop local, national and regional adaptation strategies and implementation mechanisms based on integrated monitoring and management of water resources. Floods and drought being common feature in the two countries, the project envisages strengthening the capacities of National Meteorological and Hydrological Services (NMHSs) with an innovative, robust and tailored regional Hydro-Meteorological early warning system (providing short term and seasonal status) embedded into a long-term integrated water resource information system and concrete adaptation actions developed through a participatory design and executed in an integrated manner.

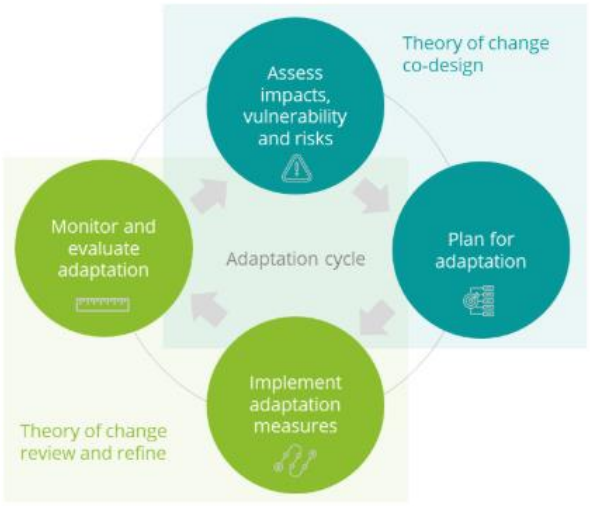
The HydroSOS BaNe project is aligned with the Adaptation Fund objective to “reduce vulnerability and increase adaptive capacity of communities to respond to the impacts of climate change at local, national and regional level” and also it will support the United Nation Early Warning System for All initiative which is led by the WMO with other international partners to cover everyone on the planet (Bangladesh and Nepal are part of first 30 priority countries) with the Early Warning system in the next five years. Also, the HydroSOS BaNe project targeted countries are supported through Systematic Observation Financing Facility (SOFF) initiative (UN Fund co-created by UNDP, UNEP and WMO) The Adaptation Fund is a member of the SOFF Advisory Board. SOFF's goal is to support countries to improve their meteorological observations in compliance with the internationally agreed WMO Global Basic Observation Network (GBON), and which in turn will support Global Research Centres for Long-Range Forecasts (such as the European Centre for Medium-Range Weather Forecasts) in developing high quality meteorological and hydrological monitoring and forecasting products.

Existing or under-development national hydrological, meteorological, and climatological modeling systems, early warning and decision-making platforms will be incorporated into the proposed system with a scope to include lessons learned in each geographical context and incorporate important inputs from other projects and initiatives. This HydroSOS BaNe project aims to enable different actors and stakeholders at the regional, national, and local levels to manage climate, weather, and water-related risks more effectively. This strategy recognizes that the current water crisis in the GBM basin is inextricably linked to climate change and requires systemic changes.

Theory of change

While climate change adaptation Monitoring and Evaluation (M&E) places a heavy focus on identifying indicators for tracking and assessing adaptation, additional elements are needed to ensure an adequate M&E process.

Theories of change (ToC) lie at the heart of any robust M&E plan. They lay out desired and describe context-specific pathways to achieve these. ToCs articulate assumptions on how resources and actions lead to desired results and impacts, thus representing an important tool to detect possible maladaptation or equity concerns early in the intervention design process.



The adaptation cycle. Adapted from UNFCCC (2022)

This project plans to drive that change using an integrated climate and water approach to deal with increasing exposure to water-related risks. A change of systems and mindset will be carried out by bringing together different disciplines in the water, climate, and disaster management sectors and fostering collaboration amongst global, national, and local partners which traditionally have been working separately. This will be done by breaking institutional barriers among sectors and organizations and establishing a model of cooperation that will enable different actors to achieve common goals. The broader aim is to forge new relationships that will deliver strategic results in the future, and beyond this project. A more detailed theory of change (ToC) framework is provided in Figure 16. National partners, including National Governments, Research Organizations, Private Sectors, etc. in each country will set their own roles and responsibilities around these focus areas, with decisions delegated as close to communities as possible. This will allow for maximum flexibility and impact depending on the available capacities in the country.

Theory of Change at the Community Level

Transitioning from a top-down approach to a collaborative, community-driven model will catalyze a significant transformation in the development and implementation of resilience strategies. Initially, decisions were made with minimal community input, resulting in misaligned priorities and a lack of local ownership. By actively involving communities in the decision-making process, incorporating their local knowledge, and ensuring continuous dialogue, the project seeks to empower communities, build trust, and enhance their sense of responsibility. Consequently, communities will not only support and sustain resilience initiatives more effectively but will also develop a stronger collective capacity to address future challenges. This transformation is expected to lead to better-coordinated efforts, increased awareness, and ultimately, more sustainable, and adaptive solutions that genuinely reflect the needs and aspirations of those most affected.

Some of the Key problems to address	**Key stakeholders/ beneficiaries**	**What steps are needed to bring about change?**	**What is the measurable effect (output)?**	**What is the long-term impact? Or benefits**	**Assumptions and risks**
Lack of integrated flood and drought EWS available	National Meteorological and hydrological services, disaster	Technical capacity development, support in co-	A transboundary, integrated EWS for floods and drought with synergies and	Key stakeholders and populations are informed about any hydro-meteo	Support from the national agencies to provide historical

for warning services	management, agriculture, water resources management, irrigation, power agencies, population	design and development of the EWS, use of global observations and local in-situ data,	complementarities with existing projects, resources and infrastructures	hazards for preparedness and resilience	and real-time data and information Participation to decision-making and capacity development workshops
Lack of affordable, sustainable solutions for water resources management in consideration of declining water resources in urban and rural areas due to a combination of climate change (i.e. more rain or less rain, more flooding or droughts, high temperatures) and development impacts (i.e. rapid, unplanned urbanization, damaged infrastructure assets, etc.)	National Meteorological and hydrological services, disaster management, agriculture, water resources management, irrigation	Development of Risk maps with impacts on various sectors and strengthened capacity of the stakeholders for risk-informed decision-making at local, national and regional levels	Risk maps with impacts on water resources management at different scales (status, short-term, long-term, sub-seasonal to seasonal, etc.)	Improvement in water resources management including support to sustainable hydropower generation, irrigation, agricultural activities	Data and information availability Support from government to invests in development plans and programmes Governmental restructuring of staffs will delay the implementation
Long-term climate change adaptation and management plans for the national and regional agencies	National Meteorological and hydrological services, disaster management, agriculture, water resources management, irrigation	Support and co-review or updating of the existing policies and plans on Climate change adaptation	Updated policies and plans on Climate change adaptation measures with recommendations for the future and including institutional arrangements	Policies and plans are linked with the national development plans and programs with sufficient budget or funding from the government	National policymakers availability and support in the activities

The project result framework provided under section.IV highlights the key outputs, baseline, indicators, target and means of verification which can support to measure the Theory of Change during the course of the project implementation. This will be reviewed during yearly, mid-term and final evaluation of the project activities.

The ToC presented below under figure 16 (next page) will be refined further by the regional and country teams during the inception phase of the project.

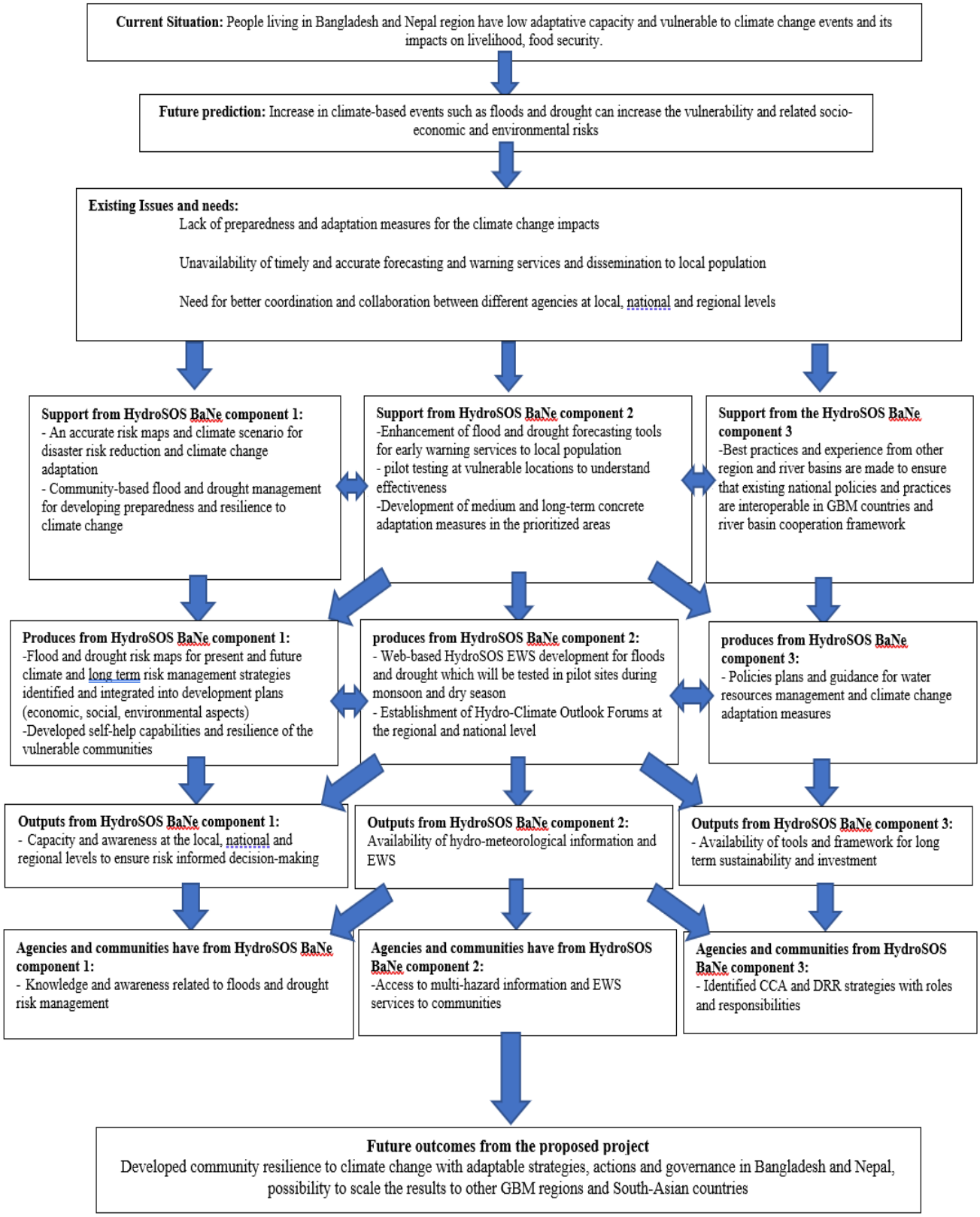


Figure 18: Theory of Change based on the HydroSOS BaNe project

Project / Programme Components and Financing:

Currently, the institutional arrangements for managing the water resources of the transboundary rivers of the Ganga Brahmaputra Meghna (GBM) basin are lacking or not enforced. This will change with effective synergy and coordination between the regional and national and other institutions linked to the basin. A separate approach by different countries leads to non-integrated management of water resources increasing the risk of water scarcity, land and natural ecosystem degradation. Over the region of Bangladesh and Nepal, flood forecasting and early warning systems until now have been developed only for the sub-basins through the WMO, GEF, World Bank supported projects. Further, it is not updated with the state-of-the-art technologies.

A large part of the whole basin therefore requires warning procedures to organize actions between the technical institutions in charge of assessing extreme hazards, the National Meteorological and Hydrological Services (NMHS), the institutions in charge of disaster civil security and the communities and citizens at risk. This means that the technical capacities to develop and run the models, especially for hydrological sub-seasonal to seasonal must also be developed, on the basis of the experience and existing capabilities in the two countries (learning from each other). Depending on the responsibilities and capacities of the Meteorological Service/Agency and the Hydrological Service in the two countries, the development and maintenance of the forecasting tools could be assigned at the regional level mainly to the regional entities such as ICIMOD (for regional coordination and cooperation) and RIMES (for technical development of tools and capacity development) ensuring long term investments and sustainability. Coordination and communication within the agencies and communities on issues of floods and drought must be improved by developing the appropriate information services, radio programmes, websites and mobile platforms. Furthermore, communities should trust and follow the official messages from their national or regional centers. As the most effective way of communication occurs through mobile platforms, national institutions should explore the use of multiple technological and non-technological channels of communication.

Several aspects must be defined and implemented in order to foster an appreciable level of participation from communities and citizens in flood, drought and environmental management. Besides legal Instruments and operational procedures to support integrated water resources management in the GBM Basin, additional non-structural measures, such as the development of risk culture, education, capacity building, and natural and nature-based solutions should be implemented with the involvement of the stakeholders to increase climate resilience of the population. The following concrete outcomes are to be further refined or developed during the proposal phase through additional national dialogues and based on already on-going, existing, or planned activities.

Project Components	Expected Outcomes	Expected Concrete Outputs	Amount (US$)
Component 1: Risk-based preparedness and adaptation to climate variabilities, water use stresses and environmental uncertainties	Outcome 1.1 Floods and drought risks informed decision-making at the regional, national and local levels	Output 1.1.1 Vulnerability and exposure assessment (including gender and sector-wise analyses) and risk maps are developed for the targeted countries	1,000,000
		Output 1.1.2 Develop capacity and awareness at the local, national and regional levels to ensure risk informed decision-making	
		Output 1.1.3 Long term risk management strategies identified and integrated into development plans (economic, social, environmental aspects)	
	Outcome 1.2 Preparedness and resilience to climate change promoted through innovative and community-based initiatives.	Output 1.2.1 Implementation of community-based floods and drought management strategies in the vulnerable sites and different ecosystems	2,000,000
		Output 1.2.2 Strengthened awareness of vulnerable communities and agencies on hydro-meteorological risks through education programs including nature-based solutions and mainstreaming gender	
Component 2: Strengthening water resources management	Outcome 2.1 A web-based Hydrological Status and Outlook System	Output 2.1.1 Improved hydrological status and outlook instruments through data standardization for EWS is designed and developed	4,000,000

through access to hydro-meteorological information and augment regional /national capacity to monitor and assess Hydro-Meteorological hazards	for EWS is designed and developed together with the National services	Output 2.1.2 Existing products and tools are integrated and visualized in the regional HydroSOS for EWS	
		Output 2.1.3 Establishment of Hydro-Climate Outlook Forums at the regional level	
	Outcome 2.2 Development of medium and long-term concrete adaptation measures in the prioritized areas and updates based on lessons learned and monitoring instruments	Output 2.2.1 EWS and concrete adaptation measures tested in selected vulnerable communities.	2,000,000
		Output 2.2.2 Coordination and collaboration developed at the regional, national and local level	
		Output 2.2.3 Decision-makers are informed with key water resources management parameters for current status and sub-seasonal and seasonal outlooks	
Component 3: Water and climate resilient regional cooperation arrangements together with National and regional stakeholders, and community involvement	Outcome 3.1 Improve information base and practices related to water resource management and climate change adaptation	Output 3.1.1 Best practices and experience from other region and river basins are made to ensure that existing national policies and practices are interoperable in GBM river basin cooperation framework	500,000
		Output 3.1.2 Analysis and optimisation of benefits of regional water and climate adaptation action.	
	Outcome 3.2 National adaptation strategies (i.e. NAPs) are fully inclusive of water management issues, address community concerns. Methodology and mechanism for leveraging and sharing benefits of optimizing adaptation at regional level are in place.	Output 3.2.1 An inclusive process is developed to ensure that National adaptation strategies explicitly address water relevant instruments and strategies. Inclusive approaches are operational to include local communities.	500,000
		Output 3.2.2 Regional mechanism for adaptation cooperation on HydroSOS established and operational. Periodic review and update of the mechanism is agreed on by riparian states.	
8. Project/Programme Execution cost (10%)			1,000,000
9. Total Project/Programme Cost			11,000,000
10. Project/Programme Cycle Management Fee charged by the Implementing Entity (if applicable) (10%)			1,090,000
Amount of Financing Requested			12,090,000

Project Duration: 4 years (48 months) (proposed start from May 2024, mid-term evaluation- May 2026, project closing and final evaluation around June 2028)

PART II: PROJECT / PROGRAMME JUSTIFICATION

A. Describe the project components, particularly focusing on the concrete adaptation activities, how these activities would contribute to climate resilience, and how they would build added value through the regional approach, compared to implementing similar activities in each country individually.

There is a need for better, more effective and coherent regional, national and local strategies and decision-making frameworks to address water related climate resilience challenges in the GBM riparian countries. These challenges are being exacerbated by a changing climate, deterioration in socio-economic and environmental conditions and unplanned development. It is thus vital that the GBM basin is better

understood through a regional project which provides opportunities to share experiences, and address knowledge gaps. Such a project will be useful to manage water resources, extreme events linked to climatic impact in a transboundary management framework and in an environment of mutual trust and confidence. The project partners propose to design and implement a large-scale, concrete and cooperative system allowing integration of relevant knowledge on quantitative and qualitative aspects of water resources and offer services and decision-making support to the end-users. This system (technical development, services delivery, support activities) will be worked out in close cooperation with the national and local partner as well as with the community beneficiaries through stakeholder engagement practices. This will improve livelihood support and contribute to increased adaptive capacity and resilience to climate change related events.

Until now, very little focus is found on determining the cost-effectiveness of climate change adaptation interventions across the GBM Basin as a whole. As a result, there is limited baseline information to be used for comparative analyses of approaches which are sustainable and replicable across the entire GBM region. In the HydroSOS BaNe project in Bangladesh and Nepal, new solutions will be implemented to improve risk reduction and climate change adaptation. Special attention will be given to promote community of users, guidance material, decision-support tools, online training, use of social networks and crowdsourcing. These solutions will be tailored according to the local needs and capacities, to account for social and cultural appropriateness. The HydroSOS End-to-End Early Warning Systems will be tested with additional climate projections to study the impact of future scenarios on spatial and urban planning and their consequences on socio-economic development.

The basin scale approach involving two countries is a suitable way to identify and implement cost-effective measures as countries in GBM region have similar challenges related to climate change events (floods and drought) that will be addressed through this project. Unfortunately, India being an upstream country has presently not provided their agreement and endorsement to join the HydroSOS project in the GBM countries. However, they will technically observe the implementation of the project activities and in future will design a HydroSOS standalone national project implementing from methodology and tools tested under this proposed HydroSOS BaNe project. The proposed project's activities under each component will promote improved coordination between regional, national and local institutions responsible for transboundary water management, disaster risk reduction and climate change adaptation. Through integration of previous knowledge and ongoing projects of the two participating countries, the planned project will ensure a) minimum overlap and b) transfer of methodologies and skills from one area to the other. A regional approach results in greater co-benefits as compared to the national one because one set of resources generates productive outcomes for two countries, which individual national projects would have achieved using more resources (human, time as well as material resources). Working at a regional level will allow the proposed project to reach several type of communities (rural, urban, semi-urban, transboundary, etc.) of the two countries with new methodologies and tools. The development and maintenance of End-to-End Early Warning System at the regional level and all related functionalities can be mutualized and shared depending on the individual needs and uses. The transboundary EWS dissemination strategies will determine the most efficient and effective ways to reach the remotest areas or the last-mile and will have broader coverage, so as to facilitate early warnings to the most vulnerable populations. The developed methodologies can be tested later at a larger scale within the basin, or easily adapted to similar types of environments at local or national level. It will thus create a community of users and will also foster integration of socio-economic and environmental risks and climate change approaches at national, regional and local levels.

A regional approach involving Bangladesh and Nepal will bring the countries to work in a more coordinated way and additionally, transboundary support and actions will allow them to share data and information on weather, climate and water resources and avoid disaster impacts on environment, social and economic services. Such regional approach will enhance cost effectiveness of capacity development (at one time participants from two countries will be involved) as well as ensuring a certain level of generic scope of tools and methodologies developed for future application beyond the pilot testing sites. Centralizing the capacity building of the Hydro-Meteorological Agencies together with the regional body will enhance cost effectiveness.

Component 1: Risk-based preparedness and adaptation to the climate variabilities and water and environmental uncertainties
The GBM region is one of the poorest around the world and carries large dependence on water resources as most are engaged in occupations such as farming, forestry, livestock, fishing. Freshwater sources which were once found to be abundant are increasingly under stress due to the twin impact of climate change and population increase. In view of the necessity to safeguard livelihoods from an increasing effect of climate change, it is essential to have an effective water resource management mechanism that protects from floods and droughts. The first component seeks to build resilience through carrying out flood and drought risk analysis integrating basin scale to the local level. Risk-based preparedness and adaptation to climate variabilities, water use stresses, and environmental uncertainties will allow us to identify how the basin ecosystems are continually being threatened by multiple drivers of the change mainly due to human activities for example, use of environmental pollutants, increase in pollution from industries, agriculture, households etc. Risk maps for floods and drought for the current climate and future projected climate will be developed for various risk indicators (impact on population, built-up areas, agricultural crops, water resources, protected and wetland areas etc.). It will combine transboundary water resource management strategies with innovative climate adaptive measures, disaster preparedness and capacity building programs for the target communities. Some of the key risk mapping activities include comprehensive vulnerability/exposure analysis to ensure representation of differential risk posed on account of gender, age, ethnicity, ecosystem, livelihood choices etc. Risk maps developed will be integrated into the decision-making process through systematic training and awareness programs from the local to national and regional level. Insights from the analysis will be used to build climate resilience by mainstreaming Disaster Risk Reduction (DRR) into the development process such as effecting necessary changes in policies and programs. Community-based flood and drought management activities in the flood and drought-prone areas will develop self-help capabilities and resilience through Climate Change Adaptation and Disaster Risk Reduction measures. Following this risk management strategies for social, economic and environmental protection and growth are identified for long-

term sustainability. A key focus of the component will be incorporation of the role of gender and nature-based solutions in alleviating risk and ensuring smooth adaptation.

Component 2: Strengthening water resources management through access to hydro-meteorological information and augment regional /national capacity to monitor and assess hydro-meteorological hazards

The primary focus of the second component will be development of a) web based EWS in association with national hydro-meteorological agencies from a regional scale hydrological status/outlook platform and b) formulation and testing of concrete adaptation measures for the medium and long term. A range of activities such as data standardization, data sharing mechanism, integration of existing tools and available methods will be undertaken to develop an EWS to operate at a regional level. Based on lessons learned, concrete adaptation measures will be formulated and tested in selected vulnerable communities. The measures such as risk baked maps and their effective use to be accomplished through institutionalization of the regional cooperation framework and continual monitoring of the system to enable remedial measures to be taken.

Component 3: Water and climate resilient regional cooperation arrangements together with National and regional stakeholders, and community involvement

Presently, the GBM countries as well as at the region lacks transboundary level decision framework and strategies to overcome the challenges of the basin-wide water resources management. To increase adaptive capacity and empower people to cope with their changing environment, the development of decision-support framework can help national and local agencies to mutually understand and respond to challenges and opportunities in the GBM countries.

The project builds on a number of risk reduction master policies and plans, and adaptation measures listed in the section E and F. a large coordination effort, joint methodologies and shared tools are still needed to ensure that the results and outputs of the national projects are integrated at the regional levels as the river basins are shared between the GBM countries.

Activities of component 3 explore how coordination efforts at the regional level will be beneficial to the concerned institutions, such as the NMHSs, Disaster Management, Environmental Agencies to plan, test and improve strategies based on experience sharing.

Adaptation measures and strategies aligning with AF ESP and gender principles will be discussed at local level in agreement with local organizations and communities to increase the resilience to floods and drought. The participation and engagement of local stakeholders will facilitate the adoption of the strategies and subsequently result in long-term sustainability.

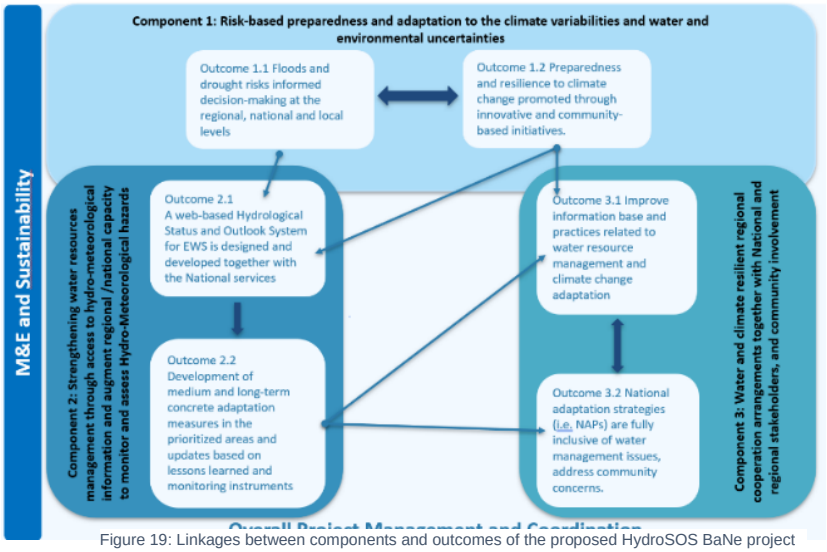


Figure 19: Linkages between components and outcomes of the proposed HydroSOS BaNe project

For Bangladesh and Nepal, the Department of Hydrology and Meteorology (the executing partners) took the lead for national stakeholder consultations mainly to identify and agree on the below set of activities (under each outputs) to be implemented at local, national and regional levels. During the proposal development, additional stakeholders will be consulted to finalize the activities as well as allocate necessary budget for the activities at local, national and regional levels. Also, During the EIA and SIA studies, each relevant agency in both countries will be presented the list of activities, outputs and outcomes generated to assess for possible social, environmental and gender specific risks. In case of possible risks, mitigation or management measures will be identified and added under the Environmental and Social Risk Management plan (ESRMP)

Project Components	Expected Outcomes	Expected Concrete Outputs	Activities planned
Component 1: Risk-based preparedness and adaptation to climate variabilities, water use stresses and environmental uncertainties	Outcome 1.1 Floods and drought risks informed decision-making at the regional, national and local levels	Output 1.1.1 Vulnerability and exposure assessment (including gender and sector-wise analyses) and risk maps are developed for the GBM basin	Activity 1.1.1.1 Conduct a desk study (compilation of existing evidence-based past data (topographic maps, satellite images, studies of extreme events, reports of disasters, etc.) and field visits to gather available information on vulnerability and exposure for current and future climate and identify gaps or additional needs. Activity 1.1.1.2 Develop an action plan to complement gathered information on the exposure and vulnerabilities Activity 1.1.1.3 Organize stakeholder's meetings and workshops, working on risk management to select priority areas for community consultations Activity 1.1.1.4 Conduct pilot field studies (focus group discussion and semi-structured interviews) with communities to identify the multi-dimensional drivers of vulnerability and risk (social, economic, ecological, cultural, political, and infrastructural determinants of vulnerability) in Bangladesh and Nepal region highly exposed to different hydrometeorological hazards Activity 1.1.1.5 Draft the field studies reports and the GBM-atlas with the existing static information available
		Output 1.1.2 Develop capacity and awareness at the local, national and regional levels to ensure risk informed decision-making	Activity 1.1.2.1 Assess the available IT equipment (computers, servers, databases, etc.) and IT/GIS expertise at the NMHSs services and other relevant services (e.g. Geographical Institute, Disaster Management, etc.). Purchase additional equipment if necessary Activity 1.1.2.2 Create the HydroSOS information exchange IT network by connecting the existing information and data available at the national and regional services Activity 1.1.2.3 Develop the meteorological, climatological and hydrological database and create the links with the existing databases for the collected information on hazards, vulnerabilities and exposure including the main driving hydro-meteorological parameters for floods and drought events (e.g. precipitation, evaporation, water levels, temperature, soil moisture, soil type, etc.) Activity 1.1.2.4 Develop web-based flood and drought risk maps using the dynamic hydro-meteorological, environmental and static social and structural database and existing maps developed in the GBM targeted countries through the past projects (see part G for more information) Activity 1.1.2.5 Scenarios for socio-economic and environment development along with the climate change projections are collected and projected impacts on population, water resources, urban development, environment and agricultural areas are analyzed Activity 1.1.2.6 Organize training workshop for professionals related to hydrology and meteorology, disaster management, and GIS etc. to convey knowledge and improve skills needed for using risk maps

			Activity 1.1.2.7 Identify roles and responsibilities to the agencies and organizations forming a task team to regularly complement and improve the database and risk maps and also to monitor and report on the new updates
		Output 1.1.3 Long term risk management strategies identified and integrated into development plans (economic, social, environmental aspects)	Activity 1.1.3.1 Design and develop the guideline presenting the whole process of risk maps development and future impacts on various sectors with examples of implementation on highly vulnerable urbans and agricultural areas Activity 1.1.3.2 Develop supplementary means of communication to reach a wider population (infographics, posters, videos, leaflets for schools, etc.) Activity 1.1.3.3 Organize trainings and workshops with stakeholders (representatives of communities, local policymakers, and decision makers) to disseminate the information on future climate and risk changes and to obtain additional qualitative input on potential impacts for socio-economic and environmental aspects Activity 1.1.3.4 Develop safeguard action plan for risk management at medium and long term with the output from workshops and consultations with the relevant stakeholders
	Outcome 1.2 Preparedness and resilience to climate change promoted through innovative and community-based initiatives.	Output 1.2.1 Implementation of community-based floods and drought management strategies in the vulnerable sites and in different ecosystems	Activity 1.2.1.1 Conduct participative community consultations to identify and select the appropriate local measures or equipment (non-structural preparedness tools such as early warning dissemination through loudspeakers and local radio, locally installed rain-gauge and river-gauge for hydrological data collection, marking of vulnerable houses for rapid response support, flood level marking plates to mark the previous year's floods useful for future construction of resilient houses, simulation exercises, knowledge and awareness session on disaster risk reduction, ecosystem services, climate change adaptation and drought indicators). Activity 1.2.1.2 Develop and install the local measures as identified with the communities under activity 1.2.1.1 Activity 1.2.1.3 Identification of existing or development of new local flood and drought management committees or groups Activity 1.2.1.4. Capacity building of local management committees or groups identified under activity 1.2.1.3 Activity 1.2.1.5 Development of community-based flood and drought management manual including safety and safeguard measures for preservation of natural habitats, land and soil conservation, biological diversity. Activity 1.2.1.6 Organize meetings to share knowledge and experience of added value of local measures or equipment under 1.2.1.2
		Output 1.2.2 Strengthened awareness of vulnerable communities and agencies on hydro-meteorological risks through education programs including nature-based solutions and mainstreaming gender	Activity 1.2.2.1 Organize dedicated short courses on the IUCN standards for nature-based solutions approaches and concepts for targeted beneficiaries to disseminate knowledge on natural and nature-based solutions (NbS) for flood and drought management Activity 1.2.2.2 Collect feedbacks from the workshop participants on their views and perception of NbS tools Activity 1.2.2.3 Recommend actions to increase the use of natural and nature-based

			solutions and environmentally friendly methodologies with the involvement of local population and aligning with the Adaptation Fund ESP principles Activity 1.2.2.4 Conduct workshops to provide support for developing project proposals (submission to the internal and external agencies in future) on implementing natural and nature-based solutions for the flood and drought events. Activity 1.2.2.5 Organize and conduct workshops on the Training Manual for mainstreaming gender in the End-End Early Warning System for Flood Forecasting (E2E-EWS-FF) and flood management with potential participants from NMHSs, local policymakers, civil authorities, women and community-based organizations etc. Activity 1.2.2.6 Collect feedback from the workshop participants on their views and knowledge sharing on mainstreaming gender in E2E-EWS-FF and IFM with other stakeholders Activity 1.2.2.7 Recommend actions that would improve the participation of women and other vulnerable groups into flood management and early warning
Component 2: Strengthening water resources management through access to hydro-meteorological information and augment regional /national capacity to monitor and assess Hydro-Meteorological hazards	Outcome 2.1 A web-based Hydrological Status and Outlook System for EWS is designed and developed together with the National services	2.1.1 Improved hydrological status and outlook instruments through data standardization for EWS is designed and developed	Activity 2.1.1.1 Make an inventory of the gauging stations with real-time data transfer (or pseudo real-time) in the GBM Basin and prepare descriptive sheets for each station (location, equipment, data series, etc.) Activity 2.1.1.2 Perform a field/desk study to check the availability and quality of the data and information related to runoff, rainfall and other relevant hydrometeorological and agrometeorological data and also through the flood forecasting and drought monitoring products available at each NMHSs and other relevant institutions Activity 2.1.1.3 Update the database of hydro-meteorological parameters with new information, or interconnect with existing platforms mainly through WMO Hydrohub (enhancing hydrological monitoring and data exchange) and World Hydrological Observing System (WHOS) mandate of standardization of data and information management systems. Activity 2.1.1.4 Organize training for the NMHSs staff related to data collection, calibration and maintenance of equipment following WMO standards Activity 2.1.1.5 Describe the thresholds for flood events and for drought period based on hydro-meteorological events and risk maps for various risk levels (for example, low-medium-high) through consultations with technical services and local representatives supported by evidence-based experiences. Activity 2.1.1.6 Define the values of the thresholds for floods and for drought events, at and around each gauging station, in relationship with past events Activity 2.1.1.7 Conduct the water resources assessment in the GBM region to understand the changing value of water level, water quality, in relationship with present status and past events Activity 2.1.1.8 Develop the HydroSOS products for the GBM basin based on above defined thresholds and real time and historical information available at the National level and from Satellite based products.

			Activity 2.1.1.9 Link the thresholds of flood and drought with the socio-economic and environmental impact
		2.1.2 Existing products and tools are integrated and visualized in the regional HydroSOS for EWS	Activity 2.1.2.1 For the areas with available forecast models in the sub-basins (e.g., Ganga, Brahmaputra and Meghna basin), create the procedure to use the outputs of the existing products and models within the network of centers producing HydroSOS jointly with the NMHSs Activity 2.1.2.2 Develop software to collect the meteorological and hydrological forecasts and to calculate the daily warning status or outlooks levels for each of the sub-basin and vulnerable areas Activity 2.1.2.3 Design and develop the interface to gather all individual warning levels on the main HydroSOS transboundary system Activity 2.1.2.4 Prepare user guide to convey all available knowledge on the interface to the various groups of users (forecasters, IT staff, decision-makers, etc.) and develop sector specific DSS contents to be disseminated to various stakeholders Activity 2.1.2.5 Carry out trainings and capacity development workshops with the NMHS professionals, local/national agencies and users of the web based EWS and water resources management for using Hydro SOS. Activity 2.1.2.6 Gather feedbacks, suggestions and scope for improvements from the workshop participants Activity 2.1.2.7. In Bangladesh, upgrade integrated water resource management strategies Activity 2.1.2.8. Organize a workshop to share experiences on risk maps and hydro-SOS EWS with other GBM countries
		2.1.3 Establishment of Hydro-Climate Outlook Forums at the regional level	Activity 2.1.3.1 Identify the linkages with the existing regional Climate Outlook forum disseminating the information available with the HydroSOS Ba-Ne system Activity 2.1.3.2 Nominate members for Hydrological outlook group which could be merged with the climate outlook forum at the regional level Activity 2.1.3.3 Organize annual regional Hydro-climate outlook meetings with the existing and nominated members Activity 2.1.3.4 Develop guidance documents for regular coordination and meetings with the Hydro-climate outlook members
	Outcome 2.2 Development of medium and long-term concrete adaptation measures in the prioritized areas and updates based on lessons learned and monitoring instruments	2.2.1 EWS and testing of identified adaptation measures in selected vulnerable communities.	Activity 2.2.1.1 Finalize the selection of the pilot tests areas with the concerned agencies and communities on the basis of the draft list presented in Table 4 Activity 2.2.1.2 Organize meetings on each of the pilot areas to identify the roles and responsibilities of the different groups of stakeholders during the tests and present the coordination and collaboration mechanism enabling first responders to receive and use efficiently the HydroSOS early warning information Activity 2.2.1.3 Identify the good practices, challenges and limitations of products and services during the Flood and Drought events at each of the pilot testing locations Activity 2.2.1.4 Raise awareness about the pilot testing using multi-media channels

			Activity 2.2.1.5 Develop an action plan to further improve products and services after the pilot testing
		2.2.2 Coordination and collaboration developed at the regional, national and local level	Activity 2.2.2.1 Organize national consultative workshops (participants from local/national agencies involved in Floods and Drought management) to share the knowledge (new methodologies, concepts and tools for effective forecasting and dissemination of early warnings) from the pilot tests Activity 2.2.2.2 Based on pilot testing, update/develop coordination and collaboration standard operating procedures (SOP) for jointly preparing and responding to future flood and drought events
		2.2.3 Decision-makers are informed with key water resources management parameters for current status and sub-seasonal and seasonal outlooks	Activity 2.2.3.1 Describe the network of the relevant policy-makers responsible for floods and drought management as well as other related fields (water resources, health, agriculture, ecosystem, forestry, soil and land management.) Activity 2.2.3.2 Organize and conduct national workshops to identify the gaps and needs in existing policies and plans with special attention on safeguard actions for minimizing direct and indirect risks arising from the project activities, and to highlight the key long-term strategies for water resources management especially for flood current status and sub-seasonal to seasonal drought outlook Activity 2.2.3.3 Present the recommendations to the concerned decision-makers at the national level
Component 3: Water and climate resilient regional cooperation arrangements together with National and regional stakeholders, and community involvement	Outcome 3.1 Improve information base and practices related to water resource management and climate change adaptation	3.1.1 Best practices and experience from other region and river basins are made to ensure that existing national policies and practices are interoperable in GBM river basin cooperation framework	Activity 3.1.1.1 Conduct a desk study, and hold meetings with stakeholders, to identify the status of climate and future socio-economic changes in the transboundary governance plans, policies and guidelines for flood and drought management in Bangladesh and Nepal Activity 3.1.1.2 Develop a short report underlining the strengths together with the identified gaps and additional needs related to climate and development impacts in the GBM regional Activity 3.1.1.3 Organize and conduct national and regional workshops to review, propose update and implementation arrangements on existing plans, policies and guidelines on water resources management and climate change adaptation in the GBM Basin. Activity 3.1.1.4 Propose long-term actions for strengthening resilience and capacities at transboundary, national and local levels to be implemented by NMHSs and the other regional agencies Activity 3.1.1.5 Collect feedbacks, suggestions and recommendations from the workshop participants on the links between activities of National Programmes Activity 3.1.1.6 Identify roles and responsibilities of the individual organizations and define the coordination mechanism to improve the implementation of the water resources management and climate change adaptation measures

		3.1.2 Analysis and optimization of benefits of regional water and climate adaptation action.	Activity 3.1.2.1 Conduct consultation with national stakeholders to gather examples of best practices and approaches for water resources management, flood and drought risks reduction and climate adaptation related measures Activity 3.1.2.2 Draft report on recommendations for improving regional water and climate adaptation action. Activity 3.1.2.3 Organize the dissemination of the report to policy-makers and decision-makers
	Outcome 3.2 National adaptation strategies (i.e. NAPs) are fully inclusive of water management issues, address community concerns. Methodology and mechanism for leveraging and sharing benefits of optimising adaptation at regional level are in place.	3.2.1 An inclusive process is developed to ensure that National adaptation strategies explicitly address water relevant instruments and strategies. Inclusive approaches are operational to include local communities.	Activity 3.2.1.1 Prepare/suggest updating of framework for adapting the National adaptation strategies with safeguard actions on long term water resources management, climate change adaptation and disaster risk reduction with local stakeholders Activity 3.2.1.2 Conduct community-based workshops with agencies, local communities/ organizations and other relevant stakeholders to identify and prioritize adaptation measures Activity 3.2.1.3 Collect feedbacks, suggestions and recommendations Activity 3.2.1.4 Propose action plans at local and national levels to review and improve the National Adaptation strategies together with the local communities
		3.2.2 Regional mechanism for adaptation cooperation on HydroSOS established and operational. Periodic review and update of the mechanism is agreed on by riparian states.	Activity 3.2.2.1 Organize and conduct workshops to disseminate the results of Hydro-SOS EWS and associated products on climate adaptation for the GBM Activity 3.2.2.2 Collect feedbacks, suggestions and recommendations from the workshop participants on the links between activities of National Programmes and the HydroSOS BaNe project Activity 3.2.2.3 Identify roles and responsibilities of the individual agencies or organizations and define the coordination mechanism to review and update the implementation of the climate change adaptation measures based on good practices identified in the GBM riparian countries.

B. Describe how the project /programme would promote new and innovative solutions to climate change adaptation, such as new approaches, technologies and mechanisms.

The development and implementation of a free, open-source, and sustainable Hydrological Status and Outlook System (HydroSOS) BaNe will aim at augmenting operational capabilities of National Meteorological and Hydrological Services and the institutions in charge of water planning and management and disaster risk reduction. The aim will be to develop an innovative system operating on a daily, weekly and monthly timescales capable of providing: 1) An indication of the current basin-wide hydrological status (including: groundwater, river flow, soil moisture, cryosphere); 2) An appraisal of where this status is significantly different from 'normal' (for example, indicating drought and flood situations); 3) An assessment of where this is likely to get worse over coming months and season. HydroSOS BaNe will bring together existing tools and approaches to develop composite products of hydrological and meteorological status and outlook through the implementation of the WMO HydroHub (enhancing hydrological monitoring (through the uptake of innovative technologies and approaches) and building capabilities) and World Hydrological Observing System (WHOS)[46] mandate of standardization of hydrological metadata, data and information management system access and exchange. A detailed inventory of existing methodologies, equipment (hard and software), skills and operational procedures in the GBM targeted countries will be conducted to build on available tools and products.

The applicability and effectiveness of the proposed HydroSOS Ba-Ne system will be tested in various pilot sites selected by the participating countries to incorporate feedback and suggestions of end-users. Other project outcomes will include development of floods and drought risk maps using the local, national and global data and impact-based forecasting and warning services. There have been studies in the past to understand characteristics of floods and drought in the GBM basin countries. Floods can be predicted successfully with lead-time ranging from several days to even up to a few weeks by some of the countries. However, a regional approach will ensure information is shared between the respective agencies of the countries and is further developed for end-user to support timely decisions. Understanding of a slow-setting drought is in particular constrained due to lack of regional datasets and standardization in analytical methods and interconnectedness between different types of droughts namely meteorological, hydrological and agricultural. The HydroSOS BaNe project will focus on integration of various types of droughts and provide support in drought monitoring and prediction from monthly to sub-seasonal to seasonal outlooks. It will aim to standardize processes followed across countries in the basin for production of hydrological status and outlooks and ensure region wide collection, dissemination of the information for climate change adaptation measures. The most vulnerable elements of the basin; human and environmental resources such as water, fish, minerals and agriculture etc. need long lasting, innovative, and coordinated measures to ensure sustainable development of the area.

Innovations under component 1: The floods and drought risk maps, integrating environmental indicators to the impact on human and properties approaches, will be open-source and thus facilitate mainstreaming of results into other initiatives relating to floods and drought management or generally development processes in the target countries. Risk maps will be developed for both current and future projected climate changes and will be crucial for generating impact-based forecasts for example for extreme floods and drought events. Coordinating with the countries will help promote adoption of risk assessment/mapping methodologies by other countries in the GBM (South Asia in general) which are also prone to floods and drought events. Community based flood management including nature-based solutions and gender mainstreaming in the selected communities will be useful to identify and design innovative solutions relating to risks identification, adaptation measures and dissemination of warnings within communities and at local levels.
Examples of locally led adaptation actions through various HydroSOS BaNe project will include:
· Communities and individuals raising the level of houses to protect their lives and properties from flood hazards maps and awareness programme
· Building of temporary structural measures such as dikes and levees, diversion of flood water etc.
· Changing the agriculture patterns e.g., use of crops withstanding the excess water or reduced water
· Enhanced water security with a focus on innovative water distribution and storage in water scarce rural areas, including through rainwater harvesting systems, solarized water systems, enhanced household water treatment and storage.
· Promoting integrated water resource management in both drought and flood-prone landscapes through nature-based solutions such as watershed restoration, water and soil conservation measures.

Nature-based or green solutions will also be designed such as multipurpose green infrastructures, keeping in mind that they should be beneficial not only from the environmental, but also from the perspective of economic and social as well. Take for example, earmarking areas that gets flooded during heavy rains toll be used for livelihood purpose such as for temporary fishing during a monsoon period and recreational areas during dry season.

Innovation under component 2: An integrated and state-of-the-art approach to flood and drought early warning systems is an immediate priority for the GBM countries (especially Bangladesh and Nepal) where timely and relevant information are lacking for impending hydro-meteorological hazards. In these countries during a flooding situation in one part, there can be a drought in another part of the country. An integrated approach to floods and drought monitoring and early warning systems will support national forecasters to observe and generate useful early warning services to the stakeholders.

[46] https://public.wmo.int/en/our-mandate/water/whos

It must be underlined that the methods for producing warnings will differ depending on the characteristics of the hazard (flood or drought), as both hydrological extremes differ in their spatial and temporal distribution. Floods are relatively rapid events, caused by intense precipitation, limited in time and affecting localized areas as compared to drought. Whereas drought in contrast is a slowly developing phenomenon and might have a much-distributed impact both in area and time. On the one hand, the data needed to describe both phenomena can be partially shared, such as meteorological, hydrological and agronomical parameters. On the other hand, the methodology to forecast the two phenomena varies considerably and depends on the availability of different types of meteorological forecasts (from nowcasting for short pluvial events to seasonal and sub-seasonal forecasts for drought onset). The HydroSOS end-to-end hydrological and meteorological monitoring, forecasting and disseminating system will be innovatively designed to bring together existing knowledge, tools and approaches to develop composite products of hydrological and meteorological status and outlook through the implementation of the WMO Hydrohub (enhancing hydrological monitoring and data exchange) and World Hydrological Observing System (WHOS) mandate of standardization of data and information management systems. A detailed inventory of existing methodologies, equipment (hard and software), skills and operational procedures in the GBM countries will be conducted to build on available tools and products. The proposed system will provide possibilities to receive information from the users (crowdsourcing) about their observations during the floods and drought events. The web-based early warning system will be made compatible and scalable to integrate other hazards in future, such as fire, diseases etc.

Innovative approach under component 3: The project will bring together policymakers and decision makers to review, develop and refine existing policies on water management and disaster risk management following experiences and lesson learned from the outcome of component 1 and 2. This will allow developing regional/transboundary water management and climate adaptation plans and guidelines instead of country specific ones. Flood management solutions will be designed with communities, benefiting from existing capacities and traditional knowledge, together with recent innovations and lessons learnt from similar situations. Besides, the project will provide support to land-use planning, alongside national and local authorities, taking into account national and local policies (environmental regulations, building codes, etc.), to areas at risk and help minimizing risks of disasters in coherence with local requirements.

C. Describe how the project would provide economic, social and environmental benefits, with particular reference to the most vulnerable communities, and vulnerable groups within communities, including gender considerations. Describe how the project would avoid or mitigate negative impacts, in compliance with the Environmental and Social Policy of the Adaptation Fund

The Project will be beneficial in general, providing vital support to the most marginalized section including those dependent on subsistence farming. Being one of the most poverty regions of the world, people's livelihoods in GBM basin region are critically linked to climatic variation and extremes such as flood and drought. The major economic, social, and environmental benefits are highlighted here.

Economic Benefits	Social Benefits	Environmental Benefits
• Water security/management and economic growth are closely linked, and the project envisages considerable benefits from this approach • Availability and access to surface/groundwater will result in higher farm productivity, increase in income, creation of new assets and growth of local and regional economy. • An effective flood and drought EWS will help in taking adaptive measures such as farm practices, crop selection/adoption, harvest timing etc. It will build resilience into livelihoods and contribute to local economy • The GBM river plains is the food basket of the region and effective management holds the key to ensuring food security. Rice and Wheat; the main staple foods together account for over half the dietary energy; and these crops require a considerable amount of water. • Water is an important input for other economic activities including household and commercial water use, hydropower generation and ecosystem services. The project will drive development and industrial growth in the GBM region. • Hydropower is both economical and renewable and the GBM basin carries immense potential for hydropower development. • Improved water management ensures access to sanitation, health and environmental sustainability. The GBM basin already under climatic stress • The project will supplement cooperation among riparian	• More than 10 million people will benefit in terms of access to EWS service in order to adapt to climatic variation and climatic extremes such as flood and drought • Development of an inclusive EWS for climatic hazards will ensure participation and access of the most vulnerable groups including those with disability, women, senior citizens and children. • Emphasis on community participation in project conception/design and project monitoring will contribute to building local network, voluntary groups, ownership/accountability and sustenance • Inclusion and training of indigenous groups, Community based and Non-Government Organizations to carry forward the initiatives beyond project phases • It will help deal with ongoing	The project with its nature-based solution approach will promote appropriate adaptation measures and help maintain ecological balance for the entire basin Efficient water management mechanisms and corresponding practices will foster sustainability for example, through appropriate irrigation methods, crop choices etc. Increased understanding of climatic changes and its relationship with natural resources including water and environment Increased hydropower generation will contribute to reduction in non-renewable energy sources There will be more systematic measures to mitigate land degradation and soil desertification

countries leading to increased trade and navigation	large scale out-migration and strengthen social institutions	

A final Environmental and Social Risk Management Plan (ESRMP) is developed in consultation with primary stakeholders at the regional, national and local levels and is submitted as part of the project proposal. ESRMP will delve into the impact analysis of the proposed project and identify potential undesirable effects during planning and implementation so that they can be addressed with suitable measures. There is a formal mechanism available within ESRMP to report any grievances arising out of project activities directly to the project implementing authorities and funding agencies

D. Describe or provide an analysis of the cost-effectiveness of the proposed project and explain how the regional approach would support cost-effectiveness.

The proposed project is an innovative solution to deal with challenges emanating from better water resource management, disaster risk reduction and building community resilience through increased farm income, inclusive growth, participative resource sharing, and gender sensitization. The cost-effectiveness analysis includes various short-term benefits such as prevention and minimization of losses from hydro-meteorological hazards, and availability and access to impact-based EWS. It further includes strengthening of observational networks, modeling capabilities, and communication infrastructure. In the medium term climate adaptation and disaster risk mitigation planning will be augmented through the development of risk maps, climate adaptation measures such as climate resilient cropping, flood level marking, development of the DRR-based local economy and creation of social institutions etc. In the long-term perspective, there will be optimal use of water resources leading to the prevention and mitigation of floods and droughts, ecological restoration, and formulation and implementation of policies for making communities adapt to climate changes.

Bangladesh and Nepal cover a major portion of the Ganga Brahmaputra Meghna (GBM) River Basin and both face challenges stemming from its socio-economic and ecological context leading to inadequate water resources management. Given the high vulnerability of the region due to its socio-economic and ecological context, this project focuses on developing integrated, climate-resilient water management strategies. These include establishing a robust Early Warning System (EWS), improving transboundary cooperation, and enhancing community-based disaster risk management. A regional approach is essential to bring into alignment a common and integrated approach that rests on mutual interest, common concerns, and considerable benefits for the participating countries. Transboundary river systems such as GBM Basin require a regional approach without which effective management will be extremely difficult. On the other hand, a regional approach provides scope for data sharing on a real-time basis and facilitating disaster response and execution of risk reduction measures.

The HydroSOS project's Environmental and Social Impact Assessment (ESIA) study emphasizes the importance of supporting the traditional structural measures, such as embankments, fences, and dikes, by considering non-structural measures mainly EWS, risk profiles in relation to climate change scenarios, capacity development, community-based approaches etc. Given the inherent uncertainties of how climate change will alter hydrological regimes and the local expression of these inevitable changes, it is crucial to implement measures that provide both immediate and long-term adaptation benefits. This approach contrasts with costly, short-term, and infrastructure-oriented disaster risk reduction methods.

Bilateral Partnerships and Last-Mile Services
A key element of the cost-effectiveness of this approach is the deepening of bilateral partnerships on last-mile weather, water, and climate services. Leveraging and sharing expertise and best practices from both countries can generate reliable information, translate it into user-specific advisories, and disseminate it to last-mile users for socio-economic and environmental benefits. Research studies show that early drought response, combined with safety net transfers and resilience-building, is cost-effective. A DfID-funded study found benefit-to-cost ratios ranging from 2.3:1 to 13.2:1, depending on the country, demonstrating that resilience efforts offset their costs. Farmers who adapted their agricultural practices based on weather advisories in India increased their annual income by 25 to 53 per cent. This collaborative approach marks a significant shift from previous practices in silos to a more holistic approach, as seen in the HydroSOS BaNe project.

Enhancing Climate Adaptive Capacities at local level
The proposed project aims to cost-effectively enhance the climate adaptive capacities and resilience of communities facing hydro-climatic risks. By integrating local, national, and regional adaptation strategies and implementation mechanisms, it focuses on the comprehensive monitoring and management of water resources. Floods and droughts, prevalent in both countries, necessitate a robust, cost-efficient solution. At local level, community will develop self-help capabilities and adaptation measures (early warning system, risk knowledge, local level plans for emergency situation, raising of house level due to flood marking, changing crop patterns, creating or re-establishing flood plains which increase flood management capacity and support biodiversity and habitat conservation objectives; Improving preparedness and contingency planning to deal with risks (including climate); etc.)

Strengthening National Services
The project will strengthen the capacities of the National Meteorological and Hydrological Services (NMHSs) through an innovative and tailored Regional Hydro-Meteorological Early Warning System, providing short-term and seasonal forecasts. This system will be embedded into a Long-term Integrated Water Resource Information System. By fostering cross-border collaboration, this initiative will enhance the overall impact by leveraging shared resources and knowledge. Concrete adaptation actions, developed through a participatory process, will be executed in an integrated manner. This cross-border collaboration ensures the sustainability and effectiveness of the project, ultimately leading to a more resilient and adaptive response to hydro-climatic challenges.

Support to Climate Change Impact and Historical Context
Between 2011 and 2022 in Nepal, there were 1,811 flood-related incidents, resulting in 876 deaths and 209 injuries. Additionally, 65,295 families were affected, 563 people were reported missing, 11,787 private houses were completely destroyed, and 42,060 private houses were partially damaged[47]. The Post Disaster Needs Assessment (PDNA) estimated that the total damage caused by floods is about USD 584.7 million, with the total recovery needed to be estimated to be about USD 705.1 million[48].
Flooding in Bangladesh causes an annual loss of around USD 1 billion. Furthermore, increasing drought periods in Bangladesh, exacerbated by climate change, threaten significant agricultural losses by 2050. Wheat production may decline by up to 32%, maize productivity by 20%, and other crops like sugarcane, soybeans, and sorghum by 7-10%, resulting in a cumulative loss of USD 36 billion (3.1% of annual agricultural GDP)[49].
The project will provide preparedness and cost-effective adaptative measures to reduce the socio-economic and environmental impacts of floods and drought in the two targeted countries.

The proposed project for the GBM River Basin represents a cost-effective approach to enhancing climate resilience and water management in one of the most vulnerable regions in the world. By combining risk mapping, capacity building, improved water management, and regional cooperation, the project addresses the root causes of vulnerability and promotes sustainable development. The potential economic benefits of the project—ranging from avoided asset losses and increased economic productivity to enhanced resilience and reduced costs of non-cooperation—far outweigh the initial investment costs. Furthermore, the project's focus on community-based approaches and long-term sustainability ensures that the benefits are not only immediate but also enduring, making it a highly cost-effective and strategic investment for the region.

HydroSOS BaNe project component	**Component Cost (US$)**	**Beneficiaries (Approximately) through the proposed project**	**Proposed project beneficiaries and benefits**	**Alternatives to proposed approach and cost (USD)**	**Potential social and environmental risks associated with the Alternative approaches (without the HydroSOS BaNe project) as discussed with the Stakeholders of Bangladesh and Nepal**
Risk-based preparedness and adaptation to climate variabilities, water use stresses and environmental uncertainties	3,000,000	Directly 10,000 Indirectly 1,000,000	Development of preparedness and adaptation measures based on dynamic risk assessment and risk-based plans. The Global Commission on Adaptation found that every $1 invested in adaptation could result in $2–$10 in net economic benefits.[50] Differential risk identification and prioritization for	Disaster risk reduction measures such as resettlement of vulnerable communities, involve much higher cost, but with limited benefits and detrimental environmental consequences. There is certainty that if DRR is properly designed and implemented, then it can certainly save more money than response could.[51] The approximate cost for developing structural disaster	Lack of social security, and livelihood options. Cultural differences in the new locality. Acquiring lands for resettlement due to already populated areas and construction of houses will be costly and might be prone to other hazards. Houses constructed in the risk areas are impacted by growing climate change events. Not having impact-based risk information, leading to economical losses of the population.

[47] Adhikari, P. B., & Khanal, N. (2024). Seasonal variations of disasters in Nepal. Bibechana, 21(1), 1–11. https://doi.org/10.3126/bibechana.v21i1.54503
[48] Post flood Recovery Needs Assessment, Nepal Flood 2017, National Planning Commission,website: https://www.undp.org/sites/g/files/zskgke326/files/migration/np/PFRNA-Report.pdf
[49] UNDRR (2020). Disaster Risk Reduction in Bangladesh: Status Report 2020. Bangkok, Thailand, United Nations Office for Disaster Risk Reduction (UNDRR), Regional Office for Asia and the Pacific
[50] "Adapt Now: A Global Call for Leadership on Climate Resilience," *Global Commission on Adaptation*, September 10, 2019, https://doi.org/10.1596/32362.
[51] "Cost–Benefit Analysis of Community-Based Disaster Risk ...," Prepare Center, accessed September 11, 2024, https://preparecenter.org/sites/default/files/cba_guidance.pdf.

			vulnerable sections including gender, elderly, disabled. Capacity building at the local community level for making use of risk maps and available information Incorporation of emerging risk from climate change perspective into development planning	risk reduction measures in the selected vulnerable will be around 300 Million USD Conventional risk maps fail to incorporate climate change induced risks and thus will be ineffective	Displacement can lead to the breakdown of community networks and social cohesion, impacting mental health and well-being. Higher incidence of poverty and inequality due to inadequate support for vulnerable sections during resettlement. Environmental degradation due to large-scale construction activities.
Strengthening water resources management through access to hydro-meteorological information and augment regional /national capacity to monitor and assess Hydro-Meteorological hazards	6,000,000	Directly 100,000 Indirectly more than 1,000,000	Regional-level data sharing will help better utilization of water resources and climate change events A regional approach is critical to mitigate hydro-meteorological hazards through an integrated approach to floods and drought monitoring and EWS. Upgrading Hydro-meteorological information and EWS in the developing world to the standard of these services in the developed world could lead to between 300 million and 2 billion USD avoided asset losses annually, an averageof 23,000 lives saved each year and between 2-30 billion USD of additional economic benefits each year.[52] Participation of communities in designing EWS for floods and droughts. Increasing productivity and better health and utility through access to water resources. Systematic documentation of	National level EWS for flood and droughts are developed separately and operate independently without being integrated at the basin scale Water resource management framework is country specific and without real time data or meta-data sharing Techno-centric EWS installed without community consultation and participation leading to lack of effectiveness and ownership The alternative solution would be to construct dams and reservoirs in vulnerable areas for flood control and irrigation channels, which will approximately cost around 150-300 Million USD, or the next solution would be to reconstruct or retrofit the vulnerable community infrastructure, which would be expensive (approximately 100-150 Million USD) and time consuming due to the need to retrofit in communities and in downstream areas	Existing national EWS systems are not designed jointly with the local stakeholders and warning services are not timely and impact-specific. Also regional aspects are not considered for monitoring of weather, water and climate events. It has been informed from the stakeholders that having timely warning advisories on weather and water will improve 50 % of livelihood or agriculture production, 90 % saving of lives or injuries to population. Construction of dams and reservoirs will be costly measures and impact the environmental and ecosystem services in the countries (in Nepal where most of the rivers are in terrain and mountainous regions) especially use of explosive, removal of houses and cultural heritage etc. Also, the construction of structural measures could impact social and economic sectors as storage of water will not allow populations to use water for irrigation, water use, fishing etc. Also, dams and reservoirs will not provide a guarantee of controlling floods. Alteration of natural water flows can impact downstream ecosystems and agricultural areas.

[52] Rajesh Kumar Rai et al., "Cost-Benefit Analysis of Flood Early Warning System in the Karnali River Basin of Nepal," *International Journal of Disaster Risk Reduction* 47 (August 2020): 101534, https://doi.org/10.1016/j.ijdrr.2020.101534.

			climatic change effects and filling of gaps in existing observational network		
Water and climate resilient regional cooperation arrangements together with National and regional stakeholders, and community involvement	1,200,000	Directly 1 Million	Operationalization of an integrated Climate adaptation with disaster risk reduction approach at a regional and national levels Community empowerment through involvement in refining national and local policies for effective and efficient implementation of adaptation plan and development practices Sharing of knowledge and practices with other communities of the region. Reduced cost for each country of knowledge management, capacity building, research and hydrological planning through coordination and data sharing.[53]	Disaster Risk Reduction and Climate Adaptation programs and policies executed separately without synergy and joint strategy . Limited Community involvement and programs without integrating science-based risk mapping and thus failing to be useful. Community knowledge sharing is not provided with other neighboring countries/communities. The development and update of national policies and programmes will cost approximately 10 Million USD without any concrete output and benefit to stakeholders	Existing Policies and plans are not aligned with the needs of local or community stakeholders which might not provide associated socio-economic benefits. Some of the polices and plans at the country level needs an update with the involvement of stakeholders from all sectors and at all levels. Inadequate community engagement can lead to a lack of ownership and participation in risk reduction and adaptation measures. Potential for increased vulnerability due to the exclusion of local knowledge and practices in policy formulation. Inadequate regional cooperation can hinder the effective management of transboundary environmental issues, such as water resource management and biodiversity conservation. Lack of integrated planning can lead to missed opportunities for enhancing ecosystem resilience through coordinated adaptation measures.

Given the relative costs and benefits of possible Climate Change Adaptation (CCA) and DRR measures, the project has selected the three least-expensive interventions through EWS and knowledge /capacity building measures, to generate significant benefits in the form of increased safety and economic activities as opposed to significant investment in structural or hard measures.

E. Describe how the project is consistent with national or sub-national sustainable development strategies, including, where appropriate, national or sub-national development plans, poverty reduction strategies, national communications, or national adaptation programs of action, or other relevant instruments, where they exist. If applicable, please refer to relevant regional plans and strategies where they exist.

The proposed project will contribute to UN Sustainable Development Goal (SDG) target 6.5 to implement integrated water resources management at all levels, including through transboundary cooperation. It also contributes to target 1.5 in building resilience through reduction in exposure and vulnerability for climate related extreme events; target 2.4 to ensure sustainable food production through climate adaptation to drought, flooding, other disasters; and target 11.5 making human settlements inclusive, safe, resilient and sustainable. At the national level, Water Resources Strategy (WRS) and Intended Nationally Determined Contributions (INDCs) and action plan (National Adaptation Plans or NAP and National Adaptation Plans for Action or NAPA) of each country will be taken into account to ensure that project outcomes are consistent and improves water resources management and in turn, reduce flood and drought disaster risks. Regional, national and local water management policies and action plans will be reviewed to ensure that knowledge and experience gained through the project feeds back to the national development policies and plans in the area of livelihood, natural resources management, ecosystem protection, disaster risk management, climate change adaptation and human rights in relation to migration and adaptation. A specific guideline for regional entities or

[53] "Regional Cooperation: Scoping the Benefits of Transboundary Water Cooperation in the NWSAS Basin," UNECE , accessed September 11, 2024, https://unece.org/fileadmin/DAM/env/water/meetings/2019/18-19_June_Tunis/Session_5_Benefits_cooperation_1906019_FINAL.pdf.

centers will be prepared together with the involvement of the national stakeholders with an aim to build better coordination and collaboration with different agencies of each participating country.

Bangladesh

Policies/strategies/plans	Description	Contribution or advancement through the HydroSOS BaNe project
National Adaptation Plan (2023-2050)	Bangladesh NAP vision which is conceptualized based on underlying aim i.e., to reduce risk and vulnerability due to the adverse impacts of climate change, and to help fulfil Bangladesh's aspiration to become a climate-resilient nation. Ecosystem resilience in the face of climate change is core to achieving this aspiration, recognizing that ecosystems may be adversely impacted both by anthropogenic impacts and by climate change. Promoting sustainable nature-based solutions that balance economic growth and environmental sustainability has been sought as a means of ecosystem-based adaptation (EbA).	The project will develop flood and drought risk maps and early warning system which will provide timely warning services to the local stakeholders improving their response capabilities. Also, during community-based flood and drought management activities, locally led sustainable climate change adaptation measures (construction of houses based on historical flood water levels, modified agricultural planting seasons, food security methods etc.) will be implemented. HydroSOS BaNe project outputs linked are 1.1.1, 1.1.2, 1.2.1, 2.1.1
National Adaptation Programme of Action (NAPA)	The project is closely aligned with and will address several National Adaptation Programme of Action (NAPA 2005 & 2009-revised) adaptation strategies, namely Strategy 2 – Providing drinking water to communities to combat the effects of climate change (Output 1.3); Strategy 3 – Capacity building for integrating climate change into land-use planning, infrastructure design and conflict management (Outputs 4.1. and 4.2); Strategy 4 – Disseminating climate change and adaptation information to vulnerable communities (Outputs 2.4 and 4.2); Strategy 5 – Constructing flood shelters to cope with enhanced recurrent floods (Output 2.1); Strategy 6 – Mainstreaming adaptation into policies and programmes in different sectors (Output 4.1); Strategy 10 – Promoting research on drought, flood and climate-resilient crops to facilitate adaptation (Output 3.1 and 4.2); 11 – Promotion of adaptation to coastal crop agriculture (Output 3.1); and Strategy 15 –Exploring options for emergency preparedness measures to cope with enhanced climatic disasters (Outputs 1.1; 2.1; 2.2; 2.3; and 2.4). NAPA 2009 emphasized on four basic national security issues of Bangladesh i. e. a) food security, b) energy security, c) water security, and d) livelihood security (including right to health) and respect for local community on resource management and	Risks maps for current and projected climate will allow to understand the impact area due to flood and drought events HydroSOS BaNe project outputs linked are 1.1.1, 1.1.2, 1.1.3, 1.2.1, 2.1.1,2.2.1, 3.1.1, 3.1.2
Bangladesh Environment and Climate-Resilient Sustainable Development (Vision 2021)	Under the Bangladesh Environment and Climate-Resilient Sustainable Development (Vision 2021), the goal is that the livelihoods of Bangladesh's population will be self-sustaining through development that ensures a healthy environment and the welfare of future generations. Climate change is a specific focus of this vision, i.e.: i) climate change adaptation in the agriculture sector; and ii) mitigating the natural hazards and threats imposed by climate change. Several elements of the project are consistent with Vision 2021, including improving resilience against the increased intensity of climate-induced disasters (Outputs 1.1;	Flood and drought risk maps with environmental indicators such as wetlands, protected areas etc. will be developed for climate resilient ecosystem system. The risk maps layers will be visualized under the HydroSOS EWS in order to assess the impact of floods and drought on protected areas, wetlands etc. Also, long term improvement of the environmental and ecosystem system will be carried out through the update of national and regional policies, plans and guidelines etc. HydroSOS BaNe project outputs linked are 1.1.1, 1.1.2, 1.1.3, 1.2.1,1.2.2 2.1.1,2.2.1, 3.1.1, 3.1.2

	2.1; 2.2; 2.3 and 2.4) and the dissemination of climate-resilient agricultural practices (Output 3.1).	
The 8th Five Year Plan (7th FYP) (2021-2025) of Bangladesh	The 8th FYP outlines new strategies, institutions and policies, while strengthening the existing ones, to complete Bangladesh's agenda of achieving the social and economic outcomes of the country's Vision 2025. Several initiatives under the 8th FYP are consistent with the project and are specifically targeted to people living in Bangladesh.	The component 3 of the HydroSOS BaNe project will contribute to the implementation of the 8th Five Year Plan mainly through saving of lives from future climate change events, development of livelihoods through climate change adaptation strategies at local levels Components 1, 2 and 3 will support in advancing of the 8th Five Year Plan.
Bangladesh Climate Change Strategy and Action Plan (BCCSAP)	The BCCSAP is built upon Bangladesh's NAPA and outlines nearly 50 programmes and projects to be implemented by the country over the short-, medium- and long-term. The proposed project is closely aligned with the seven strategic areas of the BCCSAP. These strategic areas, as well as the alignment between them and the project are described below. i) Disaster management. The project will contribute to disaster management at a local and regional level. This will be achieved by developing hazard maps for Bangladesh regions that are vulnerable to climate induced natural disasters (Output 2.1) and increasing the coverage of the other disaster preparedness Programme (Output 2.2). The project will also contribute to greatly improved disaster resilience at a local level by strengthening preparedness and response actions (Output 1.2) and improving stakeholders' knowledge and skills against cyclones and floods (Output 2.2). ii) Research and knowledge management. The project will contribute to improved research and knowledge generation regarding adaptation options in communities (Output 4.2) and locally appropriate climate resilient agricultural practices (Outputs 3.1 and 4.1). iii) Capacity building and institutional strengthening. The project will improve the capacity of communities to prepare for and respond to the impacts of increasingly severe climate induced disasters (Outputs under component 1, 2 and 3) and improve agricultural productivity under climate change conditions (Outputs under component 1 and 2). In addition to this, the project will capacitate local government institutions and policy makers to promote climate-resilient approaches in the project areas and at a district level (component 3).	The HydroSOS BaNe project will develop hazard maps (with return period of 50, 100 years) to understand the potential impacts of floods and drought events. Also, community-based flood and drought management will provide necessary capacity and tools for improving the resilience of populations. The project will identify solutions with inclusive and participatory approaches so that it is utilized and long term sustainable. The proposed project will ensure capacity development activities for risk maps, HydroSOS EWS, community-based activities etc. are carried out at local, national and regional levels. HydroSOS BaNe project outputs linked are 1.1.1, 1.1.2, 1.1.3, 1.2.1,1.2.2 2.1.1,2.2.1, 3.1.1, 3.1.2
Bangladesh Climate Change Resilience Fund (BCCRF) Guidelines, 2010	The BCCRF provides grants for climate resilience projects in Bangladesh. The guidelines outline the criteria and procedures for accessing and utilizing funds to implement adaptation measures.	The project will share results of the HydroSOS project (for example, community-based flood and drought management in the pilot locations) to BCCRF so that in future, with funding support from BCCRF, similar tools and approaches could be applied in other communities of Bangladesh where similar needs and issues are identified.
National Plan for Disaster Management (NPDM)	National Plan for Disaster Management (NPDM) 2021-2025 Action for disaster risk reduction: was prepared	The HydroSOS project will develop and test the applicability and effectiveness of the EWS and risk

	and is aligned with national, regional and international frameworks including Delta Plan 2100, 8th 5 Year Plan of Government of Bangladesh, SFDRR, Asia Regional Plan for Implementation of the Sendai Framework for Disaster Risk Reduction, Dhaka Declaration 2015 Plus for Disability Inclusive Disaster Risk Management. The plan places importance for disaster risk management linking with rapid urbanization and climate change, and the necessity of DRR for sustainable development, and is flexible and adaptive in cognizance of the changing nature of risks in Bangladesh.	maps for Bangladesh and ensuring it supports the preparedness and response activities of the NPDM. Also risk maps with climate scenario will be useful in understanding the growing climate risks for both floods and drought in urban areas and due to urbanization. HydroSOS BaNe project outputs linked are 1.1.1, 1.1.2,2.2.1, 3.1.1, 3.1.2
The Bangladesh Delta Plan 2100 Formulation Project (BDP 2100)	The Government has recently adopted the Bangladesh Delta Plan 2100, aimed at gradual, sustainable development through adaptive delta management approach. The plan identifies climate change as a significant future challenge and reaffirms Bangladesh's commitment to both reducing GHG emissions as well as lays the foundation for climate adaptation initiatives for the following decades. It specifically identified 52 climate change adaptation projects for enhancing climate resilience of the delta. The project will specifically support the climate change adaptation practices and approaches	The HydroSOS BaNe project will support and improve the climate change adaptation practices in Bangladesh mainly through integrated flood and drought early warning system, risk maps, locally led adaptation measures (raising of houses level with flood marking, improving farming activities, timely warning for saving agriculture crops etc.) Components 1, 2 and 3 will contribute to the advancing of Bangladesh Delta Plan
Mujib Climate Prosperity Plan, climate inclusive updated National Environment Policy (2018),	"Mujib Climate Prosperity Plan" for Bangladesh for mobilizing financing, primarily through international cooperation, for implementing renewable energy and climate resilience initiatives, thus contributing to both climate change adaptation and mitigation. The draft plan identifies several key initiatives, which focus on renewable energy, energy storage infrastructure, power grid modernization, establishing carbon market regime etc. for future-proofing locally-led adaptation outcomes, and enhancing MSMEs.	The HydroSOS project will partly support the Mujib Climate Prosperity plan mainly ensuring the climate resilience is improved through EWS, understanding growing risks and identifying measures for prevention or management and empowering populations with locally led adaptation measures. Component 1, 2 and 3 related activities will contribute in advancing the plan and policies
updated Standing Order on Disaster (2019)	The objective of the formulation of the Standing Orders on Disaster (SOD) is to inform all concerned about their roles and responsibilities at every stage of disaster risk management. As per the SOD, each ministry, division, department and agency will prepare its own detailed work plan to perform its responsibilities and functions efficiently as mentioned in the Standing Orders; and will take necessary measures to implement it as per their own duty and capacity.	The project through the pilot testing of the EWS will test the national emergency plan to ensure the roles and responsibilities of various institutions are identified and agreed upon for proper cooperation and collaboration. Outputs 2.2.1, 2.2.2 under component 2
Sustainable Development Goals	Bangladesh has made significant progress towards achieving the SDGs, particularly in areas such as poverty reduction, education, healthcare, and gender equality. One of the prioritized goal is on Climate Change and Disaster Management: Bangladesh is highly vulnerable to climate change and natural disasters. The country has prioritized climate change adaptation and disaster risk reduction initiatives. Bangladesh has implemented various projects to enhance climate resilience, promote sustainable agriculture, and protect the environment.	The HydroSOS BaNe project will improve the SDGs especially the climate change adaptation and disaster management, gender equality, agricultural practices and protecting the environment.

Nepal

National Adaptation Plan of Nepal	NAP Nepal has 9 priority adaptation programs. Agriculture and Food security is the top priority and accounting of water availability for irrigation is required for suitable adaptation measures. Water Resources and Energy as well as disaster risk reduction and management are also the priority programs for NAP. The irrigation systems in Nepal are largely managed by Water User Associations (WUA) which play a significant role in the management and operation of irrigation facilities at the local level.	The project will develop flood and drought risk maps and early warning system which will provide timely warning services to the local stakeholders improving their response capabilities Also during community-based flood and drought management activities, locally led sustainable climate change adaptation measures (construction of houses based on historical flood water levels, modified agricultural planting seasons, food security methods etc.) will be implemented. HydroSOS BaNe project outputs linked are 1.1.1, 1.1.2, 1.2.1, 2.1.1
Irrigation Policy 2013	The objective of the Irrigation Policy is to provide year-round irrigation to suitable agricultural land, develop institutional capability for sustainable irrigation management, and to enhance knowledge and skills in the irrigation sector. The policy emphasizes the importance of year-round irrigation services, service-oriented management, and cost-sharing with water users for efficiency and sustainability. The irrigation policy focuses on strategies like floodwater storage and inter-basin water transfer to address climate change impacts. The irrigation systems in Nepal are largely managed by Water User Associations (WUA) which play a significant role in the management and operation of irrigation facilities at the local level.	The HydroSOS products will provide stream flow status, forecasts (0-5 days) and outlook (sub-seasonal to seasonal) supporting various sectors (water resources, dams operators, water utility companies etc.) with information for enhanced services and decision making. Also risk maps and climate scenario will provide information for future planning of water resources and irrigation channels. HydroSOS BaNe project outputs linked are 1.1.1, 1.1.2, 1.2.1, 2.1.1
National Action Plan on Climate Change (NAPCC) June 2008.	Given the vulnerability of Nepal's water resources to climate change, efforts are being made to integrate climate change adaptation into irrigation and water resources management. This includes improving the resilience of irrigation infrastructure, incorporating climate change considerations into water allocation and planning, and promoting climate-smart water management practices.	The HydroSOS BaNe project will develop hazard maps (with return period of 50, 100 years) to understand the potential impacts of floods and drought events on water resources. Water resources assessment and monitoring will be carried out for developing the HydroSOS system which will support in the services related to irrigation, water utility, hydro power etc. supporting the NAPCC.
National Five-year development plan (NDP) 2024-2029-Planning Commission	Vision and Goals: The NDP sets out a vision for Nepal's development and establishes goals and targets to be achieved over the five-year period. It aligns with the broader national development agenda and priorities. Sectoral Plans: The NDP covers various sectors of the economy and society, including agriculture, energy, infrastructure, education, health, tourism, environment, and social development. It outlines strategies, policies, and programs specific to each sector to address challenges and achieve desired outcomes. Socio-economic Development: The plan focuses on promoting inclusive and sustainable economic growth, poverty reduction, job creation, and improving livelihoods. It aims to strengthen infrastructure, enhance productivity, and enhance social services to uplift the standard of living for all Nepali citizens. Regional and Local Development: The NDP recognizes the importance of regional and local development and aims to bridge regional disparities in terms of economic opportunities, access to services, and infrastructure development. It emphasizes decentralized planning and the participation of local	The HydroSOS BaNe project will improve the implementation of NDP especially the socio-economic development, gender equality, agricultural practices and protecting the environment. This is supported under component 3 of the proposed project

	communities and governments in the development process. Cross-cutting Themes: The NDP incorporates cross-cutting themes such as gender equality, social inclusion, environmental sustainability, and climate change adaptation. It highlights the need to mainstream these issues across sectors and ensure equitable development for all segments of society.	
Agriculture Development Programs	Nepal's agricultural sector is critical for rural livelihoods. The government, along with non-governmental organizations (NGOs) and development partners, implements various programs to promote agricultural productivity, enhance market access, and provide training and technical support to farmers. These initiatives aim to improve rural incomes and food security.	The HydroSOS EWS together with the risk maps will provide the impact-based forecasts on agriculture sector for any floods and drought events. This will be critical for decision making on farming, cropping and harvesting of crops. Also, risk scenarios will provide better understanding of future climate change events and identify measures for mitigating or managing negative consequences.
Sustainable Development Goals (SDG)	Gender equality and women empowerment: Nepal is committed to promoting gender equality, women's empowerment, and the elimination of all forms of discrimination and violence against women and girls. Efforts are being made to enhance women's participation in decision-making processes and ensure equal opportunities in education, employment, and leadership roles. Sustainable agriculture and food security: Nepal is working towards promoting sustainable agriculture practices, enhancing food security, and improving the livelihoods of rural communities. This includes increasing agricultural productivity, promoting climate-resilient farming techniques, and ensuring access to markets and resources for small-scale farmers. Conservation of ecosystems and biodiversity: Nepal is committed to preserving its rich biodiversity, protecting ecosystems, and promoting sustainable natural resource management. Efforts are being made to conserve forests, protect wildlife, manage water resources, and promote sustainable tourism.	The HydroSOS BaNe project will improve the SDGs especially the climate change adaptation and disaster management at local, national and transboundary levels, gender equality, agricultural practices, food security and protecting the environment. Also, capacity development on risk maps and nature-based solutions will develop understanding for conservation of ecosystems and biodiversity
National Adaptation Programme of Action (NAPA) 2010, and National Framework on Local Adaptation Plans for Action 2011	The Nepal NAPA identified nine priority areas for adaptation action based on a thorough assessment of climate change impacts and vulnerability: Agriculture and food security: Addressing the impacts of climate change on agriculture, including changes in rainfall patterns, temperature, and increased frequency of extreme weather events. Water resources: Focusing on adaptation measures related to water availability, water supply, and water management in the context of changing hydrological conditions. Forests and biodiversity: Protecting and managing forests and biodiversity to enhance their resilience to climate change and to support the livelihoods of local communities. Health: Addressing the health risks associated with climate change, such as the spread of vector-borne diseases and the impact on public health infrastructure.	Risks maps for current and projected climate will allow the decision makers to understand the impact area due to flood and drought events in the changing climate and develop risks prevention and management strategies at local and national levels. HydroSOS BaNe project outputs linked are 1.1.1, 1.1.2, 1.1.3, 1.2.1, 2.1.1,2.2.1, 3.1.1, 3.1.2

	Rural development and infrastructure: Building the resilience of rural infrastructure, including roads, bridges, irrigation systems, and other critical infrastructure. Urban areas and infrastructure: Addressing the vulnerability of urban areas to climate change impacts, including urban planning, infrastructure development, and management. Mountain ecosystems: Focusing on adaptation measures for the fragile mountain ecosystems, including glacial lakes, high-altitude biodiversity, and livelihoods of mountain communities. Disaster risk reduction and early warning systems: Strengthening the capacity for disaster risk reduction and early warning systems to respond effectively to climate-related hazards. Livelihood diversification: Promoting alternative livelihood options and income-generating activities to reduce the vulnerability of communities dependent on climate-sensitive sectors.	
National Climate Change Policy, 2019	This policy outlines Nepal's strategic approach to addressing climate change. It emphasizes the need for adaptation, mitigation, capacity building, and international cooperation to reduce vulnerability and enhance resilience to climate change impacts. The policy envisions “a country spared from the adverse impacts of climate change” (p. 5) with a focus on climate justice and the linkages between environmental conservation, human development and sustainability. It addresses both mitigation and adaptation, with the adaptation component focusing on adaptation and resilience for local communities, in line with the priorities identified in the National Adaptation Programme of Action (NAPA)	Flood and drought risk maps will be developed for adopting climate resilient measures. The risk maps layers will be visualized under the HydroSOS EWS in order to assess the impact of floods and drought on population, infrastructures, agriculture, protected areas, wetlands etc. Also, long term strategies for the development of social, economic, environmental and ecosystem systems will be carried out through the review and update of national and regional policies, plans and guidelines etc. incorporating the outputs and experience from HydroSOS BaNe project
National Framework on Local Adaptation Plans for Action (LAPAs), 2011	LAPA was developed, following an approach “delivery of adaptation services to the most climate-vulnerable areas and people” (p. 2). The LAPA framework aims to ensure that approaches to integrating climate change adaptation and resilience building in development efforts are bottom-up, inclusive, responsive and flexible. It outlines a process for local adaptation planning that involves sensitization, vulnerability and adaptation assessment and prioritization of adaptation options, leading to the formulation of a LAPA, which is then integrated into local planning, implemented and monitored (Government of Nepal, 2011c).	The project will develop flood and drought risk maps and early warning system which will provide timely warning services to the local stakeholders improving their response capabilities Also during community-based flood and drought management activities, locally led sustainable climate change adaptation measures (construction or raising the base of the houses based on historical flood water levels, modified agricultural planting seasons, food security methods etc.) will be implemented at the local levels supporting the sustainable planning and development. HydroSOS BaNe project outputs linked are 1.1.1, 1.1.2, 1.2.1, 2.1.1
Water resources policy, 2019	The policy entails three different levels of government to ensure clarity in the role and responsibilities for use, allocation and development of water resources through legal instruments, policy measures and institutional development. It focuses on water auditing & water accounting and guidance to be followed by the IWRM river basin offices	The HydroSOS products will provide stream flow status, forecasts (0-5 days) and outlook (sub-seasonal to seasonal) supporting various sectors (water resources, dams operators, water utility companies etc.) with information for enhanced services and decision making. Also risk maps and climate scenario will provide information for future planning of water resources and irrigation channels. HydroSOS BaNe project outputs linked are 1.1.1, 1.1.2, 1.2.1, 2.1.1

Water Resource Strategy 2002	The Water Resources Strategy was formulated based on policy principles that prioritize the adoption of Integrated Water Resources Management (IWRM) principles, emphasizing resource conservation and environmental protection by holistic management of river basins. The water resource strategy aims to achieve multiple objectives, including reducing poverty, providing access to safe water and sanitation, ensuring food security, generating hydropower, meeting industrial needs, facilitating water transport, protecting the environment, and preventing water-induced disasters.	The Integrated approach to flood and drought management through the HydroSOS initiative is implemented under the overall umbrella of IWRM. The output of the HydroSOS EWS will support in improving the services and decision making for water utility, hydro power generation, water resources management etc.
National Water Plan 2005	The National Water Plan 2005 operationalizes Water Resources Strategy, 2002 aiming to achieve goals of economic development, poverty alleviation, food security, and environmental protection. It is a framework that guides stakeholders for development and management of water resources and services. The short, medium and long-term action plans for the water sector has been developed through this plan.	The HydroSOS BaNe project will develop hazard maps (with return period of 50, 100 years), Hydrological status and outlook products to understand the potential impacts of floods and drought events on water resources. Water resources assessment and monitoring will be carried out for developing the HydroSOS system which will support in the services related to irrigation, water utility, hydro power etc. supporting the implementation of National Water Plan 2005.
Disaster Risk Reduction National Strategic Plan of Action (2018-2030)	This is the planning framework that covers the entire cycle and stages of disaster risk management. The plan is prepared in line with the Sendai Framework on Disaster Risk Reduction declaration for 2015-2030 and Sustainable Development Goals for 2015-2030.	The project will develop flood and drought risk maps and early warning system which will provide timely warning services to the local stakeholders improving their response capabilities Also during community-based flood and drought management activities, locally led sustainable climate change adaptation measures (construction of houses based on historical flood water levels, modified agricultural planting seasons, food security methods etc.) and disaster risk reduction (development oif hazard and vulnerability maps, knowledge and awareness etc.) will be implemented. The HydroSOS BaNe project will improve the SDGs especially the climate change adaptation and disaster management at local, national and transboundary levels, gender equality, agricultural practices, food security and protecting the environment. HydroSOS BaNe project outputs linked are 1.1.1, 1.1.2, 1.2.1, 2.1.1
National Disaster Risk Reduction Policy,2017 (2075)	The long-term vision of this policy is to contribute to sustainable development by making the nation safer, climate adaptive and resilient from disaster risk. The policy includes the increase in awareness, monitoring of natural and non- natural disasters, climate change adaptation, development of a multi-hazard early warning system for forecast based preparedness and response plan and also encouraging the regional /international agencies for rehabilitation after disaster.	The HydroSOS project will develop and test the applicability and effectiveness of the multi hazards EWS (monitoring and forecasting of climate change events) and risk maps for Nepal and ensuring it supports the preparedness and response activities of the National Disaster Risk Reduction policy mainly protecting lives, property and environment. Also risk maps with climate scenario will be useful in understanding the growing climate risks for both floods and drought in urban areas due to urbanization.
Water Induced Disaster Management Policy, 2015 (2072)	It emphasizes water-induced disaster management programs to be aligned with IWRM principle and the river basin development concept; a master plan at national level and at local level to be formulated; and to be prioritized according to short term, medium term	The Integrated approach to flood and drought management through the HydroSOS initiative is implemented under the overall umbrella of IWRM. The integrated approach will consider the water resources planning, river basin and risk management together to

	and long-term perspective and implemented with active community participation. Provision for classification of land based on effects of flood, landslide and mechanism to identify its use for settlement, economic activities and agricultural purpose.	minimize the loss of lives and improve the net benefit from the use of water sheds The output of the HydroSOS EWS will support in improving the services and decision making for water utility, hydro power generation, water resources management etc.

F. Describe how the project meets relevant national technical standards, where applicable, such as standards for environmental assessment, building codes, etc., and complies with the Environmental and Social Policy of the Adaptation Fund.

Relevant social and environmental concerns, laws/regulations, enforcing agencies, and enforced/regulated items in Bangladesh and Nepal will be reviewed and considered during the design and implementation of the project activities. Some of the laws or acts are provided below:

National technical standards, laws or acts	Description	Components/outputs alignment with the national technical standards
Environmental Act or Law • Environmental Conservation Act, 1995 • Environment Conservation Rules,1997 • Environmental Court Act, 2000 • The Local Government Ordinance, 1983 and Bangladesh Environmental Conservation Act, 2010	This act focuses on the conservation and protection of the environment in Bangladesh. It addresses various environmental issues, including pollution control, hazardous substances, environmental clearance for development projects, and environmental offenses. Also, Bangladesh Environmental Conservation Act, 2010 which focuses on the conservation and protection of the environment in Bangladesh. It addresses various environmental issues, including pollution control, hazardous substances, environmental clearance for development projects, and environmental offenses.	Components 1, 2 and 3 mainly activities under outputs 1.1.1, 1.1.2, 1.1.3, 2.1.1, 2.1.2, 3.1.1 and 3.1.2. Risk maps and EWS with environmental thresholds will be developed to understand the impacts and identify necessary mitigation and management measures
Bangladesh Meteorological Act, 2018	An act to make provisions for the purpose of issuing accurate meteorological and climate forecasts on timely basis, combating and reducing meteorological disaster, protecting public life and property, proper use of climate resources and making meteorological services strong, consolidated, target-oriented and updated	Components 1, 2 and 3 mainly activities under outputs 1.1.1, 1.1.2, 1.1.3, 2.1.1, 2.1.2, 3.1.1 and 3.1.2
Bangladesh Climate Change Trust Fund (BCCTF) Act, 2010	This act established the BCCTF, which provides financial resources for implementing climate change projects and programs. The fund supports adaptation and mitigation initiatives at the national and local levels.	Components 1, 2 and 3 mainly activities under outputs of community-based flood and drought management for designing future projects to replicate it in other communities and also for implementing national policies and plans on climate change adaptation and disaster risk reduction measures.
Labour Act or Laws, 2006	This act governs various aspects of employment and labor relations in Bangladesh. It covers matters such as working hours, wages, occupational safety and health, labor welfare, trade unions, and dispute resolution mechanisms.	Component 1 through outputs 1.1.1 and 1.1.2 and 1,1.3 will support in the development and improvement of livelihood of individuals. Also, participation from the agencies and community members to the project activities will be covered with necessary travel and allowances costs and will ensure that the working hours are not beyond 8 hours. No individual will be hired without pay and payment will be based on national labour pay scales. Child labour will be forbidden, and it will not be

		accepted from the project partners and national agencies.
Disaster Management Act	Disaster Management Act 2012 and National Disaster Management Policy 2015	Components 1, 2 and 3 mainly activities under outputs 1.1.1, 1.2.1, 1.1.3, 2.1.1, 2.1.2, 2.2.1, 3.1.1 and 3.1.2 through risk maps and HydroSOS will be developed and tested in the pilot locations
Wildlife (Conservation and Security) Act, 2012	This act provides legal provisions for the conservation and protection of wildlife in Bangladesh. It regulates hunting, trading, and possession of wildlife, and establishes penalties for offenses related to wildlife conservation.	The component 1 especially output 1.1.1 will support in identifying vulnerabilities and risks related to environmental and ecosystem services which will be indirectly providing benefits to conservation of species and animals.
Forest Act, 1927	This act governs the conservation, management, and utilization of forests in Bangladesh. It covers aspects such as forest management, timber harvesting, wildlife protection, and community forestry.	The project component 1 especially through risk maps will allow us to understand the impacts of climate change events on protected areas which need to be maintained and how it could be preserved
Bangladesh water act 2013 and Bangladesh national water policy 1999	The Bangladesh Water Act of 2013 addresses various aspects of water management in the country. It provides a comprehensive framework for the regulation, conservation, and equitable distribution of water resources. The act aims to ensure sustainable use of water, promote integrated water resource management, and establish a system for resolving water-related disputes. Bangladesh National Water Policy of 1999 serves as a guiding document for water governance and development strategies. It emphasizes the need for efficient water allocation, pollution control, and conservation measures, while considering the social, economic, and environmental aspects of water management. Both the Water Act and National Water Policy play significant roles in shaping Bangladesh's approach to water resource management.	The output 2.1.1 HydroSOS EWS with water resources assessment, monitoring and outlook indicators will provide support to efficient use of water resources for social, economic and environmental benefits.

Nepal

Environment Protection Rules, 2020 (2077)	This act provides the legal framework to protect the fundamental right of each citizen to live in a clean and healthy environment, provide the victims with compensation by the polluter for any damage resulting from environmental pollution or degradation, maintain a proper balance between environment and development, mitigate adverse environmental impacts on environment and biodiversity and face the challenges posed by climate change in Nepal. It addresses issues such as pollution control, environmental impact assessment, waste management and natural resource conservation. It focuses on sustainable management of the environment with suitable mitigation measures and effective environmental management plans. The regulation has defined a list of projects/activities whether Brief Environmental Examination, Initial Environmental Examination (IEE) or Environment Impact Assessment (EIA) is required. Detailed methodologies for scoping, Terms of Reference, public hearing and reporting mechanism of environmental studies.	Components 1, 2 and 3 mainly activities under outputs 1.1.1, 1.1.2, 1.1.3, 2.1.1, 2.1.2, 3.1.1 and 3.1.2. Risk maps and EWS with environmental thresholds will be developed to understand the impacts and identify necessary mitigation and management measures
Forest Act, 2019 (2076)	This act governs the protection, conservation, and utilization of forests in Nepal. It regulates activities such as forest	The project component 1 especially through risk maps will allow us to understand the impacts of

	management, timber harvesting, community and other forests, conservation of wildlife, environment, watershed and biodiversity.	climate change events on protected areas which need to be maintained and how it could be preserved
National Women Commission Act, 2017 (2074)	It formulates and implements necessary programs for protection and promotion of the rights and interests of women and to ensure gender justice through the empowerment of women & end all forms of violence and discrimination against women	Under activities of Component 1 and 2 , the proposed project will improve the gender equity and women empowerment through inclusive and participatory approaches. During capacity development workshop on the WMO developed tool: Training Manual for mainstreaming gender in End-to-End Early Warning system for Flood forecasting and integrated Flood Management, gender specific needs and issues before, during and after disaster will be identified and necessary approaches or strategies will be designed. This will help in increasing the participation of women, girls and other vulnerable groups in Flood and Drought management activities as well as in decision making processes.
National Natural Resources and Fiscal Commission Act, 2017 (2074)	Legal mechanism for mobilization of natural resources, revenue distribution and grant to three tiers of government in Nepal.	Components 1, 2 and 3 mainly activities under outputs 1.1.1, 1.1.2, 1.1.3, 2.1.1, 2.1.2, 3.1.1 and 3.1.2. Risk maps and HydroSOS EWS with social, economic and environmental thresholds will be developed to understand the impacts and identify necessary mitigation and management measures, supporting the natural resources management for human development.
National Dalit Commission Act, 2017 (2074)	It seeks to conduct study and research on the prevailing legal provisions relating to the Dalit for the protection and promotion of the rights, interests and the empowerment of the Dalit Community,	Components 1 and 2 related activities on risk maps and early warning system will involve Dalit representatives to understand their vulnerabilities to climate change events and how effective warning services will be provided to them
The Social Security Act, 2075 (2018)	It makes necessary provisions on the protection of the right to social security of the indigenous citizens, incapacitated and helpless citizens,helpless single women, citizens with disabilities, children, citizens who are unable to take care themselves and citizens belonging to the tribes on the verge of extinction	Components 1, 2 and 3. The proposed activities will follow the national human rights. Moreover, the proposed project will promote the basic human rights of access to information, water, and food.
National Parks and Wildlife Conservation Act, 1973	This act establishes national parks, wildlife reserves, and conservation areas in Nepal. It provides legal provisions for the protection and conservation of wildlife, their habitats, and biodiversity.	The component 1 related activities on risk maps will identify vulnerabilities, exposure and risks to changing climate and associated events (floods and events) and possibly could identify solutions for the protection of biodiversity through the nature-based solutions.
Water Resources Act, 1992 (2049) Water Resources Regulations, 1993 (2050)	This act regulates the development, utilization, and management of water resources in Nepal. It covers aspects such as water rights, priority order for utilization of water resources, licensing, water quality control, irrigation, hydropower generation, and flood control. This regulation has a mechanism of District Water Resource Committee for licensing of water resources and provision of Water Resources Utilization Inquiry Committee for dispute management.	The Component 2 output 2.1.1 HydroSOS EWS with water resources assessment, monitoring and outlook indicators will provide support to efficient use of water resources for social, economic and environmental benefits. Also, risk maps will be developed for understand the impact on water resources due to flood and drought events.

National Disaster Risk Reduction and Management Act-2017	To protect human lives and properties of the public, private and individual from natural and non-natural disasters by effective disaster risk and management. National Disaster Risk Reduction and Management Authority is established, and disaster management is a shared responsibility of three tier of Government. Rights, Functions and Duties of Province Disaster Management Committee, District Disaster Management Committee, Local Level Disaster Management Committee are clearly defined.	Components 1, 2 and 3 mainly activities under outputs 1.1.1, 1.2.1, 1.1.3, 2.1.1, 2.1.2, 2.2.1, 3.1.1 and 3.1.2 through risk maps and HydroSOS will be developed and tested in the pilot locations
Irrigation Regulation-2000 (2056)	Provision for registration of irrigation water user's association for construction, management and operation of irrigation systems. Rights, duties and function of irrigation water user's association defined and provision on collection of irrigation service fee. Provision of water allocation to farmers based on water availability on source.	The output 2.1.1 HydroSOS EWS with water resources assessment, monitoring and outlook indicators will provide support to efficient use of water resources and its use for irrigation and water utility purposes.

G. Describe if there is duplication of project with other funding sources, if any.

The project will ensure that its products and tools build on existing resources, infrastructures and services available at the national and local level and thus avoid duplication. Some of the existing National level activities (Hydro-Meteo monitoring, forecasting and warning services by the National Meteorological and Hydrological services of the targeted countries) will be considered and data and outputs will be integrated into the proposed HydroSOS system. Synergies and complementarities will be established with completed and on-going regional and national projects such as WMO HYCOS-HKH, Regional flood outlook for the Ganges and Brahmaputra river basins developed by ICIMOD, South Asia Flash Flood Guidance System (SAFFGS), IUCN BRIDGE GBM etc. A preliminary list of national activities and projects are mentioned under Annex 2.

Table 1: Other ongoing or planned projects and programmes in the region

Projects/Objectives	Objectives/Description	Possible Synergies/Complementarities
- GEFID 10207 Building climate resilient livelihoods in vulnerable landscapes in Bangladesh (BCRL) ☐ EWS; institutional capacity building etc. https://www.thegef.org/projects-operations/projects/10207	The overarching objective of this project is to improve the resilience of people, communities, and ecosystems to climate change, and improve livelihoods through increased value addition in the agricultural food systems of Bangladesh. Outcome 1.1: Technologies and innovative solutions piloted or deployed to reduce climate-related risks and/ or enhance resilience Outcome 1.2: Innovative financial instruments and investment models enabled or introduced to enhance climate resilience	Both projects will be able to learn from each other in terms of experiences and challenges, especially as stakeholders and partners will be invited to participate to the advisory committee of the HydroSOS BaNe project. A part of the results and methodologies of GEF BCRL project will be complementary to the HydroSOS BaNe project as both projects aim at improving early warning: the type of information provided by the early warning system (EWS) could be integrated into HydroSOS EWS. The methodology for climate resilient crops warnings proposed in GEF BCRL project could be linked to HydroSOS similarly to an experiment on one of the pilot sites. Adaptation solutions of GEF BCRL to improve the resilience of communities and their livelihoods could be integrated while developing Components 1 and 2 and some of them could be further transferred in the different regions of the GBM Basin. Additionally, FAO could be one of the stakeholders to receive sub-seasonal to seasonal warnings and can take an active role into the dissemination of information with a wide range of local stakeholders (farmers groups, insurance company, private companies, etc.), including decision-makers from national/local agencies responsible for Flood and Drought Management.
- GEFID 10727 Managing Watersheds for Enhanced Resilience of Communities to	The objective of this project is to enhance climate resilience of Indigenous people and local communities in the Marin watershed through nature-based solutions and	This National project in Marin watershed of Nepal will be screened and synergies will be developed on the work proposed on improving vulnerabilities, increasing adaptability and NbS solutions in Nepal by developing implementation partnerships and using the

Climate Change in Nepal (MaWRiN) ☐ WRM (floods, droughts etc.), NBS etc. https://www.worldwildlife.org/projects/managing-watersheds-for-enhanced-resilience-of-communities-to-climate-change-in-nepal-mawrin	livelihood diversification. The proposed requested GEF funding will help increase the resilience of the local communities of the Marin watershed in the face of long-term climate change and associated hazards such as landslides, floods, droughts and forest fires by reducing vulnerability, increasing adaptability, and improving the transfer and expansion of locally appropriate nature-based solutions.	methodologies and approaches proposed by the MaWRiN project partners possibly to other regions of Nepal and Bangladesh. WWF being technical partner of WMO will be invited to join as the technical partners or part of the advisory committee of the proposed HydroSOS BaNe
- GEFID 6989 Developing Climate Resilient Livelihoods in the Vulnerable Watershed in Nepal ☐ WRM (floods and droughts) https://www.thegef.org/projects-operations/projects/6989	To develop climate resilient community livelihoods through integrated watershed management practices Outcome 1.1: Technologies and innovative solutions piloted or deployed to reduce climate-related risks and/ or enhance resilience Outcome 1.2: Innovative financial instruments and investment models enabled or introduced to enhance climate resilience	Improved planning and management of water resources will help the communities in increasing their livelihood and (agricultural) production. The HydroSOS BaNe project will provide necessary information on floods and drought EWS and indicators, making the beneficiaries have timely knowledge and awareness on the impending events. The resilience approaches and methodologies of GEF project could be shared and integrated in the pilot testing locations of other countries of the HydroSOS BaNe.
- GEFID 4551 Community Based Flood and Glacial Lake Outburst Risk Reduction ☐ Climate disaster (glacial Lake outburst flood) https://www.undp.org/nepal/projects/closed-community-based-flood-and-glacial-lake-outburst-risk-reduction-project	The objective of CFGORRP is to reduce human and material losses from Glacier Lake Outburst Flooding (GLOF) in Solukhumbu district and catastrophic flooding events in the Terai and Churia Range. For achieving this objective, the Project has been streamlined into two main components. Component I (GLOF) is specifically aligned towards reducing GLOF risks arising from Imja Lake, and Component II (Flood) aims to reduce human and material losses from recurrent flooding events in the four flood prone districts of Terai. Approximately 96,562 vulnerable people will directly benefit from this project.	The HydroSOS BaNe project will fully benefit from the efforts of CFGORRP project in Nepal which is strengthening the Glacier Lake Outburst Flooding (GLOF)observation and warning services in pilot districts of Nepal. The output of CFGORRP will be integrated into the HydroSOS EWS and will be utilized by the national agencies together with other global and locally development products for riverine and urban floods. If Glacier Lake Outburst Flooding (GLOF) observation and warning products and services is found effective, it will be expanded to cover also other vulnerable regions of Nepal and Bangladesh.
Integrated River Basin Management (IRBM) in the Hindu Kush Himalayas (HKH) Region/ICIMOD https://www.icimod.org/event/integrated-river-basin-management-in-the-hindu-kush-himalaya/	The overall goal of the Hindu Kush Himalaya-HYCOS project was to contribute to protect lives, livelihoods, property of vulnerable communities, and infrastructure by enhancing flood risk management capacity in the region. For that purpose, the project aimed at establishing a framework for regional cooperation that ensured efficient collection and real-time transmission of hydrometeorological data and the sharing of information for integrated hydrological information systems and aspects of transboundary flood management within the Indus River basins. The data is available on a real time basis from This initiative is preparing focused basin reports on three river	The HydroSOS BaNe project will benefit from the IRBM-HKH methodologies and tools used for providing recommendations for elevating river basin governance in the HKH and the capacity building activities. Most of the results obtained during IRBM-HKH will be integrated into various activities of HydroSOS BaNe. Indeed, the trained groups of people of IRBM-HKH project will be contacted and involved in the development of the Transboundary HydroSOS EWS and also in the governance related activities leading to tailored and sustainable strategies for managing climate change extremes and integrated river basin management for water, energy, food, and ecosystem security. The HydroSOS BaNe project will collaborate with ICIMOD to gain technical expertise in identify the needs and proposing adequate early warning solutions for GLOF, Snow Melt related floods to be possibly included in the future into the HydroSOS EWS system.

	basins – Indus, Ganges, and Brahmaputra – to provide recommendations for elevating river basin governance in the HKH. Also, Training mid-level and senior practitioners across HKH region in IRBM	
Regional Mainstreaming Water Resilience in Asia and Pacific/ADB https://www.adb.org/projects/55064-001/main	Capacity building to enhance water security and resilience in Asia and the Pacific. It seeks to support a) increased climate resilience in water projects, programs, and policies by facilitating a shift toward climate-resilient and low-carbon development; (b) use information and communications technology (ICT), digital and remote sensing technologies, and innovations.	Component 2 of the HydroSOS BaNe project will build on the existing water resources monitoring and flood forecasting capacities and integrate the output of the early warning into HydroSOS EWS. This ADB project provides experiences on the challenges, and lessons learnt during the implementation phase of a climate resilience development and address also the issues of the sustainability of the water security. The proposed project team will have consultation to identify synergies and complementarities between activities. Standard Operating Procedure (SOP) will be developed by the proposed project for the sustainability where it could be helpful for the increased climate resilience in water projects, programs, and policies by facilitating a shift toward climate-resilient.
Coastal Resilience through Nature-Based and Integrated Solutions in Asia Pacific (Bangladesh) https://www.adb.org/projects/54212-001/main	Building coastal resilience in Asia-Pacific requires adopting long-term and integrated planning approaches. Given their potential benefits, nature-based solutions are to be considered as part of integrated plans combining grey and green solutions and soft measures such as awareness raising, policy making, land use planning and early warning.	The integrated planning approaches developed through the project favor adaptive management, a risk-based approach, inclusive processes, and consider the full spectrum of coastal resilience in Bangladesh. HydroSOS EWS will ensure the tools and products developed water risk and adaptive management designed and implemented will be assessed and will be integrated in the HydroSOS EWS.
Regional Flood Information System/HKH Hydrological Cycle Observation System (HKH-HYCOS), ICIMOD https://www.icimod.org/initiative/hycos/ https://hydrohub.wmo.int/en/projects/Himalayan-HYCOS	It aims at flood management through data sharing from 28 hydro-meteorological stations including the GBM region	Component 2 of the HydroSOS Ba-Ne project will build on the existing flood forecasting capacities at ICIMOD and integrate the output of the RFIS into the HydroSOS EWS so that the national forecasters from the meteorological and hydrological services could use it for analyses with other global and HydroSOS products output.
South Asia Water Initiative/World Bank https://www.worldbank.org/en/programs/sawi	SAWI supported climate resilience and sustainable, fair, and inclusive development by: strengthening awareness and knowledge about regional water issues; enhancing technical and policy capacity, supporting dialogue and participatory decision processes to build trust; and scoping and informing World Bank investments. SAWI worked in the Indus, Ganges and Brahmaputra River basins and in the Sundarbans wetlands, shared by Bangladesh and India. Together, SAWI activities spanned seven countries: Afghanistan, Bangladesh, Bhutan, China, India, Nepal and Pakistan.	The output of the completed SAWI project in Nepal and Bangladesh such as Strategic Basin Planning, Nepal Water Platform, River Management Improvement Bangladesh, Basin modeling and Strengthening Hydro-met Services and DRM in Bangladesh will be reviewed and utilized in the implementation of component 1, 2 and 3. The lesson learned and implementation challenges from the SAWI will not be replicable during the HydroSOS BaNe project. The World Bank will be invited during the inception phase of the project to follow the implementation as well as to ensure the methodologies, tools and products are scaled to cover other region of GBM Basin or in South Asia and South–East Countries.

ADB funded Water resources project preparatory Facility/ Expansion of coverage areas for flood control infrastructure, irrigation and drainage areas https://www.adb.org/projects/45206-001/main	A detailed study for high priority water resources projects undertaken; (ii) environmental, social, and technical capacity of the Department of Water Resources and Irrigation (DWRI) improved; (iii) Irrigation Master Plan updated; and (iv) efficient project management.	The ADB funded project is also planning to setup various water resources infrastructures for floods and droughts in the Nepal region. As the HydroSOS BaNe project is not going to implement any structural flood control measures, Component 1 of the HydroSOS BaNe project will develop risk maps and ensure to have details of these water resources infrastructures for improving resilience and capacities of the communities to the climate change events.
Strengthening Integrated Flood Risk Management: Nepal Flood Risk Sector Assessment/ADB Funded https://www.adb.org/projects/52014-001/main	To strengthen Integrated Flood Risk Management (IFRM) solutions, enhancing knowledge and application of IFRM strategies in DMCs. It will provide and promote holistic IFRM solutions, including basin-scale and nature-based solutions.	The proposed project will build on the work carried out by the ADB funded on IFRM solutions designing as both the project is proposing the IFRM strategies for to maximize net benefits from the use of flood plains and minimizing loss of lives, property damage and impact to environment that may include nature-based and other soft approaches. The HydroSOS BaNe project will assess the technical assistance provided to the participating countries and build on the results to ensure baseline information and solutions designed/proposed are considered during the initial implementation phase especially for component 1 and 2.
Irrigation and Water Resources Management Project Telemetry System	Establishment of hydrometric stations equipped with telemetric systems on major rivers, tributaries and key precipitation recording locations for management of water distribution systems on the basis of real time data.	The HydroSOS BaNe EWS project will integrate the real-time data and information from the hydrometric system installed on major rivers, tributaries and other areas for visualization and as well as for hydrological model inputs for developing forecasting and early warning services in the targeted project countries.
Regional flood outlook for the Ganges and Brahmaputra River basins developed by ICIMOD https://library.wmo.int/doc_num.php?explnum_id=4701	The project aimed at improving regional cooperation on flood risk management including the installation and operation of 30 upgraded hydrometeorological stations in four countries (Bangladesh, Bhutan, Nepal and Pakistan) and the facilitation of real-time data transmission using state of-the-art technology. Establishment of regional and national flood information systems to share real time data and information and increase lead time of flood forecasting.	The HydroSOS-BaNe will build collaboration with ICIMOD for sharing of the data and information from the operational stations and database for the development of the HydroSOS products and EWS. Also, the ICIMOD regional flood information system could be linked or integrated within HydroSOS EWS to receive the real time flood forecasting information (jointly with hydrological processes) to support in the decision-making processes for early warning and early action at the local levels.
South Asia Flash Flood Guidance System (SAFFGS) https://community.wmo.int/en/south-asia-flash-flood-guidance-system-sasiaffgs	It is part of a global FFGS which currently provides flash flood early warnings to three billion people. Participating countries of SAFFGS are Bhutan, Bangladesh, India, Nepal and Sri Lanka.	FFGS is developed by US-based Hydrologic Research Centre with financial support from USAID and the World Meteorological Organization (WMO). SSAFFGS is presently operational in South Asia and HydroSOS BaNe project will use the flash flood related data and products for development HydroSOS EWS for stakeholders at the local levels.

IUCN BRIDGE GBM project https://www.iucn.org/our-work/region/asia/our-work/water-and-wetlands/bridge-ganges-brahmaputra-meghna-river-basins-bridge-gbm#:~:text=The%20BRIDGE%20GBM%20project%2C%20facilitated,and%20Governance%20(BRIDGE)%20programme	It aims to build the capacity of a network of Civil Service Organizations (CSOs) in the GBM region to enhance their engagement in transboundary water management issues. The BRIDGE GBM project falls under the umbrella of the global Building River Dialogue and Governance (BRIDGE) programme.	The HydroSOS BaNe project will check and involve the relevant CSOs from Bangladesh and Nepal to participate in the design and implementation of various proposed activities such as risk maps, community-based flood and drought management, pilot testing of the HydroSOS EWS, local collaboration for developing policies and plan etc. This will ensure existing capacities, lesson learned, and good practices are utilized and enhanced with updated or new tools, products etc. for the management of floods and drought.
Building Resilience to Climate Hazard -Pilot Program for Climate Resilience (PPCR-BRCH)	The objective is to provide the accuracy and timely weather and flood forecasts and warnings for climate- vulnerable communities through capacity building, establishment of advanced data collection technologies and enhanced modeling techniques.	The real time data collected from the stations can be used to develop models in data scarce basins, its testing and performance analysis.
Bagmati River Basin Improvement Project https://www.adb.org/projects/43448-013/main	Flood forecasting & early warning systems MIKE model was developed. Additional support being provided under TA to enhance the model performance and a NGO recruitment in process under BRBIP-AF to strengthen the earlier trained communities.	BRBIP project supports the HydroSOS project for evaluation of the baseline study of the flood EWS in Bagmati River, compare the performance of MIKE model Flood Forecasting and Early Warning to HydroSOS EWS. The flood affected communities can be trained for flood and drought adaptation measures.
Priority Based River Basin Flood Risk Management Program (PRBFRMP) https://prbfrmp.dwri.gov.np/about-us/introduction	Output 1. Improved flood protection infrastructure. Output 2. Enhanced flood forecasting and response systems. Support the government and communities in flood-prone areas to improve early flood warning systems through (i) installing about 40 rain gauges and 30 hydro meteorological stations, (ii) developing about 5 flood forecasting and early warning systems (FFEWS), and (iii) improving maintenance of FFEWS. Output 3. Improved flood prevention and preparedness capacity.	The PRBFRMP has focused to improve flood forecasting and early warning system in 5 Small River Basins: (i) Bakraha.; (ii) Mawa Ratuwa; (iii) Lakhandei; (iv) Mohana Khutiya and (v) East Rapti. These basins are prone to flooding during monsoon and facing drought during the winter. The HydroSOS thus developed can be tested for flood EWS and drought in data scarce small basins.
CREWS Accelerator project in Nepal supporting the UN EW4All initiative (2024-2025)	The CREWS project is mainly implemented to identify gaps related to EWS and communication to stakeholders including implementation of priority activities related to EWS such as the Common Alert Protocol, defining thresholds for hydro-meteorological events, community-based approaches, etc.	The HydroSOS BaNe project will use the developed capacities, tools, and study reports prepared under the CREWS project and will build upon them to improve the early warning system in Nepal
SWEDISH contribution to the EW4All in Bangladesh (April-December 2024)	The Swedish-funded project is mainly implemented to identify gaps and needs related to EWS and develop capacities of various stakeholders. The project will also allow opportunity to implement priority activities related to EWS such as the Common Alert Protocol, media training, stakeholder consultation on EWS etc	The HydroSOS BaNe project will use the developed capacities, tools, and study reports prepared under the CREWS project and will build upon them to improve the early warning system in Bangladesh

H. If applicable, describe the learning and knowledge management component to capture and disseminate lessons learned.

The proposed components 1, 2 and 3 include dedicated outputs related to the documentation and dissemination of knowledge generated through the proposed activities. The dissemination of knowledge and good practices will enhance the learning achievements and could further facilitate the replication of success stories by government agencies and communities facing similar issues in other regions or globally. Different ways are planned to ensure proper coordination and to widen the dissemination of the project outputs to a larger circle of institutions and communities in the two targeted countries of the GBM Basin.

Knowledge Management and Experience sharing

- Development of e-learning module(s) for capacity building of key stakeholders. Online learning and training will be an option for those (e.g. representatives, local agencies, etc.) who cannot attend events, conferences and workshops. The modules will be accessible to the project stakeholders and to a certain extent to the general public and local organizations even beyond the duration of the project.
- A repository of project's technical reports, voices from the fields, training manuals and guidelines will be developed and made accessible to all. Innovative knowledge products and skills developed through the project will be communicated to respective stakeholders of the targeted countries, across the South-Asian countries and beyond. The medium of communicating these outputs will be the project website, social media channels, national and international workshops/seminars etc. Several experience sharing field visits with the neighboring countries will be organized for the national and local level stakeholders.
- Knowledge management tools and platforms including community of practices (CoP) will be developed for sharing experience and storing project documents, reports etc. It will also be ensured that the methodologies adopted, and human resources trained (from both the agencies and communities) remain a support for other actors and stakeholders in developing floods and drought risks maps, climate change scenarios, community-based initiatives and HydroSOS of their respective countries (and also in regions outside of the GBM basin) through national investments or international funding mechanism.
- As solutions and tools should be co-designed, co-developed and co-implemented in a trans-disciplinary, multi-stakeholder and participatory context, a "Open lab" could be also created in the framework of the proposed HydroSOS BaNe project. In this "Open lab", citizens, organizations, policy-makers and other stakeholders will be involved in a multidisciplinary approach where each participant could contribute with his knowledge and experience about the Floods and Drought Management and/or EWS. Discussions and exercises in groups, round tables and/or presentations could be implemented to stimulate discussions, as well as to develop and test innovative solutions in real world conditions.

Outreach to the wider public

- Facebook, LinkedIn and X (formerly known as Twitter) will serve as a wider dissemination strategy to update information, specially targeting the young generation.
- Mass media channels such as radio services, newspapers etc. will also be one effective information dissemination strategies as it is widely used in the GBM countries.
- Leaflets and panels (in the buildings and offices of the partners and on the pilot sites) highlighting the lessons learned and success stories will be shared with stakeholders and in social media for the general public, emphasizing the importance of the project activities and achievements.
- Other dissemination tools such as videos, comic books and infographics (in local languages) will be used to reach a wider non-specialized public, using a non-technical language and, if necessary, local language of the member countries. The comic books and case studies could be turned into videos with a storyboard avoiding scientific terms.
- The APFM Support-Base Partners will be contacted to develop IFM simulation-based decision-support games highlighting the importance of Nonstructural and Nature Base Solutions to improve flood preparedness strategies.

Technical reports/documents and dissemination of the project results:

- The project activity reports (in English and if possible, in local language) will be disseminated via a web portal, briefs to stakeholders, press releases, national and climate change and disaster risk reduction forums (World Bank hydromet forums, EW4All related workshops etc.), scientific publications (presented during EGU, Stockholm World Water Week, Conference of Parties (CoP) etc, and development of awareness raising tools (digital storytelling, video, success stories etc.)
- The mid-term and post-project assessment activities will be conducted with the government representatives and focal point of communities to determine the lessons learned, impacts and sustainability. The assessment report will be prepared and shared with relevant organisations for any follow-up activities.

Dissemination of results through external institutions

- Development and humanitarian agencies, NGOs and other actors involved during the implementation of projects could use the flood and drought management products and develop actions in their field of competence (e.g. identification of community-based flood management solutions for populations living in small catchments of the basin).

- Similarly, researchers and other public institutions could work on the base of the actions developed under the HydroSOS-BaNe project, to further engage in the development of adaptation measures (e.g. assessing climate change impacts and solutions in specific locations).
- Through collaboration with the national institutions responsible for technological transfer, private companies working on innovative solutions will be contacted to develop national projects that integrate our identified solutions and disseminate them within their areas of work/sectors.

Integration of best practices into the WMO and EEs communication and guidance materials

- The success stories and progress of the HydroSOS-BaNe project will be published using the communication media of the implementing and executing entities
- New guidance material in the line of the APFM Tools series http://www.floodmanagement.info/tools/ could be drafted to promote the results of the HydroSOS-BaNe project, as well as the case studies on the basis of the pilot testing.
- Field visits among different communities and local authorities within countries will be organized to share experiences and learn from each other

I. Describe the consultative process, including the list of stakeholders consulted, undertaken during project preparation, with particular reference to vulnerable groups, including gender considerations, in compliance with the Environmental and Social Policy of the Adaptation Fund.

A preliminary joint national assessment and consultation studies were conducted in the targeted countries with the NMHSs and other concerned authorities during the year 2020 with an aim to better understand their current capabilities, needs and priorities for effective management of water resources and climate extremes in the GBM countries. Even though there were travel restrictions in these countries due to the covid-19 pandemic, the project team organized vulnerable community visits (with local level associations, women, youths, minor and vulnerable groups, at various sites of the basin to understand current needs and examine benefits of the project outputs and services), regional virtual consultation meeting, two day hybrid regional workshop and national consultation workshops with the National stakeholders to present and finalize the project activities and collect missing and additional information such as user requirements to investigate and discuss benefits and functionalities (types of information, forms of warning etc.), selection and finalization of the sites for the pilot testing of the HydroSOS-GBM products, inputs on social and environmental risks, role and responsibilities of the national agencies, etc. In the next phase of the project development, several face-to-face consultations are planned with the national and regional entities including conducting of social and environmental impact assessments.
The community-related consultation also provided the opportunity to get feedback from more than 100 individuals consisting of marginalized, vulnerable and women groups (check the minutes of meeting of the vulnerable community visits) about the issues and needs related to the existing early warning system and the future proposed HydroSOS early warning system envisaged by WMO and national partners (Annex 2 add- the demo HydroSOS screenshots available here https://eip.ceh.ac.uk/hydrology/HydroSOS/portal/ . The proposed functionalities (type of information, forms of warning, dissemination channels, etc.) and benefits of the HydroSOS products and service were discussed with the participants so that their views, suggestions will be acknowledged and incorporated in the final design and development of the web-based early warning system.

Total consulted citizens (Individuals of vulnerable, marginalized and minority communities including women) through focus-group discussions and semi-structure interviews until submission of the project proposal: more than 500; Number of female participants: approximately 40% are from Government or community associations and NGO's (including women groups): 30
Additionally, the consulted members suggested further requirements for enhanced floods and drought management at the local level including better sourcing; access and delivery of the early warning information to every section of the communities (potentially have last-mile connectivity), timely support to vulnerable individuals, rain-gauge and river-gauge instruments for local forecasting, loudspeaker (megaphone) and radio for early warning information dissemination.

Some of the main outcomes of the citizen consultations are summarized as below:

- Riverine floods in the downstream agriculture areas are generating negative impacts. There is a need to develop local capacities to manage the agricultural production between the floods to ensure food security and adequate income. The requirement is timely information on the climate change events its variabilities and information on adaptation measures.
- Flood events are occurring faster than before and the conventional is no longer effective, endangering lives of people and their livelihoods.
- A new mode of early warning communication system is required for increasing self-help capabilities, preparedness and response measures. Internet connectivity is available with mobile phones and similarly local radio network can be useful for communication.
- Access routes to the schools, offices, jobs centers are inundated during the flood events, reducing the capacities of people to have regular and economical activities.
- Gender sensitive approach of the proposed project will provide capacity development and sustainable functioning of women groups and associations in the countries

- Any activity related to water and soil conservation will be welcome in order to improve agricultural productivity
- The communities are ready to test any new technologies or tools for better adaptation to the climate change and variability.

Their suggestions are incorporated for a community-based flood and drought management approach and involvement is given due importance during the pilot testing and further included as part of activities under the components 1 and 2.

The project will indirectly benefit hundreds of thousands of people living in the GBM countries through the proposed strategy of community-based flood and drought management and by enabling local-level climate change adaptation measures. In addition, private sectors such as agriculture, aquaculture, and hydropower will be important stakeholders that will benefit from the project outcomes. The studies for hazard and vulnerability mapping proposed under Component 1 of this project will help screen potential risks from a local community perspective (as per the Adaptation Fund's Environmental and Social Policy (ESP) and Gender Policy (GP)) that may arise during implementation. From an environmental viewpoint, the IUCN Red List of Ecosystems Categories and Criteria will be studied to understand better the status of ecosystems, applicable at local, national, and global levels.

In the concept note development phase, a regional face to face workshop with the WMO, representatives of NMHSs, and environmental agencies of Bangladesh and Nepal was organized during early June 2023 mainly to review and finalize the HydroSOS concept note – agree on the list of activities, updated institutional arrangements, selection of potential pilot sites for the testing of the HydroSOS EWS, decided on the way forward including review of Terms of Reference for the Environmental Impact Assessment (EIA) and Social Impact Assessment (SIA) study.

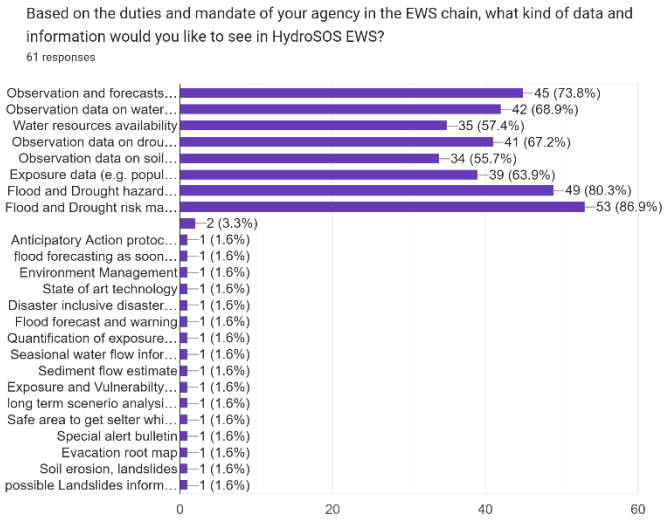
In the Project proposal development phase, WMO organized a regional stakeholder consultation workshop where 20 representatives from WMO, government representatives from hydrology, meteorology, disaster management, water resources, agriculture, environment, and regional entity ICIMOD participated to review, discuss, and finalize the project proposal. The workshop provided an opportunity to agree on the tentative budget plan for the agreed list of project activities, validate the Environmental and Social Impact Assessment (ESIA) study report (including the Environmental and Social Risk Management Plan(ESRMP)), finalization of pilot sites for community-based activities and HydroSOS-early warning system, synergies with other initiatives and projects especially on EW4All initiative in the two countries, institutional arrangements, regional coordination with ICIMOD etc. thereby building a solid platform for the successful development and later implementation of the project from regional to national to community levels.

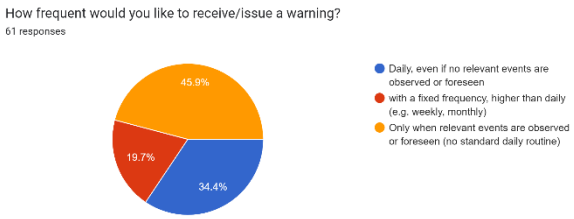
Figure 9: Regional workshop to finalize the project proposal with stakeholders of Bangladesh and Nepal

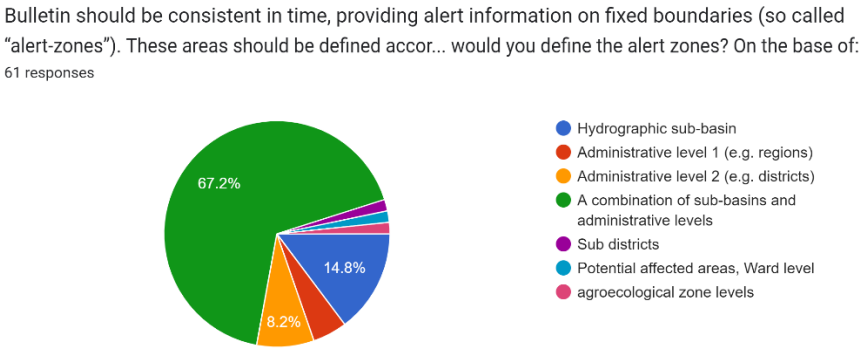
In early October 2024, WMO jointly with DHM Nepal and ICIMOD visited the flood-affected site in the Kathmandu Valley (Bagmati river at the end of September 2024 during which approximately 200 people lost their lives and more than 1000 were injured) to meet and discuss with the community the issues encountered during the flooding situation including ways for improvement in the future. The community members informed that the warning from the DHM was provided but it was not an impact-based warning (impact to which area and possible exposure) due to which they did not have a clear knowledge of whether their houses, and roads nearby will be flooded or not. Also, one of the issues for potential impact on property and social institutions was mainly due to the construction of houses in flood-vulnerable areas or plains. There is a need to have knowledge and awareness sessions with communities and local

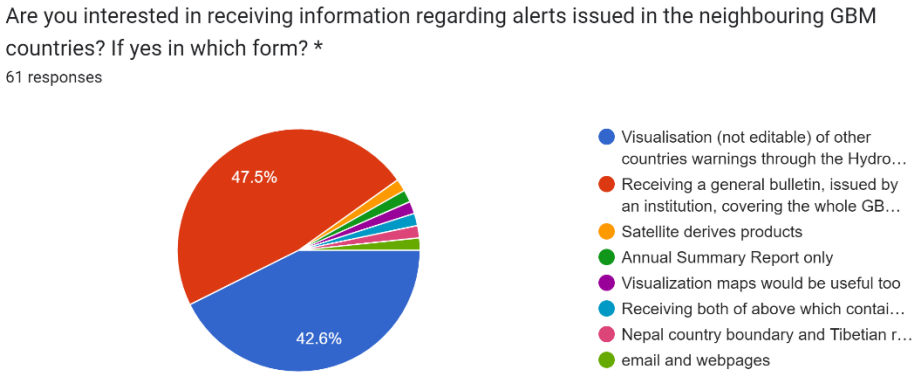
authorities to avoid similar impacts in possible future events. DHM Nepal will be strengthened with the development of risk maps, and an impact-based forecasting system through the HydroSOS BaNe project.

Also, the regional and national workshops in the two targeted countries provided an opportunity to identify user requirements (61 responses (available also under Annex 2) were received from 20 plus national and regional agencies of Bangladesh and Nepal) through a survey especially to understand the user's (different agencies and institutions) views and requirements from the HydroSOS EWS to improve or strengthen their day-to-day work responsibility and fulfill their mandate on socio-economical services to the population. For the development of an effective web-based HydroSOS EWS, this survey aims to investigate and discuss the benefits and functionalities (types of information, forms of warning, etc.) of the HydroSOS EWS service. The views and suggestions received (as shown in the charts and pie-charts below) will be essential for creating a system that can support and easily integrate into national operating services, assimilating available models and data and support in saving lives, improving livelihoods, and protecting the environment.









During the project inception and implementation phase, the project partners will continue to carry out face-to-face consultations with the national and regional entities as well as to conduct community consultations including meetings with local level associations, women, youths, minor and vulnerable groups, at various sites of the basin to examine needs and benefits of the project outputs and services.

I. Provide justification for funding requested, focusing on the full cost of adaptation reasoning.

Climate changes have been severely affecting the GBM countries with regular and large-scale floods and drought events especially impacting lives, properties, livelihoods and ecosystems. The government of the two riparian countries are developing and implementing various strategies and action plans to be better prepared to these extreme events, with technical and financial support from ministries, international development partners and agencies. The Adaptation Fund will support the HydroSOS BaNe project to expand on, and complement existing projects, in accordance with the development priorities of the countries in the urban and rural areas. The yearly flood and drought events have reduced community capabilities and their investments in socio-economic growth, such as houses, assets, livestock, food security etc. The proposed project will provide benefits to both communities and agencies and opportunities to work in a coordinated and collaborated way achieving long-term adaptation measures for Flood and Drought management. The need for concrete adaptation measures to extreme events is an important requirement for the GBM riparian countries according to the initial consultation by WMO with the stakeholders of the GBM Basin. The HydroSOS BaNe project includes the following components for developing adaptation measures and capacities:

Component 1: Risk-based preparedness and adaptation to climate variabilities, water use stresses and environmental uncertainties

Baseline situation (without any support from the Adaptation Fund)

In general, 80 percent of the land and natural resources in the GBM region and countries are prone to floods and drought events. The hydrological and meteorological characteristics of the GBM Basin and the projected climate change impacts on socio-economic vulnerabilities have not been adequately addressed and incorporated into development planning and other land use practices over the years. The government agencies of the countries also lack adequate information about the increasing risks related to climate extreme events, resulting in improper planning and decision-making for flood and drought management. Therefore, private and community infrastructures and natural resources are continuously exposed to climate variability, resulting in damage and degradation of adaptive capacities.

Impact due to the proposed project (with the support of Adaptation Fund)

The HydroSOS BaNe project plans detailed assessments of vulnerabilities, capacities and exposure to floods and drought events in the targeted GBM countries and the development of the related risk maps for present and future predicted climate scenarios. Moreover, the project will help in the development of risk management framework and capacities of the stakeholders (especially policy-makers, disaster managers etc.) to take risk informed decision-making for floods and drought events. In addition, the project will bridge the gap in adaptation measures to integrate future scenarios (economic, urban, climate, environment, etc.) into current knowledge (risks mapping, hydrometeorological features) and practices to improve the future planning and design of concrete adaptation measures or interventions. For this purpose, synergies will be created between country level projects or programmes on climate change adaptation to develop integrated flood and drought management strategies and approaches at local, national and regional levels.

Component 2: Strengthening water resources management through access to hydro-meteorological information and augment regional /national capacity to monitor and assess Hydro-Meteorological hazards

Baseline situation (without any support from the Adaptation Fund)

Presently there is no systematic measurement practices appropriate for water resources and floods and drought monitoring and forecasting over a large part in the GBM Basin. The available instruments such as radars, sensors and gauges provide information but there is no timely availability of flood and drought forecasting and warning information to the communities prone to these hazards. The existing flood and drought preparedness and response measures at local, national and regional level are ineffective, due to the lack of technical capabilities of various national agencies working on floods and drought management including coordination at local, national and regional levels. Without AF support, the situation will not change, or even deteriorate, and the population in the GBM riparian countries will continue to remain highly exposed to extreme weather, water and climate events and face consequent damages. Additionally, local actors and flood prone communities lack knowledge and tools for mainstreaming gender and developing natural and nature-based solutions for flood management, however they have useful traditional solutions and adhoc experiences which need to be captured and integrated in new flood and drought management strategies.

Impact due to the proposed project (with the support of Adaptation Fund)

The HydroSOS BaNe project will support the development and implementation of HydroSOS, an End-to-End Early Warning System for both floods and drought resulting in tailored hydrometeorological information services for the agencies, communities and the general public. The AF support will be used to strengthen data collection, transfer and management from the existing instruments available on the GBM and from external sources (national systems for monitoring hazards, global platforms (NOAA, NASA, JAXA, Joint Research Commission), satellite-based data etc.): this is a mandatory step towards a robust and appropriate network for forecasting and early warning information. The GIS-based early warning information system will be developed for the beneficiaries at all levels made of simple colour coded graphs and risks zoning, as proposed in the HydroSOS EWS prototype. The EWS will improve the stakeholder's capacities to take decisions and prepare for reducing impacts and if required, implement alternative practices. These systems will be more efficient with improved coordination between the hydrometeorological services, the other concerned departments at local and national levels and the communities prone to floods and drought. The capacity development activities, such as Gender mainstreaming for End-to-End Early Warning Systems for Floods and Integrated Flood and Drought Management through natural and nature-based solutions will help in developing pro-active approaches to account for climate change variability and its associated impacts.

Component 3: Water and climate resilient regional cooperation arrangements together with national and regional stakeholders, and community involvement

Baseline situation (without any support from the Adaptation Fund)

Although the GBM countries have recognized the need to adapt to climate change variability, the existing governance structure at the transboundary and national levels does not provide coordination and collaboration in water and natural resources management. The policies, guidelines or plans for collecting and sharing data and information related to hydro-meteorological conditions are not yet enforced to improve preparedness to extreme events. The shortage of policies plans and strategies at local, national and transboundary level for the management of short- to medium-term disaster risks exposes the GBM countries population to non-sustainable socio-economic conditions.

Impact due to the proposed project (with the support of Adaptation Fund)

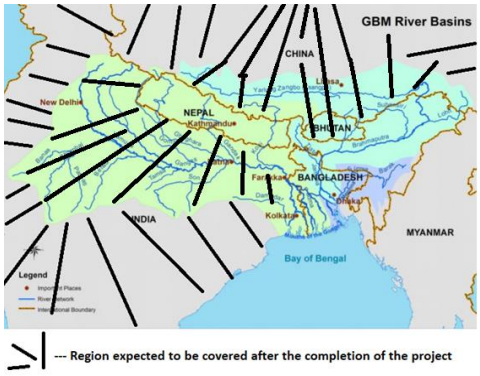
The AF support will allow development of an enabling environment between local, national and international actors and stakeholders. Systematic coordination between the riparian countries will facilitate the achievement of the common objective of developing concrete risk reduction and climate adaptation measures. Additionally, the project will develop capacities of beneficiaries to review or develop new policy frameworks to integrate climate risks to land, water, environment, livelihood with development plans and practices at local, national and transboundary level of the GBM Basin.

K. Describe how the sustainability of the project outcomes has been taken into account when designing the project.

Project sustainability will be achieved through close collaboration and capacity building of stakeholders at all levels i.e. local, national and transboundary ensuring their long term commitments for climate change adaptation activities and services developed through the project. The provision of sufficient human and financial resources will be ensured for the production, operation and maintenance of the new knowledge products and tools developed such as HydroSOS EWS which will be free, tailored and open source for use by the stakeholders Sustainability strategies for outcomes of the three HydroSOS BaNe components:

Outcomes under Component 1	Outcomes under Component 2	Outcomes under Component 3
Long term sustainability will be developed through participatory stakeholder engagement and knowledge exchange between local communities and government agencies. By showing, how and when, the risks for floods and drought events will change over short and longer periods in the GBM basin, the stakeholders will be more aware of the value of the vulnerability, capacity, exposure and risks assessment activities, the alteration of the risks factors and their impact on their daily life. The Bangladesh and Nepal NMHSs will provide support (staff and resources) to complete activities proposed under the HydroSOS BaNe project, such as development of flood and drought risks maps. The periodical assessment of the risk related information will need to be developed by the national agencies to update the associated flood and drought risk maps of their communities in order to be prepared for climate-related extreme events. Local communities will, be encouraged and incentivized to continue implementing and maintaining the various activities and deliver concrete adaptation outputs under Component 1.	Long term maintenance of the operational tools and methodologies for the activities under component 1 and 2 is important for sustainability and scaling up the results within the countries or to the neighboring countries/region. The NMHSs of the two countries (executing agencies of the project) will be highly involved in the development and operation of the HydroSOS Early Warning System for Flood and Drought during the course of the project and subsequent to its completion. NMHSs commitment is already taken to ensure that the HydroSOS Early Warning System (HydroSOS EWS) will be integrated into the day-to-day operations of their observatory or forecasting center. Doing so will ensure the long-term sustainability and operation of the software platform and related databases. Following the project's completion, the NMHSs will ensure the on-going maintenance and updating of the system regardless of the availability of other sources of funding (**The NMHSs have already provided support letters to ensure the long-term transfer of information from the national databases to continue operations of the HydroSOS EWS coordination unit (letters are provided under Annex 6).** It is anticipated that NMHSs will work with the regional entity (ICIMOD or RIMES) that could be hosting the HydroSOS EWS operational center or have it on the cloud with web-based access and will also cover maintenance/enhancement costs through other on-going and future projects or initiatives that will be linked to the early warning system developed under the HydroSOS BaNe project. The long-term sustainability of this achievement is also dependent on the continuous availability of the meteorological, hydrological and climatological data and related products from the National Meteorological and Hydrological Services (NMHSs) of Bangladesh, Nepal and other GBM countries. WMO will build on lasting collaborations with the NMHSs, as the pilot project HKH-HYCOS were endorsed 10 years ago. The HydroSOS and Early Warning Systems (EWS) for Floods and Drought, as envisaged in the demo prototype, will be developed and used by the actors of national agencies, especially the representatives of NMHSs, water resources agencies, the Country Water Partnerships and national disaster management authorities. The long-term shares of duties and responsibilities for the Flood forecasting and EWS will be taken up by the regional entity ICIMOD in collaboration with the NMHSs, with support at governmental level in the Ministries. Additional institutions involvement will be discussed during the capacity development activities of component 2.1. WMO has officially agreed with ICIMOD (agreement letter provided under Annex 6) to have their support in the design and implementation of HydroSOS BaNe project mainly at the regional level to organize and	The involvement of regional entities such as Nepal-Bangladesh Joint Expert Committee (JEC) on Harneshing of Water Resources and Mitigating Flood and Flood Damages, RIMES, ICIMOD together with NMHSs is extremely valuable to ensure the implementation of component 3, and specifically the sustainability and long-term effects of data sharing policies, sustainable development plans and practices and code of conducts at the local, national and transboundary scales. JRC will extend its operational role and maintain the project results on the longer term, therefore contributing to the design and implementation of the GBM basin Strategic Action Programme (SAP). Major institutions in charge of coordination and civil defence activities from national to local level will be integrated while detailing, and later implementing, the project components:

	facilitate the regional level activities such as on the development of risk profile and HydroSOS EWS b) to agree on the implementation of regional strategies for risk management and prevention approaches through HydroSOS EWS c) to ensure data are shared from national agencies to continue the operation of the HydroSOS system and d) under component 3, support in the review, update or development of transboundary policies, plans and guidelines on managing floods and drought events in the changing climate. A MoU has been signed between WMO and ICIMOD where a specific task on regional support from ICIMOD is requested for projects in the Ganga Brahmaputra Meghna region such as HydroSOS BaNe and upcoming WMO Hind Kush Himalaya Hydrological Cycle and Observation System (HKH HYCOS-II) phase 2 project (under preliminary discussion).	



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National Ministries, Financial institutions such as Asian Development Bank, World Bank and International organizations will be invited to follow the project implementation and success stories, as an example, ADB and WB for scaling the project to other countries of the South Asia and South-East Asia and the National Ministry of environment and forest in Bangladesh and Nepal, as financing instrument of national environment and climate adaptation projects to implement nature-based solutions identified through the project. National Meteorological and Hydrological agencies will be able to contribute to the expansion of the HydroSOS EWS to the entire national portion and beyond as shown in above figure.

L. Provide an overview of the environmental and social impacts and risks identified as being relevant to the project.

The entire project activities will be screened for any environmental and social risks according to the 15 principles outlined in the AF's Environmental, Social and Gender Policies. As noted in the following table, all principles are applicable in the countries and for all sites of the targeted countries, GBM region in general. Specific principles will be analyzed on a case-by-case basis during various field visits and in view of the exposure to one or both floods and drought hazards. It is also noted that when a specific risk is applicable and triggered, this could lead to other risks as well. Based on initial consultations and assessment with the Country stakeholders, highly impacting risks are not part of the proposed project on the GBM region as all the measures follow the principles of integrated water resources management and contribute to increased preparedness measures for climate change events such as floods and drought.

However, some of the proposed project activities such as the development of risk maps can alert the national agencies and communities about the locations possibly at-risk for flood or drought events. The national agencies might then consider moving or relocating people, or people on their own could decide to move to safer places in urban or rural areas. This can be considered as primary indirect risks. Moreover, secondary or dependent risks such as economic marginalization, fight for water, land and food resources and social and cultural conflicts with the existing people at the new location might become a challenge to the relocating families. The national agencies or people should be made aware of this kind of risks and their impacts. The proposed project will raise awareness or knowledge for such risks and potential safeguard measures with prior and informed consent of the stakeholder. With the information available at this stage, the project is expected to fall into medium risk category B because interventions such as information through risk maps and EWS will strengthen national agencies and communities' capacities to prepare and adapt to the climate change.

Table 11: Based on information available and screening on the Environmental and social policy principles of the Adaptation Fund during the EIA and SIA studies carried out during the proposal development phase

Checklist of environmental and social principles	No further assessment required for compliance	Potential impacts and risks – further assessment and management required for compliance
Compliance with the Law	Further assessment during the EIA and SIA studies were carried out with the stakeholders at national and local levels. It was informed that the project will ensure that the existing national and transboundary laws, policies and guidelines of GBM countries will be followed during the implementation of adaptation measures or in capacity development activities. The project will not require any prior environmental and construction legal and regulatory permission as there are no physical or structural construction planned in the project activities. If required international laws on data sharing protocol among different countries will be consulted and agreed upon with the stakeholders.	In case of any potential impacts and risks identified during implementation phase, risks prevention or management strategies will be executed as presented under the ESRMP
Access and Equity	Further assessment during the EIA and SIA studies were carried out with the stakeholders. The project activities will provide impartial and equitable access to project stakeholders. The project design is developed to allow representative of all groups in every capacity development training/workshop at local levels. however, the project has capacity development activities to which only small percentage of the communities will be able to participate. The project will ensure that these representatives of communities will further disseminate the information to wider groups. The selected participants will be expected to disseminate the training knowledge to other members of communities or organizations so that everyone will have fair and equitable access to all project benefits. The selection of participants/beneficiaries will also be made in consultation with local practices, traditions and access to social facilities.	In case of any potential impacts and risks identified during implementation, risks prevention or management strategies will be executed as presented under the ESRMP
Marginalized and Vulnerable Groups	Further assessment were carried out during the EIA and SIA studies. The project will contribute to the reduction of existing inequalities for EWS for floods and drought, particularly those affecting marginalized or vulnerable groups dependent on agriculture or living in urban areas. The EWS system for floods and drought will be available through technological sources. During the pilot testing, the members of communities (including marginalized and vulnerable groups) and local agencies will be provided with adequate knowledge and explanations about the systems to use it for their own benefits. Community-based flood and drought management activities including gender mainstreaming will support the participation of marginalized and vulnerable groups and their appropriation of projects benefits.	There is a risk that vulnerable and marginalized groups will have insufficient knowledge and access to technological devices such as mobile phones or lack of good cellular connectivity specially required for outcome 2.1 of the proposed activities. To avoid the exclusion of marginalized and vulnerable communities, local radio channels and traditional practices will be implemented to reach these groups especially women, girls, elderly, physically challenged individuals.
Human Rights	No further assessment is required. The proposed activities are or will not be against any of the established international and national human rights. Moreover, the proposed project will promote the basic human rights of access to information, water, and food The project will provide opportunity for every individual to give their views, perceptions and needs in developing better climate change adaptation measures.	In case of any potential risks and impact identified during planning and implementation phase, risks prevention or management strategies will be executed as presented under the ESRMP

Gender Equity and Women's Empowerment	Further assessment were conducted during the SIA and EIA studies to screen gender related policies. The proposed project will improve the gender equity and women empowerment through the WMO developed tool: Training Manual for mainstreaming gender in End-to-End Early Warning system for Flood forecasting and integrated Flood Management through a participatory design approach. This will help in increasing the participation of women, girls and other vulnerable groups in Flood and Drought management activities as well as decision making processes. Also, the activities related to risk maps and early warning system will be developed in an inclusive and participatory manner ensuring data collection for vulnerabilities are dis-aggregated by sex. The warning information are tailored to the needs of the population especially considering women, children, elderly, youths etc. Women representatives will be involved in the design, organization and implementation of activities especially in training workshops, meetings, update or review of policies and plans etc. so that they are empowered with knowledge, skills and tools for preparedness and resilience.	The proposed project is targeting region where men occupy the majority of the leadership positions. Women participation to disaster preparedness and decision making is often limited due to cultural and social norms. There is therefore a risk that women will not benefit equitably from the proposed adaptation measures and capacity-development interventions. Planning of the participative activities will ensure that women and representative of women associations will be sufficiently well represented. In case of any potential risks and impact identified during the implementation phase, risks prevention or management strategies will be executed as presented under the ESRMP
Core Labor Rights	No further assessment is required. The project will be implemented and managed in compliance with the countries designated labour laws. No individual will be hired without pay and payment will be based on national labour pay scales. Children's labour will be forbidden, and it will not be accepted from the project partners and national agencies.	In case of any potential risks and impact identified during the implementation phase, risks prevention or management strategies will be executed as presented under the ESRMP
Indigenous People	No further assessment is required. The indigenous population in the region will be consulted and involved during the design and implementation of the project activities. The traditional knowledge of indigenous people on Flood and Drought will be useful when preparing the risk maps, the early warnings and information dissemination.	In case of any potential risks and impact identified during the implementation phase, risks prevention or management strategies will be executed as presented under the ESRMP
Involuntary Resettlement	There are no activities proposed in the project which will create direct involuntary resettlement of communities. However, the risks of displacement of the population after the mapping of floods and drought risk areas could be possible as some areas could be classified as high risk for the loss of lives. On the basis of evidence-based and scientific information, the agencies will propose new prevention plan to prohibit future settlement in the high-risk areas.	In case of any potential risks and impact identified during the planning and implementation phase, a built-in safeguard approach for risks prevention or management strategies will be executed as presented under the ESRMP
Protection of Natural Habitats	There are no potential direct risks to the protection of ecosystems and its natural habitats and biological diversity through the project activities. Ecosystem services related assessment will be carried out to understand the issues related to the protection of natural habitats. Capacity development related to Natural and Nature-based solutions will be provided for protection of natural habitats	In case of any potential risks and impact identified during the planning and implementation phase, a built-in safeguard approach for risks prevention or management strategies will be executed as presented under the ESRMP
Conservation of Biological Diversity	There will be no direct risks associated with the conservation of biological diversity as the project activities will not involve any physical action on natural resources and introduce any known invasive species. The proposed project activities will provide opportunities to improve the understanding of natural processes in relationship with the water cycle.	In case of any potential risks and impact identified during the planning and implementation phase, a built-in safeguard approach for risks prevention or management strategies will be executed as presented under the ESRMP
Climate Change	No further assessment is required. The proposed project activities will not result in any greenhouse gas emission to the atmosphere and deforestation, so there will not be any impact to climate change. Furthermore, the project does not only increase the flood and drought adaptation capacity and resilience of the local	In case of any potential risks and impact identified during the planning and implementation phase, a built-in safeguard approach for risks prevention or management

	population but also contributes to develop better governance structures, policies and plans at both national and regional levels for climate change adaptation.	strategies will be executed as presented under the ESRMP
Pollution Prevention and Resource Efficiency	No further assessment is required. The project activities are not expected to result in water, air and soil pollution.	
Public Health	No further assessment is required. The project activities should not have a negative effect on public health. The project will identify the communities at risks which are prone to inundation and provide awareness of best practices for health-related safety during various capacity building activities.	
Physical and Cultural Heritage	No further assessment is required. The project does not have any activity related to affecting physical and cultural heritages. The purpose of the project is to develop better management of water resources and have traditional and cultural integration among the individuals.	
Land and Soil Conservation	No further assessment is required. The project will promote the conservation of soil and land resources, especially through the risk mapping and selection of natural and nature-based solution with environmental-friendly solutions. Through the HydroSOS EWS, Communities will improve their agricultural practice and help to build the capacity of farmers and technicians.	

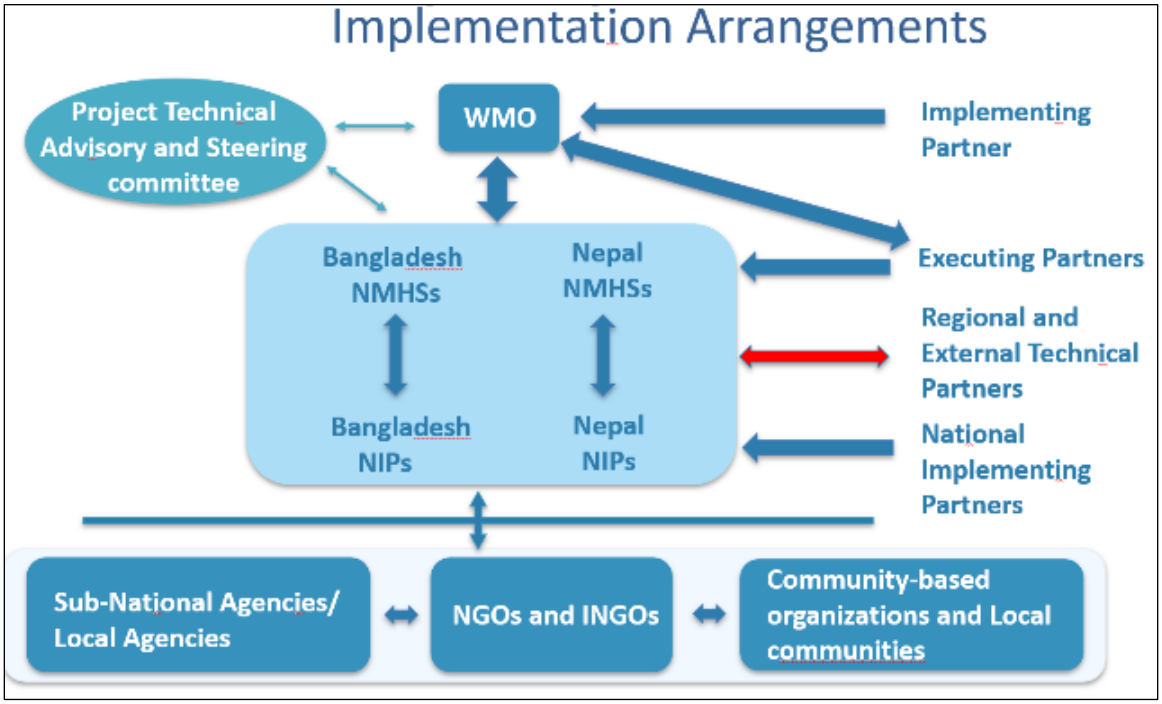
PART III: IMPLEMENTATION ARRANGEMENTS

A. Describe the arrangements for project management at the regional and national level, including coordination arrangements within countries and among them. Describe how the potential to partner with national institutions, and when possible, national implementing entities (NIEs), has been considered, and included in the management arrangements.

WMO will be the implementing and executing entity for the project providing overall management, procurement services and specific technical support in the execution of the activities. Its international experience and presence through their WMO Regional Office for Asia, situates it ideally for coordinating with national authorities, especially NMHSs (other executing entities of the project). The Technical Support Unit (TSU) of the WMO Associated Programme on Flood Management (APFM) and the Integrated Drought Management Programme (IDMP) supported by a network of Support Base Partners comprising of NMHSs, academia or research centers, private engineering companies and internationals organizations will design and develop technical solutions with the executing partners and they will have close links with the beneficiaries in the field. The IE jointly with EEs will select the APFM and IDMP technical implementation partners (to support the national agencies in implementing various activities) ensuring the following 1) Organizations have experience of working in the project countries or region 2) Organizations have relevant technical expertise in the various areas of project activities ensuring solutions and tools are provided that are free and open source following participatory approach which will be sustainable and without leading to social, environmental and gender related risks. Considering the existing capacities of the NMHSs and mandate of working and supported by the WMO, it is important that WMO provide technical execution support to the NMHSs so as to develop affordable, tailored and sustainable solutions following WMO standards, guidelines and practices in the project countries. Other WMO teams (members of Standing Committee on Hydrology, Disaster Risk reduction and Agriculture) will provide support in reviewing the project results and programmes. The HydroSOS team comprising of WMO hydrological coordination staff, UK Centre for Ecology & Hydrology(UK-CEH) and other contributing partners will be instrumental in providing technical guidance and implementation support to the national agencies. Other on-going initiatives of the WMO Climate Risk and Early warning system (CREWS), Flash Flood Guidance System, HydroHub programme, Dynamic Water Assessment Tool (DWAT) will contribute to the development of tools, products and services delivery to the decision makers and also expand the results of the project to the neighboring regions.

At the regional level, ICIMOD will lead the regional cooperation and coordination of the activities jointly working with the WMO, NMHSs, and partners of the two countries (support letter is provided here). The involvement of the ICIMOD will allow the project to link and use the existing activities/information in the two countries building synergies and complementarities with the HydroSOS BaNe project.

At the National level, WMO will collaborate with NMHSs of two riparian countries of GBM to lead the technical implementation and coordination of the project activities. For executing the project activities, the National Hydrological Services (NHSs) of each country (through a project technical manager) will be the National focal point and will implement the technical activities at the National and local levels through local agencies, NGOs and private partners forming a network of technical support group. NHSs will be in-charge of engaging and disseminating the project results towards the related Ministries in charge of Water Resources, Environment, Hydropower, Irrigation, Agriculture and Civil Defense, and to the regional organizations such as International Centre for Integrated Mountain Development (ICIMOD), Regional Integrated Multi-Hazard Early Warning System for Africa and Asia (RIMES) etc. working at the basin level. The National agencies of the GBM countries will come up with regional intergovernmental associations or authorities such as recently formed Nepal-Bangladesh Joint Expert Committee (JEC) on Harneshing of Water Resources and Mitigating Flood and Flood Damages(panel of meteorologists, hydrologists, and disaster risk management professionals from the operational organizations or services) to define the regional implementation plan and strategies for the long-term sustainability of the project outputs and outcomes. A project steering/advisory committee will be established with membership of National designated authority, agencies specialized in hydrology, meteorology, water resources, disaster management and of regional entities which will provide review and strategic guidance to the implementation of the project activities as well as support in promoting the project results in the region or outside the GBM countries. The proposed project will take into consideration the existing information, resources and infrastructures available in the country and try to support the needs of the GBM countries to develop HydroSOS system as well as support in developing concrete adaptation measures for climate change resilience at local and national levels. For each of the two countries, the contributing national and local partners related support (knowledge and skills) will be gathered and used for developing tools and products. They will play an important role in the implementation of the activities and working with the local stakeholders and beneficiaries. The list of the national agencies responsible for each activity will be refined before the inception meeting. A detailed project implementation arrangement is



described in the figure above showing how implementing, executing and other national entities coordinate and report to each other. During the next phase of the project development, a clear description of the roles and responsibilities of the implementing entity and of executing entity or organizations/stakeholders involved in the project will be provided.

For coordination at all levels, a regional working strategy group (RWSG) (mainly to check the implementation progress of the activities, engage in policy dialogues and knowledge exchange, facilitate cooperation, and develop advocacy and joint strategies for dissemination at global platforms) and National Working Group (NWG) (supported by the appointed National Project coordinator of the Executing Entities) will be established in each country and will be responsible for the overall execution of the project and facilitating coordination with various stakeholders including IE and EEs of the project. The IE and EEs will provide overall guidance, assessing implementation progress with the intended objective and technical support during the implementation

of the project activities. During the next phase of the project development, implementation cooperation and arrangements will be refined with additional stakeholders from global, regional, national, and local levels. A Project Management Unit (PMU) will be established with the WMO, regional and national executing entities staff working directly with the regional working strategy group (RWSG) and National Working groups (formed with the representatives of various agencies) to ensure the planning and timely execution of the project activities.

Roles and Responsibilities of the implementing, and executing partners, national and regional technical coordination partners, and external technical partners

Roles and Responsibility of the Implementing and Executing Partner (WMO)

- Responsible for the overall management of the project, including all financial, monitoring, and reporting responsibilities
- Funds transfer to the executing entities
- Implementation of various activities through the support of regional, national, and international technical partners ensuring solutions are services provided are affordable, tailored, and sustainable.
- Procurement of goods and services (including consultants)
- Follow Adaptation Fund environment and social policies in the planning and implementation of the project activities
- Lead the development and submission of the annual project progress report (PPR) and share it with the adaptation fund for review and endorsement
- Conduct independent mid-term and final evaluation

Roles and responsibilities of the executing partner (NMHSs of the two countries)

- The executing entities are fully accountable for the management, operation, and use of funds for activities at the national and local levels
- Executing entities will carry out specific tasks related to the preparation and execution of adaptation activities
- Support Implementing entity in various activities: M&E reporting and procurement services (including consultancy) through local NGOs and partners based on the needs
- Support and develop technical and financial reports of the activities and PPR reports and submit it to the Implementing Partner

The responsibilities and duties of the Internal and External partners shall be the following:

- Provide technical design support and develop solutions requested by the Implementing and Executing partners
- Help implement activities at the Local, National and Regional level
- Ensure linkage with the completed, on-going, and upcoming projects or initiatives

The PMU will be comprised of the following focal points:

1. WMO Project Manager
2. Two Project consultants - Bangladesh
3. Two Project Support Officers – Nepal

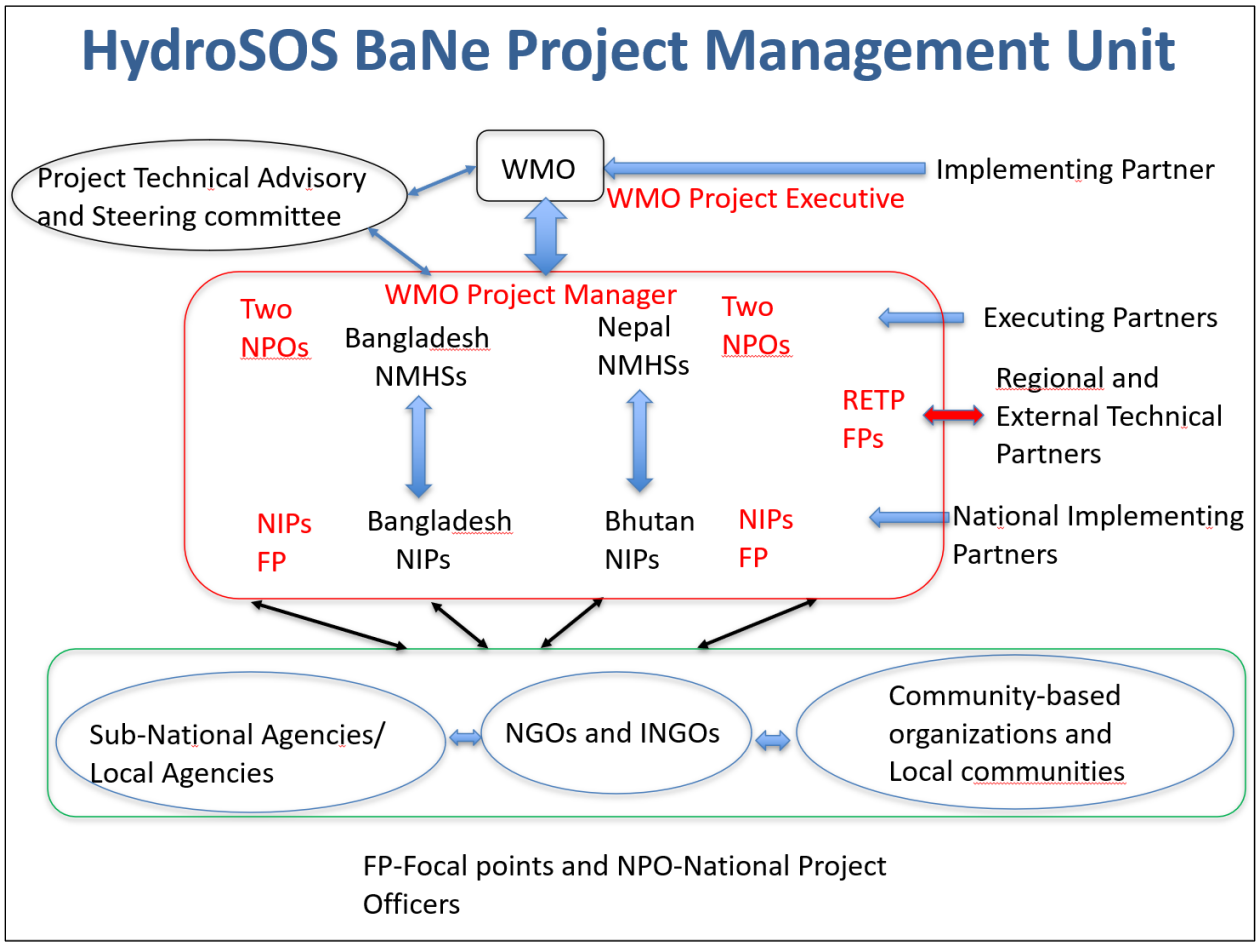
The PMU will be headed by the HydroSOS Project Executive of the WMO (representative of the Implementing Partner) who will have the overall responsibility of the project and will have regular consultations with the representative of the Executive Partners.

Note: For Nepal, the two project support officers (hired temporarily for the duration of the project) will support and work under the overall guidance and supervision of the Project Implementation Unit (PIU) of DHM which is headed by Gazette Second Class officials and consists of financial and administrative officers, etc.
For Bangladesh- the two project consultants (hired temporarily for the duration of the project) will support and work under the overall guidance and supervision of the Project Implementation Unit (PIU) of BMD and BWDB which is co-headed by the focal points of the BMD and BWDB and consists of financial and administrative officers, etc.

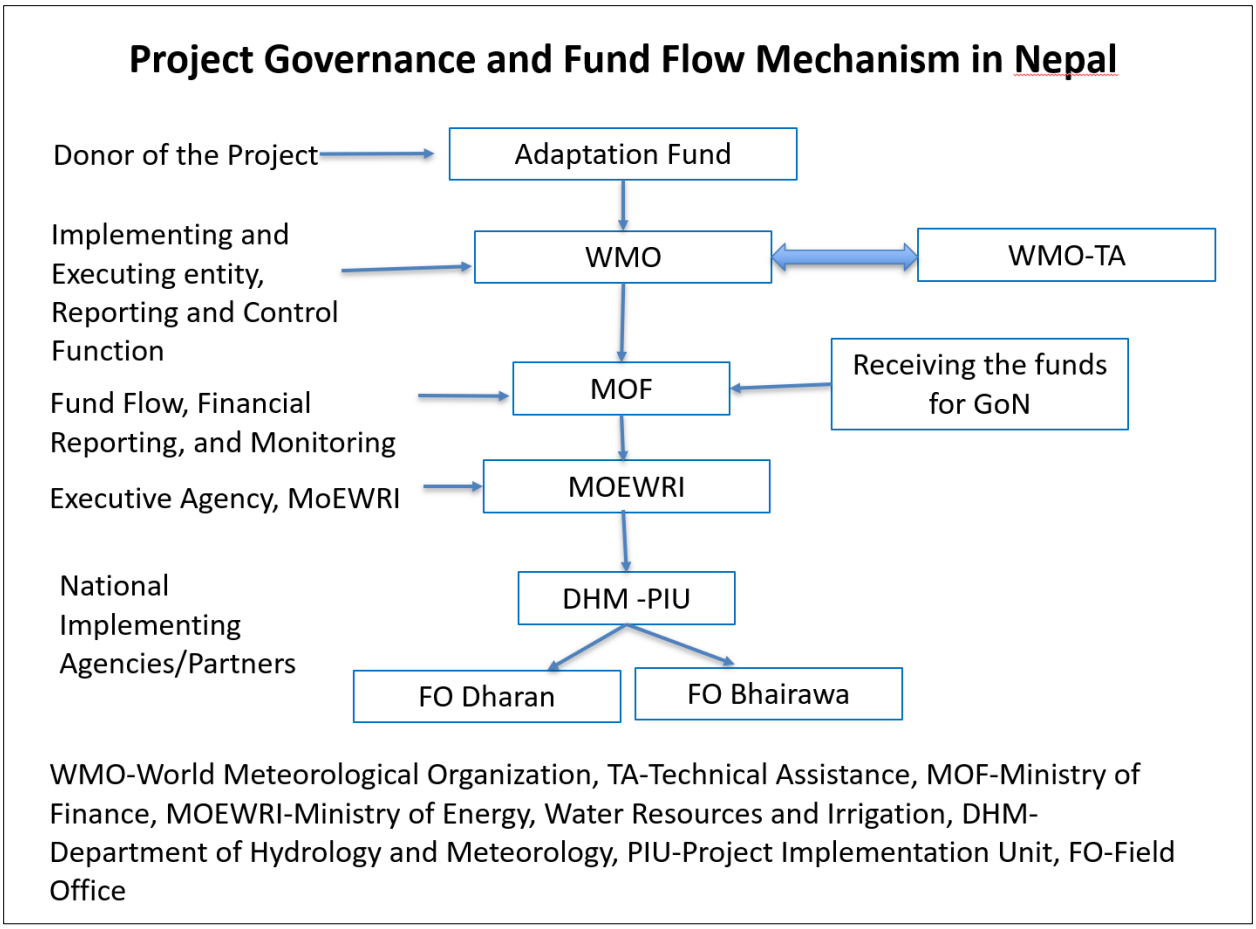
Responsibilities of the PMU (as described under below diagram)

- Day to day planning and implementing the project activities;
- Building synergies and complementarities with other completed and on-going initiatives
- Develop project work plans and associated budgetary provisions;
- Drafting of regular progress reports;
- Ensuring joint coordination, sharing of work plans, quality assurance of activities and outputs;
- Jointly promote and ensure visibility of the project, through issuance of communication products as may be appropriate;

- To identify and resolve potential situations of conflict or challenges that may negatively impact on the project implementation;



Note: The financial flow arrangement of Nepal will be as per the final agreement of project implementation between the World Meteorological Organization (WMO) and Ministry of Finance (MoF), Government of Nepal.



B. Describe the measures for financial and project / programme risk management.

Financial and project risks measures will be assessed as an on-going process throughout the design and implementation of the project. The initial potential risks identified are:

Type of risk and how it affects the project	**Risk impact on the project goal** (Low, medium, high)	**Probability of occurrence** (low, medium, high)	**Mitigation measure(s)**
Acceptance of the project Even though detailed needs assessments and consultations with stakeholders have been conducted since 2019, the support of the stakeholders can differ in the targeted countries. This will result in differential levels of acceptance or support and eventually could slow down the inception phase of the project.	Medium	Low	- During the preparation phase of the project, all relevant stakeholders (government, agencies, departments and communities) will be/are clearly identified, so that they fully share the vision and goal of the project and are aware of their contribution to the project, hence fostering ownership and sustainability over the process. - MoU or agreements will be signed with the participating stakeholders. - Roles and responsibilities of the implementing/executing agencies and other technical agencies/organizations will be defined in

			the initial stages of the project so that all the activities are completed in a coordinated way.
Physical risks Administrative barriers hinder sharing of hydro-meteorological, social and topographic data. This result in difficulties to implement components 1 and 2.	Medium	Medium	The implementing (WMO) and executing (NMHSs) entities will ensure the required data and information are made available and national level tools and products are shared. Furthermore, WMO is mandated for regional exchange of data and information on hydrology, meteorology and climatology and can request the enforcement of the agreements.
Technical/quality risks Component 2 of the project is too technical and not adapted to specific area or countries. This might result in low commitment and interest from stakeholders	Medium	Low	The project activities will be first reviewed by experts of WMO and NMHSs and eventually with the support of NIPs, local decision-makers and participants from community, the available resources, expectations and suggestions will be collected. The feedback and suggestions from the participants will be integrated into the planning and implementation of the activities.
Restructuring of government officials Restructuring in the government work structure may cause possible shifts of responsible persons at local and national levels to a different location. This can result in delays and loss of support.	Low	Medium	Alternative persons from the departments will be involved in most of the activities so that implementation of project activities will not be hampered at any time.
Financial/resources risks ▪ Inadequacy of the financial management system: procurement system, financial availability, monitoring, reporting and auditing system, etc. ▪ Availability of project resources ▪ This will result in slowing down the project activities	Low	Low	During implementation, project and financial monitoring/reviews will be conducted to ensure efficient management of project resources.
Human resources/capacity risks ▪ Lack of skills or human resources availability ▪ Adequacy between existing and required experience and skills ▪ This results in slowing down the project activities	Medium	Low	-The project benefits from the deployment of professionals/staffs by the implementing and executing agencies (WMO/NMHSs) who are selected by a panel of experts. Their ToRs are developed based on the project needs and in collaboration with the hosting institutions. - National support is obtained at the level of the governmental agencies to ensure sufficient human resources
Documentation/Reporting risks ▪ Lack of available tools and templates for developing reports and progress report ▪ Delays of reporting by the partners ▪ This results in delays in the reporting process and access to funding	Low	Medium	Appropriate tools/templates and reporting structures and procedures will be put in place by WMO to ensure proper documentation and reporting so that donor agencies and steering committee receive timely reports.
Political risks Interference from the local/national political parties This will result in delaying the project activities	Low	Low	The project will adhere to the goals, laws, and policies of the respective GBM countries. Whenever and wherever required, permission of national consensus of the countries will be taken or shown.

Gender neutral approach Techniques and technological tools developed are not accepted by all groups of the communities. This decreases the gender inclusive or equality compliances	Low	Medium	The project includes gender sensitive approach in all activities. Wherever required non-technological or traditional methods will be adopted to reach and get participation from every group of the communities.

WMO Monitoring Evaluation and Risk Prevention (MERP) team and its technical advisory group (Standing Committee of Hydrology and working groups) will provide support to the project team and executing agency for conducting regular risk monitoring and evaluation of the project activities, and the results will be tracked and reported in WMO's internal monitoring system. In addition to this, a dedicated Monitoring and Evaluation (M&E) team will be formed, to ensure essential budget and resources are allocated to execute the M&E framework including mid-term and terminal evaluation.

C. Describe the measures for environmental and social risk management, in line with the Environmental and Social Policy of the Adaptation Fund.

In the final preparation (proposal development) phase, an Environmental Impact Assessment (EIA) and Social Impact Assessment (SIA) study (in line with the Environmental, Social, and Gender Policies of the Adaptation Fund) were conducted for screening the proposed project activities against the15 principles of the Environmental and Social Policy of the Adaptation Fund. The EIA and SIA study of the project were undertaken by two ESIA national experts (as per the ToR provided under Annex 3) taking to account the existing laws, legislation or practices in place of Bangladesh and Nepal countries, along with the transboundary laws and acts on Environment and Social including Gender aspects.

Both the national experts/ consultants having more than 10 years of experience were hired to conduct environmental and Social Impact assessments in the targeted regions of Bangladesh and Nepal. The methodology of the study includes field visits to the vulnerable locations of Bangladesh and Nepal, semi-structured interviews or focus-group discussions with the agencies (national meteorological and hydrological services (NMHSs), disaster management, environment, water resources, and irrigation, civil authorities, etc.) and citizens (representatives of communities impacted by floods and droughts, marginalized and vulnerable communities, community-based organizations, associations or self-help groups, etc.). Based on the EIA and SIA study, A detailed report on the Environment and Social Impact Assessment (ESIA) and the associated Environment and Social Risk Management plan (ESRMP) was developed and submitted during the submitted project proposal as available under Annex 3.

The EIA and SIA studies carried out in the two countries highlighted the minimal direct risks associated with the implementation of the proposed activities at the regional, national, and local levels with higher positive impacts and possible (not confirmed) negative impacts.

Screening questions	**Impact**			
	Environmental		**Social**	
	Positive	**Negative**	**Positive**	**Negative**
Safeguard Standard 1: Compliance with the law				
Compliance with the national laws, acts and policies.	Ensure compliances with all necessary national laws, acts and policies to ensure easy and timely project implementation. following the protocols, and procedures of the national and local governments in the two countries. Before implementation of the activities, a concept note or ToR will be shared with the stakeholders to check if there is any noncompliance with any laws, acts and policies Following the agreement, implementation of the activities will be carried out	There is no negative impacts foreseen	Safeguard the rights, livelihoods, and well-being of communities at risk.	

Screening questions	Impact			
	Environmental		Social	
	Positive	Negative	Positive	Negative
Safeguard Standard 2: Access and equity				
Access all community members to the early warning messages.	The project will ensure representatives of all vulnerable groups will participate in all training and workshops,and will share the knowledge gained with their communities.	Considering the limited budget, it might be possible that some individuals are not able to participate. The project will request trained individuals of the community to share knowledge with others	Ensured peoples participation, cohesion and collective approaches to protect live and livelihoods.	
Safeguard Standard 3: Marginalized and vulnerable groups				
Including the marginalized and vulnerable groups, in the planning and implementation.	This project will enhance community preparedness, reduce losses, and protect biodiversity.	Difficulty may arise as the groups will have insufficient knowledge and access to technological devices and methodology	The real needs about livelihoods, resiliency will be focused and develop as per plan accordingly.	
Safeguard Standard 4: Human rights				
Potential human rights issues associated with the project.	This project is not going to take any direct activity to impact in the human right issues. But human rights issues will be addressed by the activities done by the project during disasters. All human right laws (freedom of speech, access to information etc.) will be applied during implementation		Basic human rights including access to food, shelter and information will be facilitated during the impending period.	
Safeguard Standard 5: Gender equality and women empowerment				
Impact of women's participation in decision-making processes	The gender equity, leadership, women empowerment and ownership will be developed through various activities such as Gender mainstreaming into flood management, community based activities . That helps the social and ecosystem protection.	In Bangladesh, participation of women might be limited due to restricted cultural norms. As much as possible women staff will be employed in	Ensure the identification and addressing of the real women issues that reduce the losses and make the harmony of peace in the society.	Women's participation in disaster preparedness and decision-making is often limited due to cultural and social norms, also due to lack of knowledge

Screening questions	Impact			
	Environmental		Social	
	Positive	Negative	Positive	Negative
		the project to engage women of the communities in decision-making and implementation of the activities		about the technology and reluctant to learn.
Safeguard Standard 6: Conservation and biodiversity				
Reduce the threats to biodiversity in the ecosystem of the project.	The indirect impact of the devastation will be reduced by early warning messages, which will help mitigate threats to biodiversity in the project's ecosystem. Risk maps will provide information on protected and wetland areas that could be preserved for managing flooding and drought events		Supporting livelihoods, food, and culture and enhance the resilience of the community.	
Safeguard Standard 7: Climate change				
Potential climate change impacts during its implementation period	The project does not have activities that harm the environment; instead, it focuses on enhancing the community's adaptation capacity and resilience by providing information, implementing adaptative measures (raising of houses, agriculture practices, alternative livelihoods etc.) and trainings		Build capacity of local communities on climate change adaptation that enhance the productivity and income generation.	
Safeguard Standard 8: Pollution prevention and efficient use of resources				
Pollution prevention and efficient use of resources	Project doesn't have any activity to pollute any areas . However, pollution management and mitigation measured will be increased through awareness.		Enhanced community health and safety as pollution risks are identified and mitigated.	
Safeguard Standard 9: Protection of the natural habitats				
Natural habitats that could be affected by the project.	There is no project activity that will affect natural habitats. The project will focus on awareness building to enhance conservation efforts.		Strengthened community engagement in habitat protection and restoration efforts.	
Safeguard Standard 10: Public health				

Screening questions	Impact			
	Environmental		Social	
	Positive	Negative	Positive	Negative
Public health issues that could arise from the project activities and have environmental and social impact?	The project does not involve any health hazardous or public health-related activities. Disease incidence will be reduced through health awareness activities.		Building awareness of best practices for health-related safety delivering messages on health and hygiene issues during disasters.	
Safeguard Standard 11: Cultural and physical heritage				
Minimize the impact on cultural and physical heritage sites due to flood or drought.	Project doesn't have any activity that could affect the cultural and physical heritages, rather the community awareness will raise on the importance of heritages.		Project activities will be supportive for the preservation of Cultural identity and history.	
Safeguard Standard 12: Involuntary resettlement				
Impacts of identifying the communities that are likely to be affected by involuntary resettlement.	Normally no direct resettlement activities will occur but after risk mapping for the implementation of better plan for safety and security, so communities might have to be resettled	Minor to disruption of local ecosystems, biodiversity, and natural habitats and community cohesion.	Resettled community will get safe location with alternative livelihoods options.	Minor for loss of land and income generation activities.
Safeguard Standard 13: Indigenous peoples				
Rights of indigenous peoples are respected and protected during our project.	The rights of indigenous peoples can help conserve their traditional lands, ecosystems, and natural resources through their participation and traditional knowledge.		Protection of the rights, traditional knowledge, social inclusion, cultural preservation for the indigenous people and will also help in enhancing resilience.	
Safeguard Standard 14: Core labour rights				
Compliance with the countries designated labour laws	Labor laws that guarantee fair wages and provide financial protections making them less vulnerable to the economic shocks of disaster.		Access to resources, financial aid, and technical assistance these farmers will be ensured.	
Safeguard Standard 15: Land and soil conservation				

Screening questions	Impact			
	Environmental		Social	
	Positive	Negative	Positive	Negative
Conserve land and soil in the face of flood or drought conditions associated with the project.	Implementing land and soil conservation practices can significantly enhance resilience to flood and drought conditions, reducing soil erosion and improving water retention.		These conservation practices stabilize farm production during extreme weather, ensuring food security and livelihoods.	
Additional Screening Questions for Cost-Effectiveness Measures				
Cost-effectiveness of the Early warning systems, community-based activities, and risk maps/	Methods like early warning systems and risk maps typically involve using existing natural features and systems (like rivers or weather patterns) more effectively.		Engaging communities empowers them to understand and effectively respond to climate risks, promoting resilience and adaptive capacity.	

The positive impacts through the project activities implementation:

- Build Institutional capacity to take the appropriate measures to reduce the vulnerability of the community in the targeted project areas
- Ensure accurate impact-based forecasting and early warning messages dissemination
- Lead time will be available for forecasting and warning communication
- Develop effective coordination among the concerned departments and agencies.
- Develop various tools and techniques for risk mitigation through forecasting and early warning
- Disaster Management Committee will play an active role in early warning systems
- Agencies, Municipality and communities of the targeted areas will be able to receive the right time early warning messages and advisories for livelihood.
- Development of the community's capacity to take the right time to prepare for disasters.
- Reduce the risk of marginalized and vulnerable people by involving in the project.
- Women's participation in the project to empower their participation and reduce the vulnerability
- Help in managing water resources more effectively and also maintaining and restoring ecological balance by providing early warning
- It will empower communities with timely information and tools to prepare for and respond to floods or droughts, reducing potential loss of life and livelihoods
- Raises awareness about hydrological risks, fostering a culture of preparedness and adaptive behavior among the population

The potential in-direct negative impacts:

- Trust gap will be created if not maintain the accuracy of the forecasting messages.
- May be failed mid- and long-term forecasting accurately due to limited availability of real-time data from ground stations
- Inaccurate forecasting may cause unacceptance by the community.
- Due to any reason the forecasting delay may not be effective for the community.
- Coordination gap among the different departments and agencies may slow down the process
- The Inactive Disaster Management Committee makes barriers to reaching remotely located vulnerable groups.

- Resettlement may happen after risk mapping which may create the loss of livelihoods of the community of the identified risk areas.
- Over-reliance on technology for forecasting could lead to neglect of traditional knowledge and practices related to water management

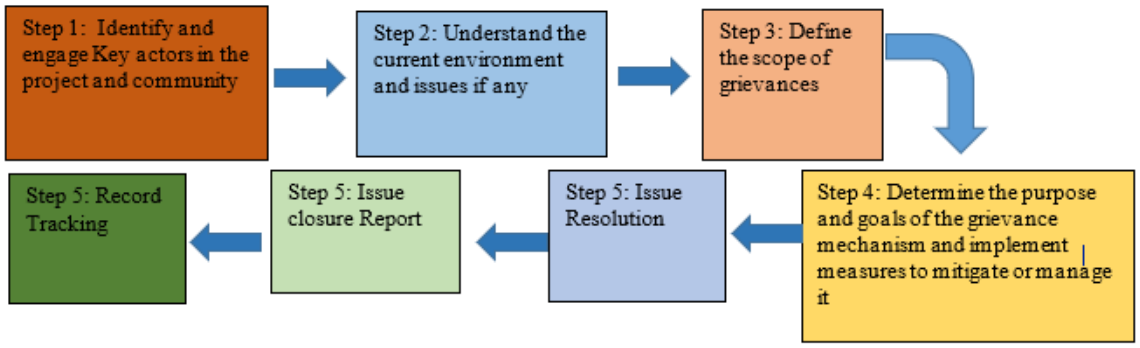
Overall, while the Hydrological Status and Outlook System offers significant benefits in terms of environmental sustainability and community resilience, careful implementation and consideration of local contexts are essential to mitigate potential negative impacts.

The potential low-medium indirect risks identified for the 15 environmental and social principles of the Fund in relation to the project activities have been described in section L, Part II, and concrete mitigation actions have been proposed for each category of the risks. Other minor risks related to the project implementation and results are included in the below Table with their appropriate response measures.

Activities under components 1 and 2 are low to medium risks and will not require any further environmental screening or assessment. Component 3 activities will be brought forward through consultative processes with agencies, community and representative groups to improve flood and drought management at the national and transboundary level and will increase community resilience, promoting gender equity and utilizing traditional knowledge as a basis for planning the adaptation measures.
A cross-analysis of the actions planned by the project and the field investigations at the level of the national portions of the GBM Basin regions in the 6 countries, made it possible to identify the positive and negative impacts of the integrated flood and drought management project. These environmental and social impacts are classified as positive or negative. The analysis of these impacts will allow to propose mitigation, compensation, or improvement measures according to the impact categories.

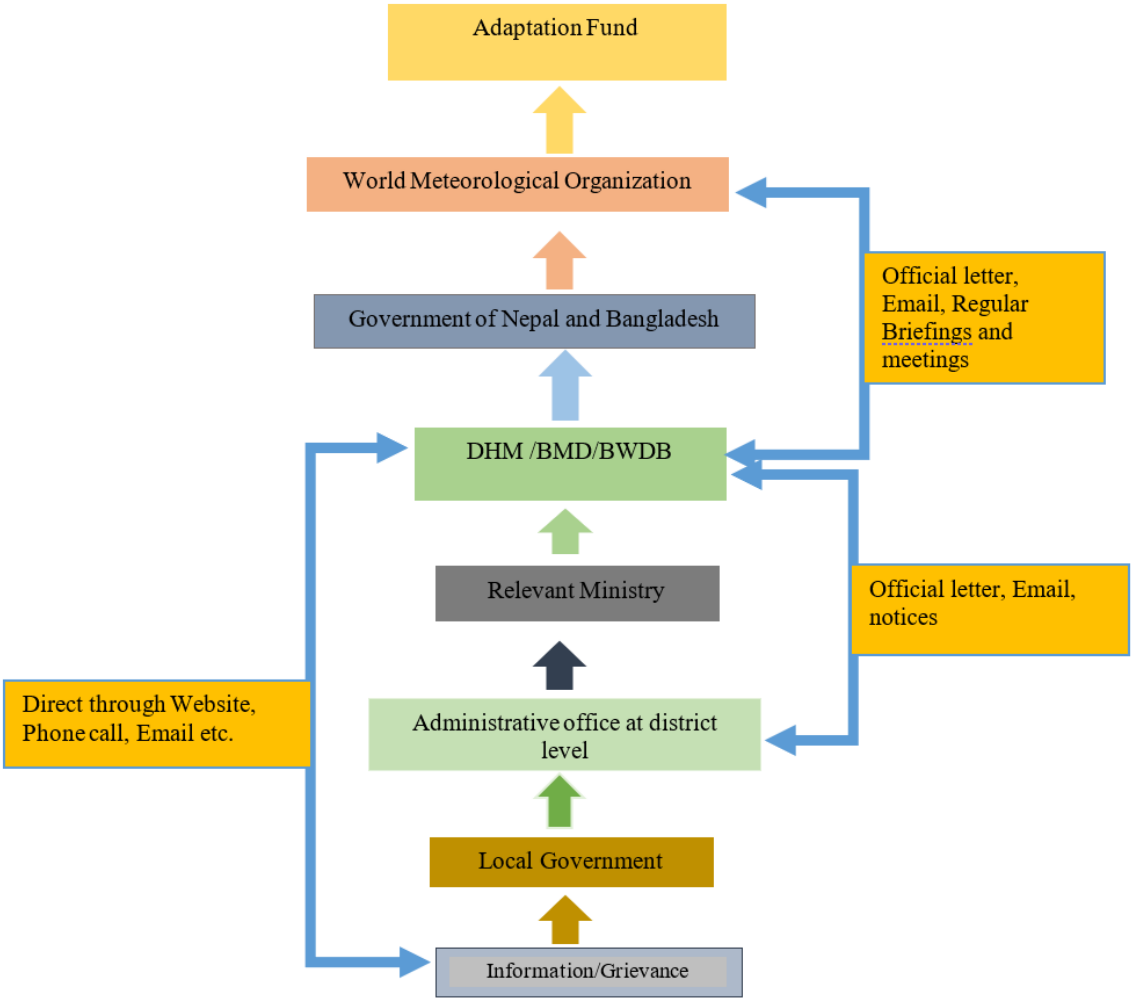
A dedicated Grievance mechanism will be developed for the beneficiaries of the project to address or report any complaints or discrimination directly to the National, Designated Authorities, Implementing entity (WMO) and funding agency (Adaptation fund). The stakeholders will be made aware of this Grievance Mechanism during several consultations carried out in the project preparation and implementation phase. Several means (using emails, social media or through posts) will be made available through which one can report the concerns they may have or find during the activity design and implementation phase. Diagram 1 represents the identification of risks and issues on social and environment related principles of the Adaptation Fund and Diagram 2 reflects the procedure of risks mitigation or management from local level to national level to WMO/Adaptation Fund.

Diagram 1: Identification of risks or issues on social and environmental principles of the Adaptation Fund



https://www.cao-grm.org/purpose-design-and-implementation

Diagram 2: Grievance Mechanism Chart and procedure for risk mitigation and management



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Grievance Redresses Committee for the HydroSOS BaNe project

Grievance Redresses will be formed at local and national level to take the steps to resolve issues if any risks are identified during planning and implementation phase. The members of the committee will be from Bangladesh Meteorological Department, Bangladesh Water Development Board, Department of Disaster Management and representative from Local Government Administration (Union Parishad). In case of Nepal, the members of the committee will be from DHM, MOHA, NDRRMA and representative from local governments

Grievance Redresses Process

At the Implementing Agency level, the grievance mechanism will be regularly monitored for the complaints from the beneficiaries or stakeholders who will share their feedback directly through the post mail, phone, fax or email using the below details.

Bangladesh Meteorological Department

E-24, Agargaon, Dhaka-1207, Bangladesh Phone: +88 02 41025730, 41025731, 41025705
Fax: +88 02 41025726, 41025727, 41025728; Email: info@bmd.gov.bd ; swc@bmd.gov.bd

Bangladesh Water Development Board

16 Merul Badda, Dhaka 1215, Bangladesh; Email(s): shamal1967@yahoo.com, se.pffc@bwdb.gov.bd
Contact person: Dr. Shamal Chandra Das; Phone: +8801759693375

Department of Hydrology and Meteorology in Nepal

Government of Nepal, Ministry of Energy, Water Resources and Irrigation, , Babarmahal, Kathmandu, Nepal +977- 1-5319052, 5358224, 5358276, 5319007, dg@dhm.gov.np

National Disaster Risk Reduction and Management Authority

Singhadurbar, Kathmandu, Nepal, P.O. Box no. 213213, Telephone: 01-4211194 / 4211197 / 4211195, Email: info@bipad.gov.np, ndrrma@gmail.com, admin@ndrrma.gov.np, Web Link: www.bipad.gov.np

World Meteorological Organization

Associated Programme on Flood Management/Integrated Drought Management Programme 7bis, avenue de la PaixCase Postale No. 2300; CH-1211 Geneva 2, Switzerland Tel.: + 41 (0) 22730 81 11 and email: floodmanagement@wmo.int or filling the WMO contact page: https://wmo.int/contact-us

Adaptation Fund

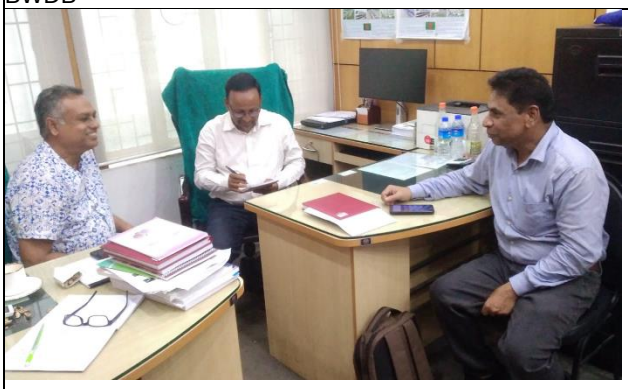
Issues or Grievances can be directly reported to the Adaptation Fund using the below form or contact address https://www.adaptation-fund.org/contact/

Adaptation Fund Postal Address

Adaptation Fund Board Secretariat; Mail stop: N 7-700 ; 1818 H Street NW ; Washington DC 20433; USA; +1.202.473.0701 (v) ; +1.202.522.3240 (f)

Photographs-Public Consultation-Key Informant Interview at National Level and local level during EIA and SIA study

Bangladesh

<table>
<tr><td>  </td><td>  </td></tr>
<tr><td>Superintending Engineer and Hydrological Adviser, FFWC, BWDB</td><td>Executive Engineer, FFWC, BWDB</td></tr>
<tr><td>  </td><td>  </td></tr>
<tr><td>Senior National Agromet Technical Coordinator, DAE</td><td>Principal Scientific Officer, WARPO</td></tr>
</table>

	
Deputy Secretary (Relief) and Deputy Director (Research), Department of DM Management, Ministry of Disaster Management and Relief	

Photographs-Public Consultation-Key Informant Interview at Local Level

	
Upazila Agriculture Officer, DAE, Nageswari, Kurigram	UP member, Nageswari, Kurigram

Photographs-Public Consultation-Focus Group Discussion at Local Level

	
Burungamari, Kurigram	Nageswari, Kurigram

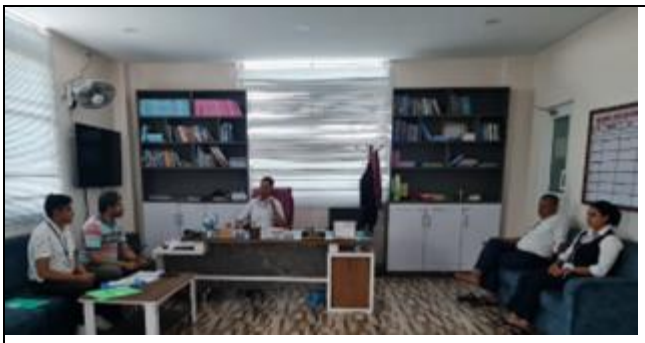
	
Godagari, Rajshahi	Tanore, Rajshahi

Photographs of Nepal

	
NDRRMA, Central Level	Ministry of Energy, Water Resources and Irrigation
	
Department of Water Resources and Irrigation, Central Level	NDRRMA, Central Level

	
Community Consultation	Site Visit to during community consultation
	
Community Consultation	Discussion with the Disaster Focal person
	
Discussion with the Disaster Focal person	Discussion with Mayor

	
Discussion with Deputy Mayor	Discussion with Mayor
	
Discusion with local community	Discusion with local community
	
Discusion with local community	Discusion with local community

	
Local level meeting	Discusion with local community

D. Describe the monitoring and evaluation arrangements and provide a budgeted M&E plan.

Monitoring and Evaluation (M&E) measure the overall progress and impact of the project activities through the Baseline, Key Performance Indicators (KPI) and Targets to be achieved. They will be monitored regularly to identify the achievements or insufficiencies, therefore supporting the development of additional strategies to achieve the targets.

Monitoring and evaluation arrangements for the project activities
A monitoring and evaluation system will be developed to support the implementation and decision-makers team in designing, implementing, and adjusting the program activities. The overall (short, medium, and long-term) impact of the planned activities will also be assessed using the resources, methodologies, tools, etc. The monitoring and evaluation arrangements will have a gender-disaggregated system of data collection (baseline and target to be achieved as established in the context of the results framework of the project) and reporting for each of the project outcomes and components.
The M&E arrangements will be structured and organized at various levels of institutional set-up such as:

Institutional level	Responsible actors	Support to the M&E framework
Local or Community level M&E activities	National Project Manager, Local Staff of Agencies (NMHS, Water Resources, Disaster Management), NGOs National External M&E expert	Collect Baseline, KPI, target to be achieved, means of verification for the activities implemented at the local level Updated checklists with the local project progress reports (LPPR) through semi-structure interviews or focus-group discussions, field visits consultation, Technical activity report
National level Monitoring and evaluation activities	Regional and National Project Manager, NMHSs staff, International M&E expert	Collect Baseline, KPI, target to be achieved, means of verification for the activities implemented at the National level Updated checklists with the National project progress reports (NPPR) through semi-structure interviews or focus-group discussions, field visits consultation, Technical activity report
Regional/Transboundary level Monitoring and evaluation activities	Regional and National Project Manager, NMHSs staff, International M&E expert	Collect Baseline, KPI, target to be achieved, means of verification for the activities implemented at the National level Updated checklists with the regional project progress reports (RPPR) through semi-structure interviews or focus-group discussions, field visits consultation, Technical activity report

Monitoring and evaluation arrangement for Project Management
The Project Management Unit (PMU) will be provided with monitoring and evaluation tools of project activities and resources. The PMU under the implementing and executing agencies will ensure that the executing agencies have adequate resources

and capacity to measure and monitor results at the local, national and transboundary level. The quarterly monitoring and annual evaluation reports of the executing agencies along with the financial statements and resource management will be submitted to the implementing agency (WMO) and further to the Adaptation Fund Secretariat for the review.

The monitoring and evaluation assessment of the activities will be conducted regularly with the local, national and regional agencies and communities after which a report will be prepared to track progress made since the start of the project's and in particular from the previous reporting period. The reporting includes, but is not limited to, on the following:

Report content	**Additional Description**
Progress on the project's objective and outcomes – each with indicators, baseline data and end-of-project targets;	aggregated, gender disaggregated, percentage of change
Project outputs delivered per outcome (quarterly, half-yearly and yearly);	Activities completed for each output in the reporting period as compared to planned
Lessons learned/good practice and challenges;	Check or assess the real benefits to the stakeholders or challenges encountered
Progress on work plan and expenditure reports; and	Update on the work plan and use of funds
Project risk and adaptive management.	Any grievance or risk encountered during the period, any measures taken
Any other information as required	

Monitoring and Evaluation reports for project activities and management:

Quarterly report	Monitoring will be carried out after each quarter and reports will be prepared with key performance indicators, results achieved, issues encountered or potential problems and proposed solutions.
Annual Report	Annual report will be prepared to monitor the progress in the time period of twelve months. This will be useful to monitor progress made in different activities. The annual report will be presented by the project management unit to the Adaptation Fund (during submission of the yearly project progress report) and project advisory committee to assess the overall progress and provide their suggestions or feedbacks.
Mid-term Assessment Report	The project management will hire an independent evaluator to conduct the mid-term review after two years of kick-off to get the feedback of project stakeholders and external experts including suggestions for way forward.
Final Evaluation or Project Termination Report	After completion of the project, an independent evaluation will be conducted to check the overall impact of the project. The final evaluation report will be developed and presented to the Adaptation Fund secretariat and Board, project advisory committee and other stakeholders.

The M&E activities with their implementation plan are shown in the table below:

Monitoring & Evaluation Activity List	Accountable Parties (short name)	Timeline															Budget allocation
		2025				2026				2027				2028			
		Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4

Design, development, and review of the Monitoring and Evaluation tools	WMO/NMHSs	X															5000
Monitoring the project activities and outputs (quarterly)	NMHSs and NIPs	X	X	X		X	X	X		X	X	X		X	X	X		20000
Improvement or additional changes in the Monitoring tool	WMO/NMHSs																	5000
Monitoring the activities and reporting the project outputs (Annually)	WMO/NMHSs				X								X					10000
Mid-term Evaluation of the project activities and assessing the progress	WMO/NMHSs								X									20000
Final or Termination evaluation and reporting (after the completion of the project)	WMO/NMHSs																X	20000
Total																		80,000

A detailed M&E tool (including updated baseline, KPI, target to be achieved etc) will be made available for project activities, as well as for the project management team before the inception phase of the project which will be validated by various stakeholders.

E. Include a results framework for the project / programme proposal, including milestones, targets and indicators.

The results framework of the project defines the key performance indicators (KPI), baseline situation and means of verification for every component, outcomes, outputs and its activities. The KPI will be used during the monitoring and evaluation to assess the progress and divulge any scope for improvements. The regional entities and national agencies from the two countries will be involved (check Annex 5 for the list of agencies who will be participating) in the finalization of the project result framework during the inception phase of the project mainly to review and update the data and information pre-filled in the below table.

Table: Project Result Framework

Objectives	Components related activities	Overall Baseline situation	Key performance Indicator (with Gender disaggregated)	Target to be achieved	Methods of Verification	Assumptions for each outcome
The HydroSOS BaNe project will increase the climate adaptive capacities and resilience of beneficiary communities to hydro-climatic risks. Furthermore, the project will develop local, national, and regional adaptation strategies and implementation mechanisms based on integrated monitoring and management of water resources It will also improve livelihood and minimize loss of lives through the establishment of an end-to-end early warning system as well as capacity development and implementation of climate change adaptation measures The project will further develop synergies between the beneficiary countries by	**Component 1:** Assessment of the Vulnerability Capacities Exposure and Risks (VCERs), development of the floods and drought risk maps (pluvial and fluvial), and integration of climate scenarios into the long term management policies and action plans. **Component 2:** Support to develop early warning systems for floods, and drought. Capacity development for strengthening knowledge and awareness related to climate change adaptation measures (Flood Green Guide and gender mainstreaming). **Component 3:** Water and climate resilient regional cooperation arrangements and updated of the national and transboundary	Number of floods and drought disasters without adequate and integrated management Increasing growth of populations losing interest in agriculture-based economic activities Lack of investment for concrete measures developing resilience to climate change Insufficient understanding of VCERs, shortage of hydro-meteo infrastructures and resources Lack of participation of GBM countries at the national and transboundary level for flood and drought management Limited IT equipment's, trained human resources for data and information	• Degree of improvement in populations' resilience to floods and drought events • Quantitative details for the reduced number of the deaths and damage to assets and environment •Local /national agencies and communities are trained on climate change adaptation measures for floods and drought and mainstreaming of gender • Percentage of households (including female-headed households) with improved livelihoods or economic benefits •Policies and guidelines at national and transboundary level for flood and drought management are better integrated and action plans are developed.	•Development of the risks map and end-to-end web-based early warning systems for floods and drought events. • 70% of floods and drought events are foreseen and adequate preparedness measures are taken by the beneficiaries • Climate scenarios are mainstreamed into national plans and decision-making tools. • More than 1000 individuals from communities, agencies, and organizations are trained through various workshops and are expected to disseminate knowledge and tools to other stakeholders.	• Web-based monitoring and early warning system for floods and drought • Monitoring and evaluation reports • Field visits reports • Success stories from the pilot testing • Workshops and trainings participation lists, • Multi-media channel report • Community of Users •Amendment to plans, policies, and guidelines documents.	Availability of Resources (data, information, infrastructures, human resources, etc.) Selection and participation of people from the agencies and communities who have shown interest to participate Representatives of the national hydrological and meteorological agencies use the products and services delivered in future work or projects. Political conditions of the countries and support for the transboundary organization (ICIMOD)

supporting the national and transboundary /regional governance helping in participatory management of water and natural resources while contributing to climate change adaptation strategies.	governance plans, policies and guidelines and their links with the national climate adaptation agreements.	management and sharing.		• National and transboundary agencies are trained and water and natural resources policies and guidelines are developed		
Component 1: Risk-based preparedness and adaptation to climate variabilities, water use stresses and environmental uncertainties						
Outcome 1.1 Floods and drought risks informed decision-making at the regional, national and local levels	Desk study, Field study, training and capacity development, Finding information from the available reports, documents, national database etc.	The existing reports and documents don't have updated information on Floods and Drought risks mapping for the GBM countries and its consequences on human and natural resources.	Development of Flood and Drought risk maps for the GBM countries or region	Availability of Flood and Drought risks maps for risk-informed decision-making through long term risk management strategies	Web-based risks maps, Field visit reports, and Monitoring and Evaluation reports Social media posts/reports	Beneficiaries will implement the techniques and tools which are disseminated and used in other regions Active involvement of stakeholders and availability of information
Output 1.1.1 Vulnerability and exposure assessment (including gender and sector-wise analyses) and risk maps are developed for the two GBM countries	Conduct a study and meetings to gather available information on vulnerabilities, capacities, exposure, and risks (VCERs) in the two GBM countries Select and develop database which contains data related to VCERs, hydrological and meteorological at the local/ national /regional level	There is a lack of updated and integrated information on Floods and Drought related VCERs for the GBM countries or region Database related to flood and drought related risks information are not available Existing IT and Data management	Percentage of baseline information on vulnerabilities, capacities, exposure and risks will be made available for the GBM countries or region	The existing data on vulnerabilities, capacities, exposure and risks will be collected and made available for developing risks maps.	Reports with information on vulnerabilities, capacities, exposure and risks of the GBM countries or region. Communication documents Centralized database with the risk related information are available for future update and use.	Data and information related to population, infrastructures, livelihoods, economic, hazards etc. are available for the two GBM project countries

	GBM countries risk profile developed with Flood and Drought probability Index	analysis is not updated;				
Output 1.1.2 Develop capacity and awareness at the local, national and regional levels to ensure risk informed decision-making	Identification of the needs (rooms, equipment, resources etc.), data and information and establishment of the VCERs database and risk maps are made available Capacity of stakeholders to use Floods and Drought risk maps is enhanced	Lack of the IT information exchange system in the countries for sharing of meta-data related to VCERs and risks maps from existing resources or projects The risks related to Floods and Drought are not well identified and are not taken into account by the different actors of GBM countries There is no concrete and updated prediction about the role of future climate change impacts on socio-economic, urban, climate and environmental conditions	Progress in terms of developing the database and risk maps (zones) on VCERs of GBM Basin (Percentage of basin surface area) The data from different countries will be made compatible highlighting the missing data and information of respective countries Number of workshops are organized for the dissemination of knowledge on VCERs and Flood and Drought risk maps Number of women trained	The database containing data and information on the VCERs related variables are available for the two GBM countries. The VCERs database and flood and drought risk maps (risk zones) for the GBM Basin will be developed with the available data; Future scenarios are developed for the climate change variability and Floods and Drought events Metadata of VCERs will be available Atleast one workshop per country will be organized to disseminate knowledge on VCERs database and Flood and Drought risk maps	Technical report of the activity, Monitoring and Evaluation reports, Meeting reports Reports of consultation workshops Feedback report of the workshops Guidelines for organizing consultation workshops and documentation Software and database	There are adequate staff in the national agencies of the two countries with knowledge and skills on GIS, IT and risk assessments.

				1 transboundary level consultation workshop with National Focal Point (NFP)		
Output 1.1.3 Long-term risk management strategies identified and integrated into development plans (economic, social, environmental aspects)	Design long-term risk management strategies with the stakeholders Capacity development activities to disseminate risk management strategies	A knowledge tool to integrate risk management strategies into development policies and plans is not available for the policymakers of the two GBM countries	Participation and training of the relevant stakeholders (Number of women involved) on the development of the risk management strategies linked with the policies and action plans of the countries	Involvement of various policymakers and professional staffs of agencies in designing the long-term strategies Capacity development of relevant stakeholders and assigning roles and responsibilities	Project technical reports, Monitoring and evaluation report Long-term risk management strategy documents for the two countries or GBM region	Availability of the policy makers from the countries to support in the designing and development of the strategies. The available information from the long term risk management strategies will be used in the future planning and development projects
Outcome 1.2 Preparedness and resilience to climate change promoted through innovative and community-based initiatives.	Capacity development of local stakeholders for hydro-meteorological risks management through concrete adaptation measures including green infrastructures	Lack of tools and awareness for community-based flood and drought management including mainstreaming gender and natural and nature-based solutions for flood management	Workshops are organised and conducted to develop capacities of the participants Number of women, youths are trained	Atleast 2 communities in each country are selected for the implementation of the community-based flood and drought management activities Atleast 1 workshop per each country is organised each at the national and local levels 1 workshop is organised with national focal points of	Community based flood and drought management activities report Report of technical Workshops Feedback reports of the workshop Monitoring and evaluation report	In future, the countries are expected to plan, design and build natural and nature-based solutions for DRR and climate change adaptation measures after adequate EIA and SIA studies. Participation of women, elderly and youths in the training/workshops and also in future activities of the End-to-End Early warning System for flood forecasting

				countries at the regional levels		and flood and drought management, in general.
Output 1.2.1 Implementation of community-based floods and drought management strategies in vulnerable sites and different ecosystems	Capacity development of the stakeholders Identify, implement and evaluate the concrete adaptation and appropriate risk reduction measures	Need for local flood and drought systems empowering the communities for enhanced hazard monitoring and preparedness	Progress in the identification and implementation of the local systems Number of people contributing and benefiting from the local systems Number of women and youths participating to various activities	Atleast two local communities in each country have disaster risk reduction and climate change adaptation measures and are using the tools and methodologies.	Community-based management manual Field visits reports Feedback from the stakeholders	Local authorities and community continuous participation and engagement during the entire process or activities
Output 1.2.2 Strengthened awareness of vulnerable communities and agencies on hydro-meteorological risks through education programs including nature-based solutions and mainstreaming gender	Capacity development on mainstreaming gender and natural and nature-based solutions for flood management	Lack of tools and awareness on mainstreaming gender and natural and nature-based solutions for flood management	Number of workshops organised and conducted to develop capacities of the participants Number and type of local and national staffs selected for the training Number of women trained	Atleast 1 workshop per each country is organised 1 workshop is organised with national focal points of countries at the regional levels with IOs, NGOs etc.	Report of technical workshop Feedback report of the workshop Monitoring and evaluation report	In future, the countries are expected to plan, design and build natural and nature-based solutions for DRR and climate change adaptation measures after adequate EIA and SIA
Strengthening water resources management through access to hydro-meteorological information and augment regional /national capacity to monitor and assess Hydro-Meteorological hazards						
Outcome 2.1 A web-based Hydrological Status and Outlook System for EWS is designed and developed together with the National services	Floods and Drought Forecasting and Early Warning Systems (integrating existing information, tools and products) for warning services to save lives, improve livelihoods, and reduce environmental damage	There is a lack of integrated forecasting and early warning systems for both Floods and Drought events Agencies and populations are unaware of the	Progress in the establishment of Forecasting and EWS for Floods and Drought Number of beneficiaries (male and female – data disaggregated by gender)	The integrated Flood and Drought forecasting and EWS is operational At least 70 % of the GBM Basin region covered by Forecasting and	Project technical reports, Monitoring and Evaluation reports of EWS Social media reports	Government agencies, ministries are committed to actively participate in the design and development of EWS and to use the delivered information to

		relevance and utility of the Forecasting and EWS and how to use it	and regions are supported with impact based forecasting and early warning information	EWS and there are used. More than 60% of the women have direct access to the EWS information		address the impacts of climate change and variability
2.1.1 Improved hydrological status and outlook instruments through data standardization for EWS is designed and developed	Data collection for Modelling and Forecasts for hydrological status and outlook are defined and available for early warning	Adequate hydrological information on status and outlook are not available at the local and national levels in the two GBM countries and region	Percentage of operationalization of Hydrological status and outlook system available at the national and regional centers.	Hydrological modeling is carried out with available information to understand the hydrological status (initial conditions for floods and drought) and outlook (where in next months if the situation will get worse) for earning warning services at the local and national centers of the GBM countries	Project technical reports Monitoring and Evaluation reports of the modeling and forecasting	Hydro-meteorological data for modeling are shared by the national agencies
Output 2.1.2 Existing products and tools are integrated and visualized in the regional HydroSOS for EWS	Multiple early warning systems from different projects or available with agencies are visualized in the regional HydroSOS platform for EWS	A single integrated system for floods and drought monitoring, forecasting and early warning services are not available in the two GBM countries	Several discussions with the national and regional agencies or partners are carried out to check the availability of the systems and their integration into the regional HydroSOS visualization platform for EWS	Atleast 3 systems are integrated into the regional HydroSOS visualization platform for EWS	Consultation meeting reports Including list of participants Monitoring and Evaluation reports	
2.1.3 Establishment of Hydro-Climate Outlook Forums at the regional level	Desk studies, meetings with the local/national agencies staffs of National Meteorological and Hydrological Services	Hydro-Climate Outlook Forums at the regional level are not organized and conducted in the two countries	Progress in the establishment of the Hydro-Climate Outlook Forums at the regional level for sharing information	Atleast one annual Hydro-climate outlook forums are organized at the regional level	Workshop/forum report Monitoring and evaluation report	

	(NMHS) and other stakeholders	for sharing information on weather and water outlooks There is a lack of skills and knowledge on the hydro-climate outlooks situation in the project countries	on weather and water outlooks Number of women participants joining the Hydro-climate Outlook forums			
Outcome 2.2 Development of medium and long-term concrete adaptation measures in the prioritized areas and updates based on lessons learned and monitoring instruments	Web-based Early Warning System for floods and drought are designed and developed. Pilot testing at Floods and Drought prone regions of the two GBM countries	Lack of medium and long-term adaptation measures with early warning system. Lack of coordination and collaboration in the establishment and use of the early warning system Currently there are no forecasting and early warning techniques available for the communities and agencies of the GBM Basin region, which can be interpreted easily	Pilot tests are organized to assess the impact of tools and models developed Improved coordination and collaboration for the operationalization of the early warning system	Atleast 2 pilot locations of each countries has been tested with developed tools and models Number of marginalized, vulnerable groups are involved in the pilot testing to test the applicability and effectiveness of the early warning system	Pilot-tests technical report, Monitoring and evaluation report Social media reports	The selected pilot sites face high rainfall or dry periods for testing the flood and drought scenario including forecasting and warning dissemination Agencies and communities continue to use the information provided by EWS and knowledge gained in the pilot tests Dissemination of the knowledge from pilot-sites to the entire region of the GBM
Output 2.2.1 EWS and testing of identified adaptation measures in selected vulnerable communities.	Impact-based forecasts and EWS for Floods and droughts are tested during the monsoon and dry seasons	Agencies and Communities have limited knowledge about the impact based forecasting and EWS for both Floods and Drought	Progress in the pilot testing (identification and selection of pilot tests, monitoring during the floods and dry season, etc.) of forecasting and EWS	Pilot testing in atleast two locations of each country More than 80% of the participants	Pilot-tests technical report, Monitoring and Evaluation	

			Participation of various actors and stakeholders working on Floods and Drought management	benefit from the pilot testing to understand their roles and responsibilities beneficiaries	List of participants in the pilot tests	
Output 2.2.2 Coordination and collaboration developed at the regional, national and local level	Assessing and improving coordination and collaboration of actors and stakeholders Capacity development and communication outreach of stakeholders	Lack of coordination and collaboration between the actors and stakeholders.	Workshops are organized and conducted to develop the capacities of the participants to develop emergency plan including SOP for early warning communication Development of the communication material	Atleast 1 workshop per each country is organised Success stories, best practices, lesson learnt are shared through various social media channels so as to reach broader audience.	Feedback report of the workshop Monitoring and evaluation report Booklet (Voices from the field) and communication documents	
Output 2.2.3 Decision-makers are informed with key water resources management parameters for current status and sub-seasonal and seasonal outlooks	Capacity development of policy makers Identify, implement and evaluate the appropriate measures	Policy makers and decision makers are trained on the water resources management parameters for current status and sub-seasonal and seasonal outlooks conditions for identifying safe guard actions	Progress in the identification and implementation of the safeguard actions for water resources management based on current status and sub-seasonal and seasonal outlooks Number of people (including number of women) contributing and benefiting from the safe guard actions	Atleast one workshop annual in each country is organized for presenting the current status and sub-seasonal and seasonal outlooks conditions for identifying safe guard actions	Workshop reports including recommendations for safe guard actions Feedbacks from the stakeholders	
Component 3: Water and climate resilient regional cooperation arrangements together with National and regional stakeholders, and community involvement						
Outcome 3.1 Improve information base and practices related to water resource management and	Decision support system and governance for the GBM region are designed and developed	Unavailability of information base and best practices for developing decision support system for	Workshops and meetings are organized	A decision support system framework and governance policies are	Reports of workshop and meeting	The stakeholders of the project continue to show dedication towards revising, developing, adopting policies

climate change adaptation	Development of strategic framework for strengthening resilience and coping capacities	improved water resource management and climate change adaptation		established with the stakeholders	Monitoring and evaluation report	and action plans for better climate resilience and implement interdisciplinary approaches at the national and regional levels to integrate, tools techniques and practices
Output 3.1.1 Best practices and experience from other regions and river basins are made to ensure that existing national policies and practices are interoperable in the GBM river basin cooperation framework	Meetings with stakeholders, to identify the status of climate and future socio-economic changes in the transboundary governance plans, policies and guidelines for flood and drought management in Bangladesh and Nepal	Lack of strategic framework and information at the national and transboundary level for the management of water resources, floods, and drought events	Desk studies and meetings are organized to understand to identify the status, gaps, and needs on climate and future socio-economic changes in the transboundary governance plans, policies, and guidelines for flood and drought management Number of policies, plans, and guidelines to be revised	Number of policies, plans and guidelines are reviewed at the national and transboundary levels identifying gaps and needs on improved water resources management and climate change adaptation	Reports of the desk study and meetings with the stakeholders Monitoring and evaluation report	
3.1.2 Analysis and optimization of benefits of regional water and climate adaptation action.	Capacity development and stakeholder consultation to analyze and optimize the benefits of water and climate adaptation measures at national and regional levels	Lack of consultation and collaboration with the direct and indirect beneficiaries on the benefits of water and climate adaptation measures at national and regional levels	Number of workshops organized and conducted to identify best practices (national agencies professionals, decision-makers, policymakers) and approaches for water resources management, flood and drought risk reduction, and climate adaptation-related measures	One workshop each at national and transboundary levels is conducted. The best practices and approaches to water resources management are collected and disseminated to various stakeholders.	Reports of technical workshop Best practices and success stories are reported from the workshop Monitoring and evaluation report	

			Number of women participating in the workshops			
Output 3.1.3 Experiences of local communities on key long-term strategies for floods and drought management are collected	Meetings/Consultation workshops with the direct and indirect beneficiaries of the project	Lack of involvement of key stakeholders in the development of key long-term strategies for floods and drought management	Progress in organizing meetings or consultation workshops at the local level Number of women, elderly, and youths consulted	More than 20 meetings or consultations take place at various local regions of the GBM Basin region. The discussion outcomes are drafted to improve the existing policies, plans etc.	Consultation or meeting reports	
Outcome 3.2 National adaptation strategies (i.e. NAPs) are fully inclusive of water management issues, address community concerns. Methodology and mechanism for leveraging and sharing benefits of optimising adaptation at regional level are in place.	Capacity development of the stakeholders at national and transboundary level	Lack of knowledge, policies, plans and guidelines for the key actors to manage risks Lack of involvement of key stakeholders in the development of key long-term strategies for floods and drought management	Workshops are organized and conducted to discuss and present the opportunity to improve the existing plan, policies and guidelines including the involvement of the local stakeholders (communities)	The available policies, plans, and guidelines are reviewed, updated and are fully inclusive of water management issues, and address community concerns.	Reports of technical workshop Feedback report of the workshop Monitoring and evaluation report	Training/ Consultation workshops will provide policy-makers with the capacity to integrate experiences from the project into national adaptation and climate resilience strategies into long-term development plans or actions.
Output 3.2.1 An inclusive process is developed to ensure that National adaptation strategies explicitly address water-relevant instruments and strategies. Inclusive approaches are	Capacity development of the stakeholders from local/national and regional. Inclusive approaches are applied to ensure the participation of the local communities.	Limited knowledge and implementation of action plans, policies, and guidelines for explicitly addressing water management aspects in the National adaptation	A number of transboundary consultative workshops were organized with the policymakers and advisors including communities.	One transboundary consultative workshop is conducted with participants from each country of the GBM region	Reports of technical and consultation Workshop Monitoring and evaluation report	

operational to include local communities.		strategies and plans		Climate adaptation plans (NAPA, NAP, NDC), policies and guidelines (on data and information exchanges) on issues related to risk reduction and Early Warning System are revised or developed to address water management related aspects and shared with the stakeholders for their approval		
Output 3.2.2 Regional mechanism for adaptation cooperation on HydroSOS established and operational. Periodic review and update of the mechanism is agreed on by riparian states.	Consultation meetings with the policy-makers and decision-makers of the two countries for the regional adaptation cooperation on HydroSOS	There is a need for a regional mechanism for adaptation cooperation on HydroSOS and climate change adaptation by the two countries	Consultative meetings and workshops are organized to identify and link National Programmes and the HydroSOS BaNe project including Identify roles and responsibilities of the individual agencies or organizations and define the coordination mechanism to review and update the implementation of the climate change adaptation measures based on good practices identified in the GBM riparian countries.	Atleast one workshop and meetings are organized with the stakeholders at national levels Improved integration of HydroSOS BaNe project outputs with the national programmes and projects resulting in better management of water resources and flood and drought events at the national and transboundary level	Consultation meeting report Monitoring and evaluation reports	

			Number of men, women, elderly, and youths are involved and consulted			

F. Demonstrate how the project / programme aligns with the Results Framework of the Adaptation Fund

This part will be further developed in the full proposal, but the development of the HydroSOS BaNe project will be in line with the strategic results framework of the Adaptation Fund.

Project Objective(s)[1]	Project Objective Indicator(s)	Fund Outcome	Fund Outcome Indicator	Grant Amount (USD)
The HydroSOS BaNe project will reduce vulnerabilities and strengthen community resilience through integrated approach for flood and drought management in the GBM countries, namely Bangladesh and Nepal; while providing support for decision-making in socio-economic and environmental development against the climate change and variability	• Before the planned end of project in June 2027, -More than 60% of the vulnerable population have improved preparedness and resilience to floods and drought events. This will be achieved through strengthening the capacities of national agencies ability to monitor climate change events and provide accurate and timely forecasts and warning services to the stakeholders. • More than 50 Staffs of the local /national Hydrological and meteorological services and approximately 1000 community representatives at various locations are trained on climate change adaptation measures for floods and drought events • At least 10 policies and guidelines at national and transboundary levels are reviewed for integrated flood and drought management and action plans are updated and developed.	Outcome 1: Reduced exposure at national level to climate-related hazards and threats	1. Relevant threat and hazard information generated and disseminated to stakeholders on a timely basis	12,090,000
Project Outcome(s)	**Project Outcome Indicator(s)**	**Fund Output**	**Fund Output Indicator**	**Grant Amount (USD)**
Outcome 1.1 Floods and drought risks informed decision-making at the regional, national and local levels	Number of Flood and Drought national risks maps for the targeted two GBM countries/ region will be developed which provide support for disaster risk preparedness and management	Output 1: Risk and vulnerability assessments conducted and updated at a regional level	1.1. No. and type of projects that conduct and update risk and vulnerability assessments	1,000,000
Outcome 1.2 Preparedness and resilience to climate change promoted through innovative and community-based initiatives.	Number of individuals in the countries with improved awareness of future risks and impacts on economic, urban, climate, environment etc. due to climate change and variability	Output 6: Targeted individual lives and community livelihood strategies strengthened in relation to climate change impacts,	6.1.1. No. and type of adaptation assets (physical as well as knowledge) created in support of individual or community livelihood strategies	2,000,000

		including variability		
Outcome 1.2 Preparedness and resilience to climate change promoted through innovative and community-based initiatives.	Number of individuals in the countries with improved awareness of future risks and impacts on economic, urban, climate, environment etc. due to climate change variabilities and necessary policies, plans and strategies are updated based on lesson learned and good practices	Output 7: Improved integration of climate-resilience strategies into country development plans	7.2. No. of targeted development strategies with incorporated climate change priorities enforced	
Outcome 2.1 A web-based Hydrological Status and Outlook System for EWS is designed and developed together with the National services	At least 70 % of the population in Bangladesh and Nepal region has HydroSOS Forecasting and EWS and it has been utilized.	Output 1.2: Targeted population groups covered by adequate risk reduction systems	1.2.1. Percentage of population covered by adequate risk reduction systems	4,000,000
Outcome 2.2 Development of medium and long-term concrete adaptation measures in the prioritized areas and updates based on lessons learned and monitoring instruments	Atleast two pilot locations of each GBM countries have been tested with developed HydroSOS EWS tool and models	Output 3.1: Targeted population groups covered by adequate risk reduction systems	3.1. Percentage of targeted population aware of predicted adverse impacts of climate change, and of appropriate responses	2,000,000
Outcome 2.2 Development of medium and long-term concrete adaptation measures in the prioritized areas and updates based on lessons learned and monitoring instruments	At least two pilot locations of each GBM countries have been tested with developed HydroSOS EWS tool and models	Output 2.1: Strengthened capacity of national and sub-national centres and networks to respond rapidly to extreme weather events	2.1.2. Capacity of staff to respond to, and mitigate impacts of, climate-related events from targeted institutions increased	
Outcome 3.1 Improve information base and practices related to water resource management and climate change adaptation	Strengthened plans, policies and guidelines on water resources management and climate change adaptation documents with necessary amendments.	Output 3: Targeted population groups participating in adaptation and risk reduction awareness	3.1.1 No. and type of risk reduction actions or strategies introduced at local level	

		activities		
Outcome 3.2 National adaptation strategies (i.e. NAPs) are fully inclusive of water management issues, address community concerns. Methodology and mechanism for leveraging and sharing benefits of optimising adaptation at regional level are in place.	Locals/national/regional stakeholders integrate several risk management related policies, plans into national and transboundary development plans.	Output 7: Improved integration of climate-resilience strategies into country development plans	7.1. No., type, and sector of policies introduced or adjusted to address climate change risks 7.2. No. or targeted development strategies with incorporated climate change priorities enforced	

G. Include a detailed budget with budget notes, broken down by country as applicable, a budget on the Implementing Entity management fee use, and an explanation and a breakdown of the execution costs.

The total budget of the HydroSOS-BaNe project is estimated at USD 12,090,000 for the development of activities in the two participating countries, including an amount of USD 1,000,000 for project executing entities and an amount of USD 1,090,000 to cover the expenses of the implementing entity. A detailed budget is presented below including budget notes. The disbursement schedule is presented along with funds disaggregated for each activity, at country and regional levels.

Approximate distribution of the Total cost (USD) that will be devoted to each country and at the regional levels during the project period.

Bangladesh	**Nepal**	**Regional/Transboundary**	**IE and EEs fees**
4,000,000	4,000,000	2,000,000	2,090,000

Budget Plan for the HydroSOS BaNe project															
Output No	Output Description	Activities planned for each output	Type of expenditure	Budget Notes	No of units	Cost per units	Total costs for the activity	Cost per each output	Cost per each outcome	Cost per each component	Y1	Y2	Y3	Y4	comments
Component 1: Risk-based preparedness and adaptation to climate variabilities, water use stresses and environmental uncertainties															
Outcome 1.1 Floods and drought risks informed decision-making at the regional, national and local levels															
Output 1.1.1	Vulnerability and exposure assessment (including gender and sector-wise analyses) and risk maps are developed for the GBM basin	Activity 1.1.1.1 Conduct an initial desk study (compilation of existing evidence-based past data (topographic maps, satellite images, studies of extreme events, reports of disasters, etc.) and field visits to gather available information on vulnerability and exposure for current and future climate and identify gaps or additional needs.	Desk studies and field visits	1	10	4000	40000	346000	1000000	3,000,000					
		Activity 1.1.1.2 Develop an action plan to complement gathered information on the exposure and vulnerabilities	Desk study/meeting	2	3	15000	45000								
		Activity 1.1.1.3 Organize stakeholder's meetings and workshops, working on risk management to select priority areas for community consultations	Workshops and consultation meetings	5	3	12000	36000								

		Activity 1.1.1.4 Conduct pilot field studies (focus group discussion and semi-structured interviews) with communities to identify the multi-dimensional drivers of vulnerability and risk (social, economic, ecological, cultural, political, and infrastructural determinants of vulnerability) in Bangladesh and Nepal region highly exposed to different hydrometeorological hazards	Field Study	4	30	7000	210000								
		Activity 1.1.1.5 Draft the field studies reports and the GBM-atlas with the existing static information available	Desk studies	3	3	5000	15000								

Output 1.1.2	Develop capacity and awareness at the local, national and regional levels to ensure risk informed decision-making	Activity 1.1.2.1 Assess the available IT equipment (computers, servers, databases, etc.) and IT/GIS expertise at the NMHSs services and other relevant services (e.g. Geographical Institute, Disaster Management, etc.). Purchase additional equipment if necessary	Assessment study	6	3	20000	60000	470000							
		Activity 1.1.2.2 Create the HydroSOS information exchange IT network by connecting the existing information and data available at the national and regional services	Desk studies with Equipment's procurement and services	9	2	15000	30000								

		Activity 1.1.2.3 Develop the meteorological, climatological and hydrological database and create the links with the existing databases for the collected information on hazards, vulnerabilities and exposure including the main driving hydro-meteorological parameters for floods and drought events (e.g. precipitation, evaporation, water levels, temperature, soil moisture, soil type, etc.)	Other Contractual Service for Database(example: MCH database), software and server installation	7 and 9	2	50000	100000								
		Activity 1.1.2.4 Develop web-based flood and drought risk maps using the dynamic hydro-meteorological, environmental and static social and structural database and existing maps developed in the GBM targeted countries through the past projects (see part G for more information)	Training/Work shop, technical advisory support	5 and 10	2	50000	100000								

		Activity 1.1.2.5 Scenarios for socio-economic and environment development along with the climate change projections are collected and projected impacts on population, water resources, urban development, environment and agricultural areas are analyzed	Desk work with Scientific Advisor Support on Climate Change	3	2	60000	120000								
		Activity 1.1.2.6 Organize training workshop for professionals related to hydrology and meteorology, disaster management, and GIS etc. to convey knowledge and improve skills needed for using risk maps	Capacity development workshops		2	20000	40000								
		Activity 1.1.2.7 Identify roles and responsibilities to the agencies and organizations forming a task team to regularly complement and improve the database and risk maps and also to monitor and report on the new updates	Desk work with the NIPs	16	2	10000	20000								

Output 1.1.3	Long term risk management strategies identified and integrated into development plans (economic, social, environmental aspects)	Activity 1.1.3.1 Design and develop the guideline presenting the whole process of risk maps development and future impacts on various sectors with examples of implementation on highly vulnerable urbans and agricultural areas	Desk work and Technical documentation	17	2	8000	16000	184000							
		Activity 1.1.3.2 Develop supplementary means of communication to reach a wider population (infographics, posters, videos, leaflets for schools, etc.)	communication and outreach	12	1	8000	8000								

		Activity 1.1.3.3 Organize trainings and workshops with stakeholders (representatives of communities, local policymakers, and decision makers) to disseminate the information on future climate and risk changes and to obtain additional qualitative input on potential impacts for socio-economic and environmental aspects	national and local workshops	5	20	5000	100000								
		Activity 1.1.3.4 Develop safeguard action plan for risk management at medium and long term with the output from workshops and consultations with the relevant stakeholders	Technical desk work with consultation workshops	17	2	30000	60000								
Outcome 1.2 Preparedness and resilience to climate change promoted through innovative and community-based initiatives.															

Output 1.2.1	Implementation of community-based floods and drought management strategies in the vulnerable sites and in different ecosystems	Activity 1.2.1.1 Conduct participative community consultations to identify and select the appropriate local measures or equipment (non-structural preparedness tools such as early warning dissemination through loudspeakers and local radio, locally installed rain-gauge and river-gauge for hydrological data collection, marking of vulnerable houses for rapid response support, flood level marking plates to mark the previous year's floods useful for future construction of resilient houses, simulation exercises, knowledge and awareness session on disaster risk reduction, ecosystem services, climate change adaptation and drought indicators).	Local Consultation meetings	18	10	57400	574000	1570000	2000000						
		Activity 1.2.1.2 Develop and install the local measures as identified with the communities under activity 1.2.1.1	Implement concrete adaptation measures	19	10	40000	400000								

		Activity 1.2.1.3 Identification of existing or development of new local flood and drought management committees or groups	Consultation meetings	5	10	8000	80000									
		Activity 1.2.1.4. Capacity building of local management committees or groups identified under activity 1.2.1.3	technical workshops	5	20	15000	300000									
		Activity 1.2.1.5 Development of community-based flood and drought management manual including safety and safeguard measures for preservation of natural habitats, land and soil conservation, biological diversity.	desk work with technical meetings	2	2	8000	16000									
		Activity 1.2.1.6 Organize meetings to share knowledge and experience of added value of local measures or equipment under 1.2.1.2	national and local workshops	5	20	10000	200000									

Output 1.2.2	Strengthened awareness of vulnerable communities and agencies on hydro-meteorological risks through education programs including nature-based solutions and mainstreaming gender	Activity 1.2.2.1 Organize dedicated short courses on the IUCN standards for nature-based solutions approaches and concepts for targeted beneficiaries to disseminate knowledge on natural and nature-based solutions (NbS) for flood and drought management	technical workshops	5	2	35000	70000	430000							
		Activity 1.2.2.2 Collect feedbacks from the workshop participants on their views and perception of NbS tools	desk study	2											
		Activity 1.2.2.3 Recommend actions to increase the use of natural and nature-based solutions and environmentally friendly methodologies with the involvement of local population and aligning with the Adaptation Fund ESP principles	technical support	14	3	20000	60000								

		Activity 1.2.2.4 Conduct workshops to provide support for developing project proposals (submission to the internal and external agencies in future) on implementing natural and nature-based solutions for the flood and drought events.	National and regional workshops	5	4	20000	80000								
		Activity 1.2.2.5 Organize and conduct workshops on the Training Manual for mainstreaming gender in the End-End Early Warning System for Flood Forecasting (E2E-EWS-FF) and flood management with potential participants from NMHSs, local policymakers, civil authorities, women and community-based organizations etc.	National workshops	5	10	20000	200000								
		Activity 1.2.2.6 Collect feedbacks from the workshop participants on their views and knowledge sharing on mainstreaming gender in E2E-EWS-FF and IFM with other stakeholders	Desk work	3											

		Activity 1.2.2.7 Recommend actions that would improve the participation of women and other vulnerable groups into flood management and early warning	Technical support and development	17	1	20000	20000								
Component 2: Strengthening water resources management through access to hydro-meteorological information and augment regional /national capacity to monitor and assess Hydro-Meteorological hazards															
Outcome 2.1 A web-based Hydrological Status and Outlook System for EWS is designed and developed together with the National services															
2.1.1	Improved hydrological status and outlook instruments through data standardization for EWS is designed and developed	Activity 2.1.1.1 Make an inventory of the gauging stations with real-time data transfer (or pseudo real-time) in the GBM Basin and prepare descriptive sheets for each station (location, equipment, data series, etc.)	Desk work and meetings	2	3	40000	120000	2847000	4000000						

		Activity 2.1.1.2 Perform a field/desk study to check the availability and quality of the data and information related to runoff, rainfall and other relevant hydrometeorological and agrometeorological data and also through the flood forecasting and drought monitoring products available at each NMHSs and other relevant institutions	Field visits and consultations	4	40	9000	360000								
		Activity 2.1.1.3 Update the database of hydro-meteorological parameters with new information, or interconnect with existing platforms mainly through WMO Hydrohub (enhancing hydrological monitoring and data exchange) and World Hydrological Observing System (WHOS) mandate of standardization of data and information management systems.	Technical support and development	14	3	20000	60000								

		Activity 2.1.1.4 Organize training for the NMHSs staff related to data collection, calibration and maintenance of equipment following WMO standards	technical workshops	11	3	20000	60000								
		Activity 2.1.1.5 Describe the thresholds for flood events and for drought period based on hydro-meteorological events and risk maps for various risk levels (for example, low- medium-high) through consultations with technical services and local representatives supported by evidence-based experiences.	Technical support and development	10	1	17000	17000								
		Activity 2.1.1.6 Define the values of the thresholds for floods and for drought events, at and around each gauging station, in relationship with past events	Technical support and development	10	2	50000	100000								

		Activity 2.1.1.7 Conduct the water resources assessment in the GBM region to understand the changing value of water level, water quality, in relationship with present status and past events	Technical field work and support	4	10	25000	250000								
		Activity 2.1.1.8 Develop the HydroSOS products for the GBM basin based on above defined thresholds and real time and historical information available at the National level and from Satellite based products.	Technical support and development through trainings, workshops, modelling, forecasting, tools and products	10 and 13	3	600000	1800000								
		Activity 2.1.1.9 Link the thresholds of flood and drought with the socio-economic and environmental impact	Technical support and development	14	2	40000	80000								

2.1.2	Existing products and tools are integrated and visualized in the regional HydroSOS for EWS	Activity 2.1.2.1 For the areas with available forecast models in the sub-basins (e.g., Ganga, Brahmaputra and Meghna basin), create the procedure to use the outputs of the existing products and models within the network of centers producing HydroSOS jointly with the NMHSs	Capacity development with Technical Assistance	11 and 14	2	40000	80000	757000							
		Activity 2.1.2.2 Develop software to collect the meteorological and hydrological forecasts and to calculate the daily warning status or outlooks levels for each of the sub-basin and vulnerable areas	Technical assistance	14	2	100000	200000								
		Activity 2.1.2.3 Design and develop the interface to gather all individual warning levels on the main HydroSOS transboundary system	Desk work with IT technical support	3, 13 and 14	1	100000	100000								

		Activity 2.1.2.4 Prepare user guide to convey all available knowledge on the interface to the various groups of users (forecasters, IT staff, decision-makers, etc.)	Documentation and reporting	17	3	8000	24000								
		Activity 2.1.2.5 Carry out trainings and capacity development workshops with the NMHS professionals, local/national agencies and users of the web based EWS and water resources management for using Hydro SOS.	Regional Training/ Workshop (3-4 days)	20	3	80000	240000								
		Activity 2.1.2.6 Gather feedbacks, suggestions and scope for improvements from the workshop participants	Documentation and reporting	17	1	5000	5000								
		Activity 2.1.2.7. In Bangladesh, upgrade integrated water resource management strategies	Stakeholders Consultation with Technical Assistance	10 and 2	1	60000	60000								
		Activity 2.1.2.8. Organize a workshop to share experiences on risk maps and hydro-SOS EWS with other GBM countries	National Consultation Workshops with Stakeholders	5	2	24000	48000								

2.1.3	Establishment of Hydro-Climate Outlook Forums at the regional level	Activity 2.1.3.1 Identify the linkages with the existing regional Climate Outlook forum disseminating the information available with the HydroSOS BaNe system	Desk work with technical advice	2	1	8000	8000	396000							
		Activity 2.1.3.2 Nominate members for Hydrological outlook group which could be merged with the climate outlook forum at the regional level	Desk work	2	1	8000	8000								
		Activity 2.1.3.3 Organize annual regional Hydro-climate outlook meetings with the existing and nominated members	national/regional workshops with stakeholders	3 and 20	8	45000	360000								
		Activity 2.1.3.4 Develop guidance documents for regular coordination and meetings with the Hydro-climate outlook members	Desk work with technical advice	14 and 17	1	20000	20000								
Outcome 2.2 Development of medium and long-term concrete adaptation measures in the prioritized areas and updates based on lessons learned and monitoring instruments															
2.2.1	EWS and testing of identified adaptation measures in selected vulnerable communities.	Activity 2.2.1.1 Finalize the selection of the pilot tests areas with the concerned agencies and communities on the basis of the draft list presented in Table 4	desk work with technical meetings	2 and 3	10	8000	80000	1816000	2000000	6,000,000					

		Activity 2.2.1.2 Organize meetings on each of the pilot areas to identify the roles and responsibilities of the different groups of stakeholders during the tests and present the coordination and collaboration mechanism enabling preparedness and response activities including first responders to receive and use efficiently the HydroSOS early warning information, media training, bulletins for stakeholders, simulation exercises	national and local workshops	5	30	52000	1560000								
		Activity 2.2.1.3 Identify the good practices, challenges and limitations of products and services during the Flood and Drought events at each of the pilot testing locations	desk work with technical support	14 and 17	20	5000	100000								
		Activity 2.2.1.4 Raise awareness about the pilot testing using multi-media channels	communication and outreach	12	2	13000	26000								

		Activity 2.2.1.5 Develop an action plan to further improve products and services after the pilot testing	desk work with technical support	5 and 10	2	25000	50000								
2.2.2	Coordination and collaboration developed at the regional, national and local level	Activity 2.2.2.1 Organize national consultative workshops (participants from local/national agencies involved in Floods and Drought management) to share the knowledge (new methodologies, concepts and tools for effective forecasting and dissemination of early warnings) from the pilot tests	national consultative workshops	5	4	12000	48000	98000							
		Activity 2.2.2.2 Based on pilot testing, update/develop coordination and collaboration standard operating procedures (SOP) for jointly preparing and responding to future flood and drought events	consultation meetings, desk work with technical support	2	2	25000	50000								

2.2.3	Decision-makers are informed with key water resources management parameters for current status and sub-seasonal and seasonal outlooks	Activity 2.2.3.1 Describe the network of the relevant policy-makers responsible for floods and drought management as well as other related fields (water resources, health, agriculture, ecosystem, forestry, soil and land management.)	desk work	1	2	5000	10000	86000							
		Activity 2.2.3.2 Organize and conduct national workshops to identify the gaps and needs in existing policies and plans with special attention on safeguard actions for minimizing direct and indirect risks arising from the project activities, and to highlight the key long-term strategies for water resources management especially for flood current status and sub-seasonal to seasonal drought outlook	national consultative workshops	2	4	15000	60000								
		Activity 2.2.3.3 Present the recommendations to the concerned decision-makers at the national level	desk work with technical support	17	2	8000	16000								
Component 3: Water and climate resilient regional cooperation arrangements together with National and regional stakeholders, and community involvement															

Outcome 3.1 Improve information base and practices related to water resource management and climate change adaptation															
3.1.1	Best practices and experience from other region and river basins are made to ensure that existing national policies and practices are interoperable in GBM river basin cooperation framework	Activity 3.1.1.1 Conduct a desk study, and hold meetings with stakeholders, to identify the status of climate and future socio-economic changes in the transboundary governance plans, policies and guidelines for flood and drought management in Bangladesh and Nepal	consultation meetings, desk work with technical support	2, 3 and 17	10	5000	50000	239000	489,000	1,000,000					
		Activity 3.1.1.2 Develop a short report underlining the strengths together with the identified gaps and additional needs related to climate and development impacts in the GBM regional	Documentation and reporting	17	3	4000	12000								
		Activity 3.1.1.3 Organize and conduct national and regional workshops to review, propose update and implementation arrangements on existing plans, policies and guidelines on water resources management and climate change adaptation in the GBM Basin.	Regional and national Training/ Workshops (3-4 days)	20	6	14000	84000								

		Activity 3.1.1.4 Propose long-term actions for strengthening resilience and capacities at transboundary, national and local levels to be implemented by NMHSs and the other regional agencies	Desk work with technical suppot	17	3	10000	30000								
		Activity 3.1.1.5 Collect feedbacks, suggestions and recommendations from the workshop participants on the links between activities of National Programmes	Data collection with reporting	21	3	6000	18000								
		Activity 3.1.1.6 Identify roles and responsibilities of the individual organizations and define the coordination mechanism to improve the implementation of the water resources management and climate change adaptation measures	Technical desk work with consultation meetings	17	3	15000	45000								

3.1.2	Analysis and optimization of benefits of regional water and climate adaptation action.	Activity 3.1.2.1 Conduct consultation with national stakeholders to gather examples of best practices and approaches for water resources management, flood and drought risks reduction and climate adaptation-related measures	Consultation meeting with the stakeholders at national and local levels	2	10	10000	100000	250000							
		Activity 3.1.2.2 Draft report on recommendations for improving regional water and climate adaptation action.	Technical Documentation and reporting	17	10	6000	60000								
		Activity 3.1.2.3 Organize the dissemination of the report to policy-makers and decision-makers	communication and outreach and workshops at local and national levels	12	3	30000	90000								
Outcome 3.2 National adaptation strategies (i.e. NAPs) are fully inclusive of water management issues, address community concerns. Methodology and mechanism for leveraging and sharing benefits of optimising adaptation at regional level are in place.															

3.2.1	An inclusive process is developed to ensure that National adaptation strategies explicitly address water-relevant instruments and strategies. Inclusive approaches are operational to include local communities.	Activity 3.2.1.1 Prepare/suggest updating of framework for adapting the National adaptation strategies with safeguard actions on long term water resources management, climate change adaptation, and disaster risk reduction with local stakeholders	Desk work with technical support	17	3	20000	60000	223000	511000						
		Activity 3.2.1.2 Conduct community-based workshops with agencies, local communities/ organizations, and other relevant stakeholders to identify and prioritize adaptation measures	local Consultation workshops	2	23	5000	115000								
		Activity 3.2.1.3 Collect feedback, suggestions, and recommendations	Data collection with reporting	21											
		Activity 3.2.1.4 Propose action plans at local and national levels to review and improve the National Adaptation strategies together with the local communities	Desk work with technical support (10 local sites and 2 national levels) and workshops	17	6	8000	48000								

3.2.2	Regional mechanism for adaptation cooperation on HydroSOS established and operational. Periodic review and update of the mechanism is agreed on by riparian states.	Activity 3.2.2.1 Organize and conduct workshops to disseminate the results of Hydro-SOS EWS and associated products on climate adaptation for the GBM	Capacity development workshops	11	12	14000	168000	288000							
		Activity 3.2.2.2 Collect feedbacks, suggestions and recommendations from the workshop participants on the links between activities of National Programmes and the HydroSOS BaNe project	Data collection with reporting	21											
		Activity 3.2.2.3 Identify roles and responsibilities of the individual agencies or organizations and define the coordination mechanism to review and update the implementation of the climate change adaptation measures based on good practices identified in the GBM riparian countries.	Technical documentation with staleholders consultation	17	10	12000	120000								

Budget notes:

1) Desk studies/field visits	Costs include travel and per diem of participants and trainer/facilitator, including technical expertise fee and local travel allowance
2) Desk study/ Meeting	Technical support costs for completing the proposed study/meeting; cost of national and local staff travel and per diem, logistical expenses for organizing meetings to complete the proposed study.
3) Desk study/work	Costs include fee for national or international consultants, technical assistance of expertise, outreach and communication including the purchase of related materials such as topographic or satellite maps, satellite data, etc., development of user guide, designing and layout
4) Field Visits	Cost of national staff travel and per diem for conducting field survey and meeting with the stakeholders, technical support cost of the international or national expertise
5) Workshops and consultation meetings	Costs include travel and per diem of participants and trainer/facilitator, including technical expertise fee and logistical costs (with minor catering) for completing the workshop
6) Assessment Study	Cost of technical expertise to identify existing capacities, gaps, and needs for end-to-end early warning system
7) Report writing	Cost of Technical assistance and consultant fee for compiling the reports prepared by local/national staff
8) Inventory	Cost includes technical support fee of expertise to prepare a list of equipment, databases, servers, and communication network
9) Desk studies with Equipment procurement and services	Procurement and installation of equipment (including Server, UPS, monitoring stations) and software for the development and function of databases and website required for the Early warning system.
10) Technical advisory support	Costs related to experts sharing technical advisory to the national and regional agencies
11) Consultation and Training Workshops	Cost of travel and per diem of participants from the regional, national, and local agencies
12) Outreach and communication	Support cost for the development of reports and outreach materials or/and Development of social media page and other mediums to reach maximum users or/and Knowledge repository and management of the project website
13) Website development/ Software	Development of the website through the contractual services and service support;
14) Technical Assistance	Subject matter specialists or experts to provide technical support in the designing and implementation of the project activities.
15) Contractual Service	Contracts with specialized institutions/agencies for supervision, technical support and oversight of the quality of flood and drought risk management activities
16) Desk work with the NIPs	Coordination meetings with the National Implementing Partners (NIP) for planning, implementing and conducting various activities including reporting
17) Desk work and technical support/documentation	Support costs for the desk study to develop technical documents (concept note, ToR, activities report) through holding of the mini national workshops related to the assessment study, EWS, pilot testing etc
18) Local consultation meetings	Organize and conduct local consultation workshops with logistical costs, national and local agencies staff allowance, minor catering etc.
19) Implement concrete adaptation measures	Costs related to the implementation activities at the community level including the purchase of warning communication equipment's, and other activities identified to support in implementation of the adaptation measures
20) Regional Training/Workshop	Regional workshop organized with the regional, national, and local stakeholders. Costs related to logistical arrangements, travel, minor catering etc.
21) Data collection and support	Support in carrying out data collection related to hydro-met, risk related information, early warning communication with the communities etc

Implementing Entity Fee Breakdown			
Activities	**Responsibilities**	**Total USD ($)**	**Notes**
Overall coordination and management with the Adaptation Fund Secretariat	Project Coordinator (P3-190000 USD per year) – accounted for 75% (USD 142,500 per year)	570,000	1. The staff cost is for four years of the project.
Management of project implementation with the Executing agencies and project development with the Advisory Committee			
Financial management, including accounting and grant management to Executing entities and third parties		60,000	
Information and communication management		40,000	
Quality assurance including internal and external audits	At midterm and final evaluation	30,000	2
Participation of WMO staff and advisory committee in project activities		50,000	
Monitoring and Evaluation		80,000	
WMO administration support fee		260,000	
Total		**1,090,000**	

Note 1:
The total contract for the project staff to be hired will be for the project period (4 years)

Note 2:
-Ensure compliance with internal and external audit requirements
-Set out financial reporting (in compliance with WMO and Adaptation Fund standards)
-Ensure accountability and incorporation of lessons learned

Executing Fee Breakdown				
Entity	**Execution activity**	**Role**	**US$**	**Notes**
WMO	Execution of the activities	Execution costs including procurement and contracting support	150000	
NMHSs Bangladesh	Project personnel and administration	Support with the 2 National Project officers stationed at the BMD and BWDB	300000	

NMHSs Nepal	Project personnel and administration	Support with the 2 National Project officers stationed at DH Nepal	300,000	
NMHSs Bangladesh and Nepal and external partners	Information management and communication costs		70,000	Support to knowledge management and communication activities at national and local levels through consultants or specialist organizations
WMO/NMHSs Bangladesh and Nepal	Inception Meeting		100,000	Planned for launching the project with the country partners and stakeholders
WMO/NMHSs Bangladesh and Nepal	Advisor/steering committee meetings		80,000	A yearly face-to-face meeting (20,000 USD each) with the project technical advisory committee members
	Total		**1,000,000**	

A. Include a disbursement schedule with time-bound milestones.

Project Disbursement Matrix

	Upon signature of the Agreement	**One Year after Project Start (a)**	**Year 3**	**Year 4**	**Total**
Scheduled date	January 2025	January 2026	January 2027	January 2028	
Project Activities Funds	2400000	3400000	3300000	900000	10,000,000
Implementing Entity Fees (10%)	272,500	272,500	272,500	272,500	1,090,000
Execution costs (10%)	350,000	250,000	200,000	200,000	1,000,000
Total	**3022500**	**3,922,500**	**3,772,500**	**1,372,500**	**12,090,000**

[a)] Use projected start date to approximate first year disbursement

Component/Outcome/ Outputs	Description (Components, Outcome, Outputs)	Timeline (I = milestones)															
		2025				2026				2027				2028			
		Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
Component 1	Risk-based preparedness and adaptation to climate variabilities, water use stresses and environmental uncertainties																
Outcome 1.1	Floods and drought risks informed decision-making at the regional, national and local levels																
Output 1.1.1	Vulnerability and exposure assessment (including gender and sector-wise analyses) and risk maps are developed for the GBM basin countries																
Output 1.1.2	Develop capacity and awareness at the local, national and regional levels to ensure risk informed decision-making																
Output 1.1.3	Long term risk management strategies identified and integrated into development plans (economic, social, environmental aspects)																
Outcome 1.2	Preparedness and resilience to climate change promoted through innovative and																

	community-based initiatives.																
Output 1.2.1	Implementation of community-based floods and drought management strategies in the vulnerable sites and in different ecosystems																
Output 1.2.2	Strengthened awareness of vulnerable communities and agencies on hydro-meteorological risks through education programs including nature-based solutions and mainstreaming gender																
Component 2	A web-based Hydrological Status and Outlook System for EWS is designed and developed together with the National services																
Outcome 2.1	A web-based Hydrological Status and Outlook System for EWS is designed and developed together with the National services																
Output 2.1.1	Improved hydrological status and outlook instruments through data standardization for EWS is designed and developed																

Output 2.1.2	Existing products and tools are integrated and visualized in the regional HydroSOS for EWS																
Output 2.1.3	Establishment of Hydro-Climate Outlook Forums at the regional level																
Outcome 2.2	Development of medium and long-term concrete adaptation measures in the prioritized areas and updates based on lessons learned and monitoring instruments																
Output 2.2.1	EWS and testing of identified adaptation measures in selected vulnerable communities.																
Output 2.2.2	Coordination and collaboration developed at the regional, national and local level																
Output 2.2.3	Decision-makers are informed with key water resources management parameters for current status and sub-seasonal and seasonal outlooks																
Component 3	Water and climate resilient regional cooperation arrangements together with National and																

	regional stakeholders, and community involvement																
Outcome 3.1	Improve information base and practices related to water resource management and climate change adaptation																
Output 3.1.1	Best practices and experience from other region and river basins are made to ensure that existing national policies and practices are interoperable in GBM river basin cooperation framework																
Output 3.1.2	Analysis and optimization of benefits of regional water and climate adaptation action.																
Outcome 3.2	National adaptation strategies (i.e. NAPs) are fully inclusive of water management issues, address community concerns. Methodology and mechanism for leveraging and sharing benefits of optimising adaptation at regional level are in place.																

Output 3.2.1	An inclusive process is developed to ensure that National adaptation strategies explicitly address water-relevant instruments and strategies. Inclusive approaches are operational to include local communities.																
Output 3.2.2	Regional mechanism for adaptation cooperation on HydroSOS established and operational. Periodic review and update of the mechanism is agreed on by riparian states.																

PART IV: ENDORSEMENT BY GOVERNMENTS AND CERTIFICATION BY THE IMPLEMENTING ENTITY

A. Record of endorsement on behalf of the government[54] *Provide the name and position of the government official and indicate date of endorsement for each country participating in the proposed project/programme. Add more lines as necessary. The endorsement letters should be attached as annexes to the project/programme proposal.*

Ms. Farhina Ahmed Secretary Ministry of Environment, Forest and Climate Change	Date*: July 20 2023*
Mr. Suman Subedi Under Secretary (Technical), Head, Adaptation Section Climate Change Management Division Ministry of Forests and Environment	Date*: June 2025*

B. Implementing Entity certification *Provide the name and signature of the Implementing Entity Coordinator and the date of signature. Provide also the project/programme contact person's name, telephone number and email address*

I certify that this proposal has been prepared in accordance with guidelines provided by the Adaptation Fund Board, and prevailing National Development and Adaptation Plans and subject to the approval by the Adaptation Fund Board, commit to implementing the project/programme in compliance with the Environmental and Social Policy of the Adaptation Fund and on the understanding that the Implementing Entity will be fully (legally and financially) responsible for the implementation of this project/programme.	
Moyenda Chaponda *Moyenda Chaponda* *Implementing Entity Coordinator* *Development Partnerships Office*	
Date: *05 June 2025*	Tel. and email: +41 22 730 8646 and mchaponda@wmo.int
Project Contact Person: Hwirin Kim	
Tel. And Email: +41 22 730 8358 and hkim@wmo.int	

[54] Each Party shall designate and communicate to the secretariat the authority that will endorse on behalf of the national government the projects and programmes proposed by the implementing entities.

Date.....

Dr Petteri Taalas
Secretary-General
World Meteorological Organization
7bis Avenue de la Paix
Case postale 2300 Nations,
1211 Geneva

Subject: Endorsement and commitment to provide operational support for the HydroSOS Early Warning Systems to be developed under the project 'Hydrological Status and Outlook system in the Ganga Brahmaputra Meghna Basin (HydroSOS- GBM)'

We would like to confirm the endorsement and commitment of the National Meteorological and Hydrological Services (NMHSs) of Bangladesh participation in all HydroSOS project development activities aiming towards the achievement of the HydroSOS project objectives to the benefit of Bangladesh and the Ganga Brahmaputra Meghna region as a whole.

We request WMO as the Implementing entity of the proposed regional project to submit the HydroSOS project pre-concept note to the Adaptation Fund during January 2022 for funding.

The NMHSs is committed to provide during the project development, implementation and after its completion meteorological, hydrological and climatological data from its existing network of observation stations and related information required for the sustainable operation of the HydroSOS Early Warning System. The NMHSs will also provide in-kind support (staff and resources) to complete additional activities under the proposed project such as community-based activities, development of flood and drought risks maps and how they are impacted by climate scenarios.

The NMHSs will ensure that the resources and information are made available to World Meteorological Organization solely for the purpose of development, operation and maintenance of the HydroSOS Early Warning System. We may also apply the developed products and approaches advanced with this early warning system to basins outside the Ganga Brahmaputra Meghna.

Sincerely,

Signature and stamp

20.07.2022

Fazlur Rashid
Director General
Bangladesh Water Development Board

Signature and stamp

12.4.22

Md. Azizur Rahman
Director
Bangladesh Meteorological Department

Government of Nepal
Ministry of Energy, Water Resources and Irrigation
DEPARTMENT OF HYDROLOGY & METEOROLOGY

Ref No.: 30-2079/80

Date: 19th July, 2022

Dr Petteri Taalas
Secretary-General
World Meteorological Organization
7bis Avenue de la Paix
Case postale 2300 Nations,
1211 Geneva

Subject: Endorsement and commitment to provide operational support for the HydroSOS Early Warning Systems to be developed under the project 'Hydrological Status and Outlook system in the Ganga Brahmaputra Meghna Basin (HydroSOS-GBM)'

We would like to confirm the endorsement and commitment of the National Meteorological and Hydrological Services (NMHSs) of **NEPAL** participation in all HydroSOS project development activities aiming towards the achievement of the HydroSOS project objectives to the benefit of **NEPAL** and the Ganga Brahmaputra Meghna region as a whole.

We request WMO as the Implementing entity of the proposed regional project to submit the HydroSOS project pre-concept note to the Adaptation Fund during August 2022 for funding.

The NMHSs **(DEPARTMRNT OF HYDROLOGY AND METEOROLOGY)** of **NEPAL** is committed to provide during the project development, implementation and after its completion meteorological, hydrological and climatological information or related products from its existing network of observation stations for the sustainable operation of the HydroSOS Early Warning System. The NMHSs will also provide in-kind support (staff and resources) to complete activities under the proposed HydroSOS GBM project including community-based activities, development of flood and drought risks maps and how they are impacted in the projected climate scenarios.

The NMHSs will ensure that the resources and information are made available to World Meteorological Organization solely for the purpose of development, operation and maintenance of the HydroSOS Early Warning System. We may also apply the developed products and approaches advanced with this early warning system to basins outside the Ganga Brahmaputra Meghna.

Sincerely,

Director General

Kamal Ram Joshi
Director General
Department of Hydrology and Meteorology, Nepal

CC: Ministry of Energy, Water Resources and Irrigation

Babarmahal, Kathmandu **Tel:** 014219052, 014215396, 014258224, 014258276, 014215131, **Fax:** 014264219, **P.O.Box No.:** 406
Email: info@dhm.gov.np **Web**: www.dhm.gov.np

Support Letter from ICIMOD

ICIMOD

Pema Gyamtsho
Director General

05 July 2024

Dr. Stefan Uhlenbrook
Director
Hydrology, Water and Cryosphere
World Meteorological Organization
7bis Avenue de la Paix Case Postale 2300 Nations, 1211 Geneva

Subject: Support letter to provide regional coordination and operational support for the project 'Hydrological Status and Outlook System in Bangladesh and Nepal (HydroSOS- BaNe)'

Dear Dr. Uhlenbrook,

Greetings from ICIMOD!

The International Centre for Integrated Mountain Development (ICIMOD) is a regional intergovernmental learning and knowledge-sharing centre serving the eight regional member countries of the Hindu Kush Himalayas – Afghanistan, **Bangladesh**, Bhutan, China, India, Myanmar, **Nepal**, and Pakistan. ICIMOD supports the region through partnerships with regional and global partners, facilitates the exchange of experiences, and serves as a regional knowledge hub to enable mountain people to adapt to climate and socio-economic changes occurring globally and in the HKH region ICIMOD has the mandate and responsibility to support member countries in strengthening their climate resilience especially developing and sharing knowledge products that drives regional policy and action plans.

ICIMOD is informed about the development of the HydroSOS-BaNe project in the two regional member countries, Bangladesh and Nepal.

With this support letter, ICIMOD (an accredited AF entity) provides its support and commitment to participate in the development (and later execution) of the HydroSOS-BaNe project mainly leading the regional cooperation and coordination activities together with the National Meteorological and Hydrological Services (NMHSs) of Bangladesh and Nepal to ensure long term sustainability of the developed tools and products through the project. The products and approaches developed by this project may also be outscaled by other member countries of the Hindu Kush Himalaya region.

Dr. Mandira Singh Shrestha, Senior Water Resources Specialist, will serve as the ICIMOD focal point for the HydroSOS BaNe project.

Sincerely,

Pema Gyamtsho, Ph.D.
Director General

International Centre for Integrated Mountain Development
GPO Box 3226, Kathmandu, Nepal
T +977 1 5275222 | E info@icimod.org
www.icimod.org

Government of Nepal
Ministry of Forests and Environment

P.O. Box No. 3987
Singh Durbar, Kathmandu

Ref. No. 362

Letter of Endorsement

Date:16th June 2025

To: The Adaptation Fund Board
c/o Adaptation Fund Board Secretariat
Email: Secretariat@Adaptation-Fund.org
Fax: 202 522 3240/5

Subject: **Endorsement for Hydrological Status and Outlook system for integrated water resources management and climate resilience in Bangladesh and Nepal (HydroSOS-BaNe) Project**

In my capacity as designated authority for the Adaptation Fund in Nepal, I confirm that the above regional project proposal is in accordance with the government's national priorities in implementing adaptation activities to reduce adverse impacts of, and risks, posed by climate change in Nepal.

Accordingly, I am pleased to endorse the above project proposal with support from the Adaptation Fund. If approved, the project will be implemented by World Meteorological Organization (WMO) and executed by World Meteorological Organization (WMO) and Department of Hydrology and Meteorology, Nepal in close co-ordination with Ministry of Forests and Environment, Nepal.

Sincerely,

16th June 2025

Suman Subedi
Designated Authority, Adaptation Fund
Under Secretary, Adaptation Section
Ministry of Forests and Environment
Email:s_subedi2003@yahoo.com
suman.subedi@nepal.gov.np

সচিব
পরিবেশ, বন ও জলবায়ু পরিবর্তন মন্ত্রণালয়
গণপ্রজাতন্ত্রী বাংলাদেশ সরকার
বাংলাদেশ সচিবালয়, ঢাকা-১০০০

Secretary
Ministry of Environment, Forest and Climate Change
Govt. of the People's Republic of Bangladesh
Bangladesh Secretariat, Dhaka-1000

Letter of Endorsement on behalf of the Government of Bangladesh

Record No. 00.0000.067.019.17.part(1).155 Date: 20 July 2023

To: The Adaptation Fund Board
c/o Adaptation Fund Board Secretariat
Email: Secretariat@Adaptation-Fund.org
Fax: 202 522 3240/5

Subject: Endorsement for Hydrological Status and Outlook system for integrated water resources management and climate resilience in Bangladesh and Nepal (HydroSOS-BaNe) project

In my capacity as designated authority for the Adaptation Fund in Bangladesh, I confirm that the above regional grant proposal is in accordance with the government's national priorities in implementing adaptation activities to reduce adverse impacts of, and risks, posed by climate change in Bangladesh and Nepal region.

Accordingly, I am pleased to endorse the above grant proposal with support from the Adaptation Fund. If approved, the project will be implemented by the World Meteorological Organization (WMO) and executed by the World Meteorological Organization (WMO), Bangladesh Meteorological Department (BMD), Bangladesh Water Development Board (BWDB), and Department of Hydrology and Meteorology of Nepal in close coordination with the climate change focal ministry in these two countries.

Justification to include WMO as an executing partner is provided below in the Annex 1.

Sincerely,

20.07.2023

Dr. Farhina Ahmed
Secretary
Ministry of Environment, Forest and Climate Change
and
Designated authority for the Adaptation Fund in Bangladesh

সচিব
পরিবেশ, বন ও জলবায়ু পরিবর্তন মন্ত্রণালয়
গণপ্রজাতন্ত্রী বাংলাদেশ সরকার
বাংলাদেশ সচিবালয়, ঢাকা-১০০০

Secretary
Ministry of Environment, Forest and Climate Change
Govt. of the People's Republic of Bangladesh
Bangladesh Secretariat, Dhaka-1000

Annex 1: Request for Change in Project Execution Arrangements: HydroSOS Bane Project (Bangladesh and Nepal)

To: The Adaptation Fund Board
c/o Adaptation Fund Board Secretariat
Email: Secretariat@Adaptation-Fund.org
Fax: 202 522 3240/5

Record No.00.0000.067.019.17.part(1).155 Date: 20 July 2023

Subject: Agreement on the implementation of HydroSOS BaNE project by the WMO together with the Bangladesh Meteorological Department (BMD), Bangladesh Water Development Board (BWDB), and Department of Hydrology and Meteorology of Nepal

Dear Adaptation Fund Secretariat,

As the Designated Authority for Bangladesh. I would like to present my compliments to the Secretariat.

I am writing this letter to endorse the change requested by the Implementing and Executive Partners regarding the Executing Entities responsible for the implementation of the regional project " Hydrological Status and Outlook system for integrated water resources management and climate resilience in Bangladesh and Nepal (HydroSOS-BaNe) " that WMO is also executing the project in Bangladesh and Nepal.

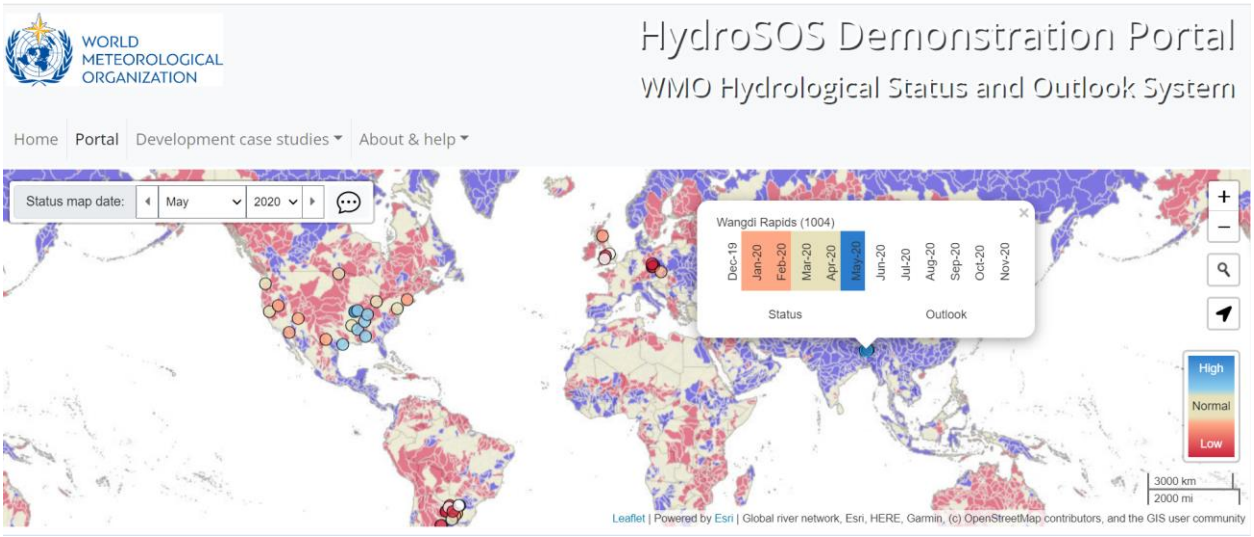
The Designated Authority was informed about the need to officially submit an endorsement letter in order to formalize the change and to obtain the approval by the Project and Programme Review Committee (PPRC) and the Adaptation Fund Board, and would like to state that such change does not represent any inconvenience but represents, in fact, the best solution to ensure continuity and quality implementation of the project activities at the regional, national and local levels, considering the limited capacity (technical and human) of the Bangladesh Meteorological Department (BMD), Bangladesh Water Development Board (BWDB), and Department of Hydrology and Meteorology of Nepal to execute the activities at the national and regional level. Also, WMO being an United Nations specialized agency has several advantages such as VAT exemption during the procurement of goods and services, expertise and availability of technical tools and products etc. which will be instrumental in the execution of the project activities.

Sincerely,

20.07.2023

Dr. Farhina Ahmed
Secretary
Ministry of Environment, Forest and Climate Change
and
Designated authority for the Adaptation Fund in Bangladesh

Annex 1: prototype screenshot for HydroSOS Global demonstrator products as a demonstration of EWS end products under the HydroSOS BaNe project : https://eip.ceh.ac.uk/hydrology/HydroSOS/portal/ co-designed and developed with the national and regional stakeholders



Annex 2: User requirements through Community consultation (Vulnerable, Marginalized, and Minority including women groups) survey response sheets and reports

Community consultation carried out in 2022

community consultation report - Bangladesh.pdf

community consultation report - Nepal_WMO.pdf

User requirements collected from the national agencies of Bangladesh and Nepal to understand their requirements from the HydroSOS EWS project

https://wmoomm.sharepoint.com/sites/Services/Shared%20Documents/SS_Hydrology%20and%20Water%20Resources/APFM/13.%20other%20info/GBM-AF/Consultation%20meetings%20report/User%20requirements%20from%20the%20National%20and%20Regional%20agencies%20of%20BaNe%20countries/User%20requirements%20from%20the%20national%20and%20regional%20agencies%20of%20the%20GBM%20countries.pdf?CT=1731505173511&OR=ItemsView

Below is the questionnaire filled out during the community consultation

① SAITDHAR
② PANCHRUKHI
③ PURBOGRAM } 4 villages representatives.
④ DAMPARA

User Survey Questionnaire for the Hydrological Status and Outlook system (HydroSOS)-Ganga Brahmaputra Meghna (GBM) project

The questions below are designed to collect information on community's experience and recommendations on floods and Drought management. Under the planned project, the project partners are planning to develop an information tool, called HydroSOS Early Warning System, to warn and prepare the citizens for the floods and drought events.

Location: NIKLI, KISHORGANJ. FARMERS & HOUSEWIVES

Please click here to indicate that you agree to allow the use of your information for a regional assessment: ☐

Questions:

1. Have you experienced flood and drought situations in the past?

Yes ☑ No ☐

→ Some times flood & droughts → but they can manage

→ Flood is more serious.

If Yes, did you face negative consequences and lose properties or goods?

- One crop / one season in a year, if inundated, irrigation
- 8th 2017 flood was ⇔ flash flood serious
- 8 to 20 people two weeks ago. (lightning)

2. Did you receive any warning about the flood or drought event?

Yes ☐ No ☑

If Yes,

By whom:

Village/Community Representative☐ Municipality☐ Disaster Management☐

others ☐ _____

How??:

Word of mouth ☐ Loudspeaker ☐ SMS/Phone call ☐ Television/Radio☐

others ☐ _____

When before the event? :

0-2 Hours ☐ 2-12 Hours ☐ 12-24 Hours ☐ other duration : _____

→ no preparation
no action no response.

→ flood only crop inundation

→ Some times they try to cut harvese quickly

3. Would you like to receive direct, quick and reliable warning information?

Yes ☑ No ☐

→ If they can receive, 1 day before 2 days for harvese

If Yes,

How would you like to receive this information?

News, loudspeaker, SMS, etc.

* Flood is occours frequently 20 ~ 30 years ago

to 5 people most of them 2G phone only 2 have smart phone

4. Do you have access to smart phone and internet?
Yes ☑ No ☐
If Yes then proceed to question 5 and 6.

5. If national agencies would provide a warning bulletin, what kind of information you would like to receive with it?
Water level ☑
Water resources information ☑
Precipitation ☑
Forecasting for next days ☑ → 1 week in advance information
Risk and safer zones/areas ☐ → for agriculture
Potential impact areas ☐

- river flood
- flash flood → crop risk area

Do you have additional comments and recommendations?

1. financial crises → Residents stay safer
2. pest. drseas how to prepare → one crop / per year, food secure
information Health. measure → rest of year
3. they have boots / the field all inundated

Thank you for filling out the form.

to commute during flood

flash flood effects to crop. river flood

Any specific difficulties due to flood for women

1. kitchen inundate they can't cook
2. cow, chicken ~~eat~~ inundate.
3. ~~to~~ ~~stay~~ ~~do~~ water polluted water cause stomache, illness
to difficult to correct ~~food~~

User Survey Questionnaire for the Hydrological Status and Outlook system (HydroSOS)-Ganga Brahmaputra Meghna (GBM) project

The questions below are designed to collect information on community's experience and recommendations on Floods and Drought management. Under the planned project, the project partners are planning to develop an information tool, called HydroSOS Early Warning System, to warn and prepare the citizens for the floods and drought events.

Location: _____

Please click here to indicate that you agree to allow the use of your information for a regional assessment: ☑

Questions:

1. Have you experienced flood and drought situations in the past? - last month- flash flood
Yes ☑ (not responding to drought as its slow) No ☐ previously in 2017, Biggest flood.

If Yes, did you face negative consequences and lose properties or goods?

one crop season only available,
they lose it due to the floods.
This year 8-10 people lost their lives due to pre-monsoon lightning.
Harvesting of crops become difficult

2. Did you receive any warning about the flood or drought event?

Yes ☐ No ☒
If Yes, in future.
By whom:
Village/Community Representative☐ Municipality☐ Disaster Management☐
others ☐ _____
How??:
Word of mouth ☐ Loudspeaker ☐ SMS/Phone call ☐ Television/Radio☐
others ☐ _____
When before the event? :
0-2 Hours ☐ 2-12 Hours ☐ 12-24 Hours ☒ other duration : _____
Was to take necessary precaution

3. Would you like to receive direct, quick and reliable warning information?

Yes ☑ No ☐
If Yes,
How would you like to receive this information?

News, loudspeaker, SMS, etc.
People out of 16 have mobile phone.

4. Gender related issues are not prescri

Water development Board Agriculture dept coordinate with the community on the preparedness.

4. Do you have access to smart phone and internet?

Yes ☒ only 2 person out of 16 No ☐

If Yes then proceed to question 5 and 6.

5. If national agencies would provide a warning bulletin, what kind of information you would like to receive with it?

Water level ☒

Water resources information ☐

Precipitation ☐

Forecasting for next days ☒ one week in advance

Risk and safer zones/areas ☐

Potential impact areas ☐

during rainy season Do you have additional comments and recommendations?

Kitchen - cannot cook during flood as houses are inundated
Collect food for the cattle.
Diarrhoea - water borne disease increases
Availability
6 months they use the boat

construction

Thank you for filling out the form.

lose one cropping, It will lead to non-availability of foods

Pesticides Information.

more floods situation are happening in last 20 years

Sub-merge roads are present

Embankments construction of house

school based shelters

WMO HydroSOS

Community consultation for the Hydrological Status and Outlook System (HydroSOS) in the Ganga Brahmaputra Meghna (GBM) project

Country name: Bangladesh Name of the community Pach village, Kishoreganj

Participants Attendance sheet

Name	Male/Female	Occupation	Signature
1. AKKAS MIA	MALE	Farmer, Putbograam	
2. MD MURSHID	11	11	
3. DULAL	11	11	
4. ALEM ALI	11	11	
5. DULAL MIA	MALE	Farmer	
6. JAKIR HOSSAIN	11	11	

WMO HydroSOS

Name	Male/Female	Occupation	Signature
7. BADRUZZAMAN	MALE	FARMER	
8. NOMEZA BEGUM	FEMALE	House wife	
9. RASHIDA KHATUN	〃	〃	
10. ~~Mino~~ MINARA	〃	〃	
~~11~~ 11. RUZINA	〃	〃	
12. REZIA BANA	〃	〃	
13. Rokeya Begum	〃	〃	
14. HELENA	〃	〃	
15. RAWSHONARA	〃	〃	
16. AKLIMA	〃	〃	

1. * drought : 2 years ago 2019 May huge drought, low flow, not every year

User Survey Questionnaire for the Hydrological Status and Outlook system (HydroSOS)-Ganga Brahmaputra Meghna (GBM) project

but flood occour every year

The questions below are designed to collect information on community's experience and recommendations on Floods and Drought management. Under the planned project, the project partners are planning to develop an information tool, called HydroSOS Early Warning System, to warn and prepare the citizens about the flood and drought events.

Location: Sipaghat, Nepal

Please click here to indicate that you agree to allow the use of your information for a regional assessment: ☐

Questions: last worse huge drug

1. Have you experienced flood and drought situations in the past? last April

Yes ☑ No ☐

If Yes, did you face negative consequences and lose properties or goods?

house was no land agri agricultural damage farms

2. Did you receive any warning about the flood or drought event?

Yes ☑ No ☐

If Yes,

By whom: phone call upstream SMS no human casualty

Village/Community Representative☐ Municipality☐ Disaster Management☐

others ☐ SMS

How??:

Word of mouth ☐ Loudspeaker ☐ SMS/Phone call ☑ Television/Radio☐

others ☐

When before the event? :

0-2 Hours ☑ 2-12 Hours ☐ 12-24 Hours ☐ other duration : _____

3. Would you like to receive direct, quick and reliable warning information?

Yes ☐ No ☐

If Yes,

How would you like to receive this information?

News, loudspeaker, SMS, etc.

SMS is enough

* more residents, more houses → can be more damages → higher level for house building

4. Do you have access to smart phone and internet?

Yes ☑ No ☐

If Yes then proceed to question 5 and 6.

5. If national agencies would provide a warning bulletin, what kind of information you would like to receive with it?

Water level ☐

Water resources information ☐

Precipitation ☐

Forecasting for next days ☐

Risk and safer zones/areas ☐

Potential impact areas ☐

They know + shelter + evacuate way.

Do you have additional comments and recommendations?

embankment is to standard

request (3) precipitation forecasting information

Thank you for filling out the form.

(2) send SMS 2~3 hours before in advance

* They need one richie for old people, children.

* 10~15 years flood. * landslide

They were inundated

* debris

User Survey Questionnaire for the Hydrological Status and Outlook system (HydroSOS)-Ganga Brahmaputra Meghna (GBM) project

The questions below are designed to collect information on community's experience and recommendations on Floods and Drought management. Under the planned project, the project partners are planning to develop an information tool, called HydroSOS Early Warning System, to warn and prepare the citizens about the flood and drought events.

Location: Melmarki, Bazar

Please click here to indicate that you agree to allow the use of your information for a regional assessment: ☐

Questions:

1. Have you experienced flood and drought situations in the past?

Yes ☑ No ☐ (flood in 2021)

If Yes, did you face negative consequences and lose properties or goods?

Damage to house & household materials washed away
shop was damaged.
Livelihood impact

2. Did you receive any warning about the flood or drought event?

Yes ☐ No ☒

If Yes,

By whom:

Village/Community Representative ☑ Municipality ☐ Disaster Management ☐

others ☐ Timbu village (upstream 13 km) gave them warning

How??:

Word of mouth ☐ Loudspeaker ☐ SMS/Phone call ☑ Television/Radio ☐

others ☐ _____

When before the event? :

0-2 Hours ☒ 2-12 Hours ☐ 12-24 Hours ☐ other duration : _____

3. Would you like to receive direct, quick and reliable warning information?

Yes ☒ No ☐

If Yes,

How would you like to receive this information?

News, loudspeaker, SMS, etc. phone call

4. Do you have access to smart phone and internet?

Yes ☒ No ☐

If Yes then proceed to question 5 and 6.

5. If national agencies would provide a warning bulletin, what kind of information you would like to receive with it?

Water level ☐
Water resources information ☐
Precipitation ☐
Forecasting for next days ☐
Risk and safer zones/areas ☐
Potential impact areas ☐

} Direct flood warning

Do you have additional comments and recommendations?

They never imagined these kinds of flood situation
Evacuation place (Red cross provided Tent)
Loudspeaker/siren will be important

Thank you for filling out the form.

National Consultation on Hydrological Status and Outlook Systems for IWRM and Climate Resilience in the GBM Basin

17 May, 2022

Community Consultations ~~The Everest Hotel~~, Baneshwor, Kathmandu

Registration

S.N	Name	Institution/Village	M/F ~~Email~~	Signature
1	Tika Bahadur Sapkota	Sipapokhare, Shindupalchok,	m.	
2.	Pukura Shrestha	Sipaghat, Kavre.	f.	
3	Rajendra Danwar.	Sipaghat, Kavre.	m.	
4	Dambar Bahadur Shrestha.	Sipaghat, Kavre.	m.	
5	Kalpana Shrestha.	Sipaghat, Kavre.	f	
6	Bel Bahadhur Shrestha.	Sipaghat, Kavre.	m.	
7	Sunita Tamang	Sipaghat, Kavre	F	
8.	Tirthamaya Tamang.	Sipaghat, Kavre	f.	
9	Dal Bahadur Danwar	Sipaghat, Kavre.	m.	
10	Sanomaya Shrestha.	Sipaghat, Kavre.	f	
11	Rambabu majhi	Dhotar, Indrawati, ward-12,	m.	
12	Sony Tamang	Dewanundan, Sipaghat-,	f.	
13	Ram Kumari Shrestha	Sipaghat,		
14	Sharita Shrestha.	Sipaghat, Kavre.		

Annex 3: Environmental and Social Impact Assessment (ESIA) Report and Environmental and Social Risk Management Plan (ESRMP)

REPORT ON ENVIRONMENTAL AND SOCIALIMPACT ASSESSMENT

HYDROLOGICAL STATUS AND OUTLOOK SYSTEM FOR INTEGRATEDWATER RESOURCES MANAGEMENT AND CLIMATE RESILIENCE IN BANGLADESH AND NEPAL (HYDROSOS-BANE) PROJECT

ESIA REPORT

ENVIRONMENTAL AND SOCIAL IMPACT ASSESSMENT WITHTHE DEVELOPMENT OF ENVIRONMENTAL AND SOCIAL RISKMANAGEMENT PLAN IN THE FRAMEWORK OF DRAFTING A PROJECT PROPOSAL TO SUBMIT FOR FUNDING TO ADAPTATION FUND

15 August 2024

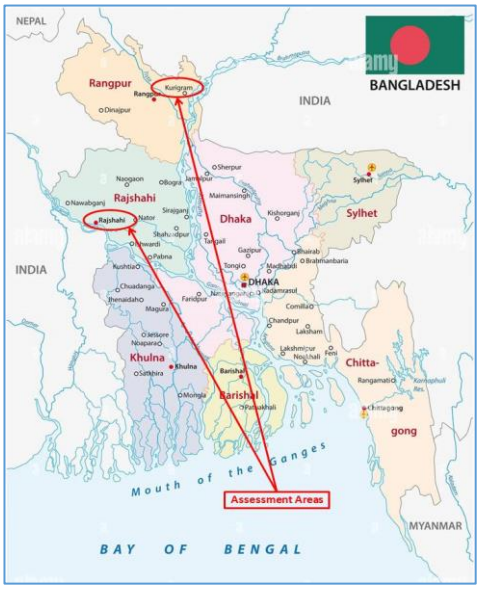
Table of Content

Abbreviation

AF	Adaptation Fund
BMD	Bangladesh Meteorological Department
BWDB	Bangladesh Water Development Board and Flood
DDM	Department of Disaster Management, Bangladesh
DHM	Department of Hydrology and Meteorology, Nepal
ESRMP	Environmental and Social Risk Management Plan
EIA	Environmental Impact Assessment
ESP	Environmental and Social Policy
EPR	Environmental Protection Regulations
FFWC	Forecasting and Warning Centre, Bangladesh
MOHA	Ministry of Home Affairs, Nepal
NHMSs	National Meteorological and Hydrological Services
SIA	Social Impact Assessment
WMO	World Meteorological Organization

1. Introduction

Country Background: Bangladesh



Bangladesh is the eighth most populated country in the world, with a population of approximately 169.8 million spread over an area of 148,460 square kilometers according to the 2022 census. The country is located between the Himalayas and the Bay of Bengal, featuring gently sloping land that meets the Bay of Bengal at the southern end. Bangladesh is highly vulnerable to natural disasters, particularly floods and droughts, which cause significant socio-economic and environmental challenges. The country's geographical location contributes to its susceptibility to extreme events, resulting in damage to infrastructure, reduced agricultural productivity, and increased human insecurity. The north-western region of Bangladesh frequently experiences floods that shape the environment and pose severe challenges.

The Dry Season (Nov-Mar) is hot and sunny, highs around 30°C (86°F), sometimes rainy in November and the Winter (Dec-Jan) is Warm days, cool nights, fog inland. Highs below 20°C (68°F), with night lows 3-6°C (37-43°F) in the north, 10°C (50°F) in the south. Spring (Mar-May) is the hottest season, max temperatures 35°C (95°F) inland, 32-33°C (90-91°F) coast. Peaks up to 42-43°C (108-109°F) in the north. High humidity, thunderstorms, rainfall up to 250mm (10 in) in May.

The Monsoon (Jun-Oct) starts late May/early June, heavy rains, high humidity, daytime highs 30-32°C (86-90°F). Rainfall peaks 800mm (31.5 in) in Sylhet, 1000mm (40 in) in Teknaf. Less intense in the west, annual rainfall 1500-1600mm (60-63 in)[55].

The north-western region of Bangladesh frequently experiences floods that shape environment and pose severe challenges. These floods lead to soil erosion, habitat loss, and disruptions in ecosystems, affecting wildlife and fisheries. Contaminated water sources promote waterborne diseases and displace communities.

Figure 10: Physiographical map of Bangladesh

Managing floods requires balancing their benefits for sustainable development and mitigating adverse impacts. The western Barind Tract region in the mid-western of Bangladesh faces semi-arid conditions with low rainfall, resulting in drought. Extended dry spells in the pre-monsoon and post-monsoon seasons lead to water scarcity, soil degradation, reduced agricultural productivity, and biodiversity loss. Inadequate water management infrastructure exacerbates these impacts, leading to water stress and socio-economic disparities.

Country Background: Nepal

Nepal, a landlocked mountainous nation, is strategically situated between India to the south, east, and west, and China to the north. The country is divided into five distinct physiographic regions running east to west: Terai, Siwalik (Churia), Middle Mountains, High Mountains, and High Himal[56]. This geographical diversity ranges from lowlands in the south, less than 60 meters above sea level, to the towering peaks of the Himalayas, including Mount Everest at 8,848 meters, along with eight other mountains exceeding 8,000 meters and over 200 peaks above 6,400 meters, all within a span of just 200 Km[57]. The geographical map of Nepal is showed in .

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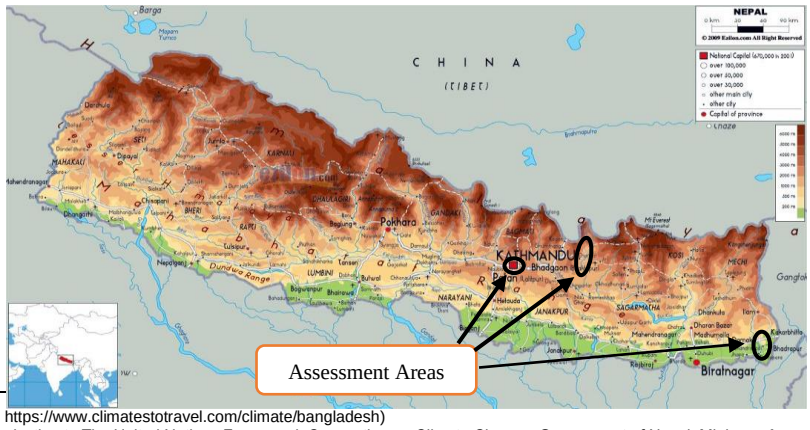

[55] (Source: World Climate guide, https://www.climatestotravel.com/climate/bangladesh)
[56] Nepal's Third National Communication to The United Nations Framework Convention on Climate Change, Government of Nepal, Ministry of Forests and Environment, 2021
[57] Nepal Geography, https://www.countryreports.org/country/Nepal/geography.htm, May 4, 2024

Figure 11 : Physiographical map of Nepal

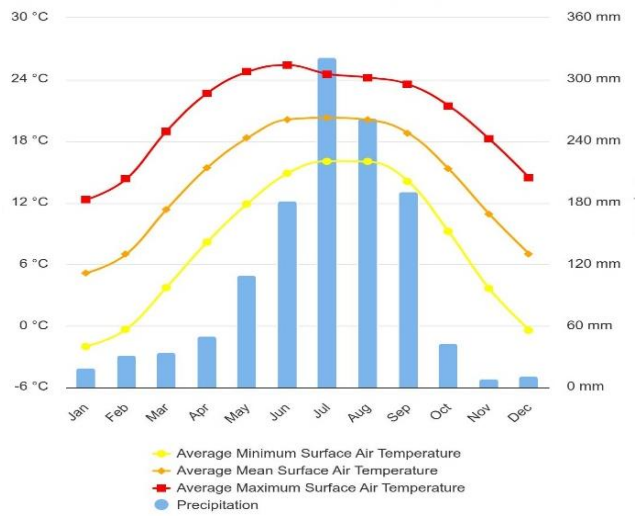

Figure 12 : Average monthly climatology for mean surface temperature and precipitation from 1991 to 2022

Source: Climate Change Knowledge Portal, World Bank[58]

In Nepal, the average annual maximum temperature is increasing by 0.056°C/year and the minimum by 0.002°C/year. The minimum temperature is decreasing in mountainous districts like Humla and Manang but rising in the central Terai and Middle Mountainous regions. On the other side the average annual precipitation has declined by 1.3 mm per year over the period of 1971-2014 [59]. Rapid changes in temperature and precipitation are significantly impacting forests, biodiversity, water resources, food production, and livelihoods. These extreme variations pose substantial risks to growth and distribution in these areas[60].

Water and forests are Nepal's most abundant natural resources, with freshwater (derived from glaciers, snow, and rainfall) accounting for an estimated 2.27% of the total world supply [61]. This water feeds the country's major rivers: Koshi, Gandaki, and Karnali. Together, these river systems supply freshwater to a large portion of the 500 million people who live in the Ganges River basin[62]. Small-scale, subsistence agriculture is a mainstay of Nepal's economy, employing 69% of the country's workforce in 2015. Despite this, agriculture contributed only 25% to GDP in 2019, compared to a 60% contribution from the service sector. Further Nepal's vulnerability to climate change impacts and recent studies shows that Nepal will faces loss 2.2% of annual GDP due to climate change by 2050[63].

In the future, the rise in maximum and minimum temperatures is expected to be more pronounced than the average temperature increase, intensifying pressure on human health, livelihoods, and ecosystems. Temperature increases will be strongest during winter, glaciers are melting rapidly, and extreme precipitation events are becoming more frequent. These changes heighten the vulnerability of Nepal's communities, especially those in poverty and reliant on subsistence agriculture. As climate change impacts become more severe, Nepal must pursue sustainable, inclusive, and resilient growth. The country's achievements in community forestry and hydropower provide a strong foundation for future climate-smart development[64].

Nepal faces significant vulnerability to climate change, experiencing an increasing incidence of landslides, flash floods, extreme heat, and droughts. Ranked as the tenth most affected country globally by the Long-Term Climate Risk Index65, about 80% of Nepal's population is exposed to climate-induced hazards such as floods, landslides, heat stress, and drought66. The country's high susceptibility to the adverse effects of climate change stems from its diverse topography, fragile geological structures, sensitive ecosystems, and varied climate and microclimate zones. Additionally, poverty, social disparities, and heavy reliance on natural resources for livelihoods exacerbate Nepal's sensitivity to climate impacts67. Floods and landslides are the most common hazards, with their frequency having doubled in recent years68.

[58] Climate Change Knowledge Portal, World Bank Group, https://climateknowledgeportal.worldbank.org/country/nepal/climate-data-historical , May 4 2024
[59] Vulnerability and Risk Assessment and Identifying Adaptation Options: Summary for Policy Makers, MoFE, GoN, 2021
[60] Vulnerability and Risk Assessment and Identifying Adaptation Options Sectoral Report Forests, Biodiversity, and Watershed Management, MoFE, GoN, 2021
[61] Country Environment Note Nepal, Asian Development Bank, 2014
[62] Climate Risk Country Profile: Nepal (2021): The World Bank Group and the Asian Development Bank.
[63] Climate Change Knowledge Portal, World Bank Group, https://climateknowledgeportal.worldbank.org/country/nepal , May 4 2024
[64] Country Climate and Development Report Nepal. The World Bank Group, 2022.
[65] Eckstein, D., Künzel, V., Sch¨afer, L., 2021. GLOBAL CLIMATE RISK INDEX 2021: Who Suffers Most from Extreme Weather Events? Weather-Related Loss Events in 2019 and 2000–2019. Germanwatch, Berlin. Retrieved from. https://www.germanwatch.org/sites/default/files/Global%20Climate%20Risk%20Index%202021_2.pdf.

[66] MoHA, 2018. Nepal Disaster Report 2017: The Road to Sendai. Ministry of Home Affairs, GoN, Kathmandu.
[67] Government of Nepal, 2019. National Climate Change Policy, 2076 (2019)

[68] Country Climate and Development Report Nepal. The World Bank Group, 2022.

The Government of Nepal (GoN) is committed to achieving the Sustainable Development Goals (SDGs) and fulfilling international pledges for climate-resilient, inclusive, and sustainable development by 2030. In line with the Paris Agreement, the GoN aims to combat climate change and achieve socio-economic prosperity through a climate-resilient society. The UN system in Nepal, in collaboration with the GoN, has developed the UN Sustainable Development Cooperation Framework (UNSDCF) for 2023-2027, aligning with the SDGs and national priorities. Localized hazards in Nepal necessitate tailored risk management strategies. Implementing an effective Early Warning System (EWS) is crucial to mitigate climate change impacts, especially for agriculture and natural-resource-based livelihoods. Strengthening technical and functional capacities, upgrading disaster management information systems, and enhancing hazard and risk mapping are essential. An integrated EWS will support timely community preparation, response, and recovery, reducing losses and fostering resilience. Improved coordination among federal, provincial, and local stakeholders is vital for embedding forecasts and early warnings into decision-making, enhancing Nepal's disaster resilience.

Initial State of the Socioeconomic

Initial state of the socioeconomic condition in Bangladesh

Floods and droughts in these regions result from a combination of natural and anthropogenic factors, including seasonal variability, climate change, and unsustainable water management practices. Understanding the existing environment of flood and drought is essential for developing adaptive strategies and ensuring sustainable resource management. This description provides a detailed overview of the geographical features, climate patterns, ecosystems, and the socio-economic implications of flood and drought. The description of existing environment is mentioned below:

Flood Prone Kurigram District

Kurigram, in northern Bangladesh, has flat terrain with fertile soils from the Teesta, Dharla, and Brahmaputra rivers. The tropical monsoon climate brings warm, humid summers and cool, dry winters. Monsoon flooding causes significant crop and infrastructure damage. Rivers are crucial for irrigation, transport, and fishing, with arsenic-free groundwater accessed via tube wells. The district faces widespread poverty, with many relying on agriculture and fishing. Seasonal floods exacerbate economic challenges, causing displacement and income loss. Small industries like rice mills, jute processing, and handicrafts support the local economy. Tribal communities, including the Santal, Oraon, and Munda, rely on agriculture, fishing, and crafts. Key crops are rice, jute, and maize, with wetlands attracting migratory birds.

Drought Prone Rajshahi District

Rajshahi, in the Barind Tract, has fertile soils from the Ganges and tributaries. It features a tropical wet and dry climate, with hot summers and monsoon rains from June to September. Key rivers like the Padma, Mahananda, and Baral support irrigation, fishing, and transport. Groundwater, vital for agriculture, faces some arsenic contamination. Rainwater harvesting aids dry season water supply. Low salinity and occasional flooding affect the area. Air quality suffers from agricultural activities and brick kilns. Flora includes Sal, Neem, and Mango trees; fauna includes Bengal foxes, jackals, and various birds and reptiles. Tribal groups like the Santal, Oraon, and Paharia add cultural diversity. The economy is diverse, with agriculture, textile mills, brick kilns, and small industries.

Initial state of the socioeconomic condition in Nepal

The total population of Nepal, as of the census day (25 November 2021) is 29,164,578, of which 48.87 % are male and 51.13 % are Female. There are a total of 2,928 individuals (0.01 percent of the total population) reported as ‘other gender’ (sexual and gender minorities). The 2021 census results show that 3.88 % of the total households do not have any of the household assets/amenities and 2.2 % of the total population have one or the other type of disability. The literacy rate of the country's total population aged 5 years and above is 76.2 %. Of the total 24 Million population aged 10 years or above, 65.5% persons are economically active. Among the economically active population, the highest share of people (50.1 %) are engaged in agriculture, forestry and fishery skilled workers.69 Nepal has established a very good network of Protected Areas system with 12 National Parks, 1 Wildlife Reserve, 1 Hunting Reserve, 6 Conservation Areas, and 13 Buffer Zones extending from lowland Terai to high mountains, covering 23.39 % of the total country's land, which contribute to in-situ conservation of ecosystems and biodiversity across the country.[70]

[69] https://censusnepal.cbs.gov.np/results/files/result-folder/National%20Report_English.pdf
[70] https://dnpwc.gov.np/en/

Initial state of West Rapti

The West Rapti River basin is situated in the mid-western region of Nepal . The river originates in Nepal's middle mountains, flows into the lowlands, and ultimately drains into the Ghagra (Karnali) River, a tributary of the Ganges River in India. It has several tributaries, with the major ones being the Jhimruk River, Mari River, Arun River, Lungri River, Sit River, Dunduwa River, Sotiya, and Gandheli rivulets. The runoff in the basin is primarily due to monsoon rainfall and groundwater. The upper West Rapti River basin experiences a temperate climate, while the lower basin, including the Banke district, has a tropical to subtropical climate71. The primary agricultural activities in this region include rice and maize production. Farmers rely on mulberry, citrus, and Asian pear as cash crops. In the highlands of the West Rapti region, they herd sheep, goats, and cattle. The major population groups are Bahun, Chettri, Newar, and Magar.[72]

The West Rapti River in Nepal is one of the most flood-prone rivers in the region. The villages most affected by this are Betahani, Holiya, Binauna, and Phatepur in the Banke District. Major problems affecting the lives and livelihoods of people living in the lower West Rapti River basin include sediment deposition in farmland from torrents originating in the Chure/Siwalik range, flooding-induced inundation, and bank erosion at various locations due to rapid geomorphological changes[73.]

Initial state of Kankai River

The Kankai River, a trans-boundary river in eastern Nepal, flows through the hills of Ilam and the plains of the Jhapa District, bordering India. Originating at the confluence of the Mai Khola and Deb Mai Khola rivers, the upper Kankai basin has a sub-tropical and temperate climate, while the lower basin experiences a tropical climate. The hilly upper basin features steep terrain, and the river's braided form leads to significant flooding impacts, inundating vast downstream floodplain regions during high flood levels74. Farmers in this region are increasingly adopting multi-year cropping practices, cultivating crops such as Amriso, banana, supari (areca nut), tea, and coffee. Despite these efforts, erosion and sedimentation processes remain active. Erosion and landslides in the uphill areas exacerbate the debris run-out process, often creating large debris fans that cause significant damage and loss across the foothills of Chure. The expansion of settlements and tourism activities in and around these debris fans has heightened vulnerability [75].

Initial State of Bagmati River Basin

The Bagmati River, located in central Nepal, originates in Bagdwar at an altitude of 2690 meters and flows south through the Kathmandu Valley. Its basin spans an area of 3750 square kilometers and includes parts of eight districts: Kathmandu, Lalitpur, Bhaktapur, Makwanpur, Kavre, Sindhuli, Rautahat, and Sarlahi. Flooding along the Bagmati River is common during the monsoon season. Local residents in the Kathmandu Valley rely on the monsoon rains and the resulting floods for rice cultivation[76]. Some villages considered to be at very high flood risk include Khairwa, Arnaha, Mahinathpur, Auraiya, Bairiya, Gangapipra, Inarbari, Jowaha, Katahariya, Laxmipur, Maryadpur, Mathiya, Bhediyahi, Pipra Bhagwanpur, Rajdevi, Rajpur, Sarmujawa, and Masedawa. [77]. Farmers in the Bagmati River Basin (BRB) cultivate vegetables such as potatoes, pumpkin stems, smooth gourd, cucumbers, along with maize and rice.

Initial State of Tinau River

The Tinau River in Nepal originates in the Mahabharata range and is not fed by snow. Flowing through the Palpa and Rupandehi districts, it frequently floods the Terai plains, causing significant damage. Unlike major Himalayan rivers, Tinau's floods are driven by cloudbursts in Palpa and landslides upstream of Butwal. The Marchawar area in southern Rupandehi, near the Indian border, often experiences inundation due to increased river flow and water backup during peak times[78]. Paddy, maize, and wheat are the main food crops, while ginger, vegetables, and fruits are also considered cash crops[79].

Initial state of Tamakoshi River Basin

The Tamakoshi River Basin features two types of elevation relief: the high Himalayas and the lesser Himalayas. The Tamakoshi River is the main watercourse, joined by 72 feeder streams within the basin.[80]

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[71] Gautam, D. K., & Phaiju, A. G. (2013). Community based approach to flood early warning in West Rapti River Basin of Nepal. *Journal of Integrated Disaster Risk Management*, *3*(1), 155-169.
[72] https://en.wikipedia.org/wiki/Rapti_Zone
[73] Talchabhadel, R., & Sharma, R. (2014). Real time data analysis of west Rapti River Basin of Nepal. *Journal of Geoscience and Environment Protection*, *2*(05), 1-7.
[74] Pudasaini, S., Gautam, N. P., & Shrestha, A. (2023). Flood Risk Mapping of Kankai Basin: A Case Study of Shivasatakshi Municipality and Kankai Municipality. *Kathford Journal of Engineering and Management*, *2*(01), 106-121.
[75] https://brcrn.gov.np/publication/6.CERP_Kankai.pdf
[76] Dhital, Y. P., & Kayastha, R. B. (2013). Frequency analysis, causes and impacts of flooding in the B agmati R iver B asin, N epal. *Journal of Flood Risk Management*, *6*(3), 253-260.
[77] Shreevastav, B. B., Tiwari, K. R., Mandal, R. A., & Singh, B. (2022). "Flood risk modeling in southern Bagmati corridor, Nepal"(a study from Sarlahi and Rautahat, Nepal). *Progress in disaster science*, *16*, 100260.
[78] Dhungana, H., Pain, A., & Dhungana, S. P. (2016). Disaster risk management and meso-level institutions in Nepal: a case study of floods in Tinau River in Western Terai. *Climate Change and Rural Institutions (CCRI) Research Project, CCRI Case Study*, *6*.
[79] https://lib.icimod.org/record/24994/files/c_attachment_387_3836.pdf
[80] Shrestha, U. S. (2023). Environmental Flow and River Ecology: A Case Study from Tamakoshi River Basin of Central Nepal. *Research Journal of Padmakanya Multiple Campus*, *2*(1), 114-126.

August 2013, heavy rainfall in Bhirkot (Dolakha) triggered a flash flood in the Guiye River and Adhnari Khola, blocking the Pushpalan Highway for about a week.[81]. Agricultural practices are primarily focused on subsistence production of rice, wheat, maize and millet farming[82].

Project Background

The Hydrological Status and Outlook System for Integrated Water Resources Management and Climate Resilience in Bangladesh and Nepal (HydroSOS-BaNe) project aims to enhance climate adaptive capacities and resilience against hydro-climatic risks in Bangladesh and Nepal. These countries encompass a significant portion of the Ganga Brahmaputra Meghna (GBM) River Basin, which spans 1.7 million square kilometers and supports over 500 million people. The project's necessity was identified through national stakeholder consultations conducted by the World Meteorological Organization (WMO) from 2019 to 2020. HydroSOS-BaNe intends to develop a cutting-edge, tailored Regional Hydro-Meteorological Early Warning System providing short-term and seasonal forecasts, integrated within a Long-term Water Resource Information System. This initiative aligns with the Adaptation Fund's goal to reduce community vulnerability and enhance adaptive capacity in response to climate change, while also supporting the United Nations' "Early Warnings for All" initiative. The WMO will oversee and execute the project, leveraging its international and regional presence, while National Meteorological and Hydrological Services (NMHSs) in Nepal and Bangladesh will manage local execution, coordination, and stakeholder engagement. A regional inter-governmental entity will serve as the focal point for hosting the HydroSOS Early Warning System, coordinating data sharing, and linking national structures. The NMHSs will ensure project sustainability by sharing meteorological, hydrological, and climatological data and related products, which will be disseminated to the community level by various agencies.
This rich geographical diversity of the country is further enriched by diverse climate, rich natural resources, abundant water resources, fertile lands, and rich cultural diversity form a sound basis for the socio-economic development of the country.
The HydroSOS-BaNe Project seeks to address the environmental and social challenges posed by floods and droughts in Bangladesh and Nepal. Through integrated water resources management and early warning systems, the project aims to enhance preparedness, resilience, and sustainable development in the GBM River Basin. The project emphasizes the importance of environmental and social impact assessments to comply with the Adaptation Fund's policies, ensuring minimal negative impacts on the environment and socio-economic condition.

Project Components

Component 1: Enhance capabilities and establish structures at local, national, and regional levels to promote decision-making.

- Enhance understanding of risks through the establishment of risk maps and the dissemination of knowledge.
- Incorporate future climate scenarios (economic, urban, climate, etc.) into existing risk maps to understand potential future impacts on various socio-economic and environmental sectors.
- Integrate short, medium, and long-term risk management strategies into development plans, encompassing economic, social, and environmental considerations.

Component 2: Develop specific strategies for adapting to and mitigating climate change that prioritize environmental sustainability through an integrated approach.

- Development of the HydroSOS EWS with integration of existing information, products and tools from completed and on-going projects and initiatives
- Pilot testing the End-to-End Early Warnings System and community-based flood and drought management activities including locally led adaptation measures
- Increasing awareness among vulnerable populations about hydro-meteorological risks, prevention, preparedness, response, and mitigation strategies through educational programs with participatory approaches

Component 3: Strengthening the policy and institutional capacity for the integrated management of floods and droughts at local, national, and cross-border levels.

- The newly created tools for planning and operational activities are being tested against existing plans to ensure readiness and an efficient response to floods and droughts.
- Local, national, and regional institutions (including weather and hydrological) are established for managing risks and have a clear understanding of their roles and coordination mechanisms.
- A collaborative approach is being developed to ensure that these tools and strategies are embraced by local communities and tailored to the specific context.

[81] Change, C. (2015). The Production of Landslides Risks and Local Responses: A Case Study of Bhirkot, Dolakha District of Nepal.
[82] https://academic.oup.com/book/32353/chapter-abstract/268614844?redirectedFrom=fulltext

Screening of the Adaptation Fund's 15 Principles of Environmental and Social Policy and Gender Policy against the Project Activities

In this study, the environmental and social assessment for the HydroSoS - BaNe Project (Nepal Part) is conducted based on the principles of the Adaptation Fund (AF).

The **Adaptation Fund's 15 principles** are as follows:

- **Principle 1: Compliance with the Law:** Projects/programs funded by the AF must be in compliance with all national and international rights applicable. The Implementation Entity will ensure that the project will be in accordance the national and international law applicable.
- **Principle 2: Access and Equity:** Projects/programs funded by the AF must be in compliance with all national and international rights applicable. The implementation entity will ensure that the project will be in accordance the national and international law applicable.
- **Principle 3: Marginalized and Vulnerable Groups:** Projects/programs funded by the funds must not impose any negative impact on marginalized and vulnerable groups, including children, women and girls, the elderly, indigenous peoples, the tribal groups, displaced persons, refugees, persons living with disabilities and people living with HIV/AIDS.
- **Principle 4: Human Rights:** Projects/programs funded by the Fund must satisfy and if necessary, promote human rights as defined at international level
- **Principle 5: Gender Equality and Women Empowerment:** Projects/programs funded by the Fund must be designed and implemented so that women and men 1) have equal opportunities to participate in accordance with the UNFPA gender equality policy; (2) receive social benefits and comparable economic; and (3) do not suffer from negative effects disproportionate during the development process.
- **Principle 6: Core Labour Rights:** Projects/programs funded by the AF must satisfy such core labour standards as defined by the International Labor Organization.
- **Principle 7: Indigenous Peoples:** The Fund does not fund projects/programs that are incompatible with the rights and obligations set out in the Declaration of the United Nations on the rights of indigenous peoples and other international instruments relating to the indigenous people
- **Principle 8: Involuntary Resettlement:** Projects/programs funded by the Fund must be designed and implemented so as to avoid or reduce to a minimum the need for involuntary resettlement. When limited involuntary resettlement is unavoidable, due process must be respected so that displaced persons are informed of their rights, found on their options and that they be offered technical, Economic and social alternatives for possible resettlement or a fair and appropriate compensation.
- **Principle 9: Protection of the Natural Habitats:** The Fund does not fund projects/programs that would include a wrongful transformation or a reduction of critical natural habitats, including those who are (a) legally protected; (b) which are the subject of an official of protection proposal; (c) recognized by sources for their high ecological value, including as critical habitat; or (d) recognized as protected by the local indigenous or traditional communities.
- **Principle 10: Conservation and biodiversity:** Projects/programs funded by the Fund must be designed and implemented so as to avoid any reduction or significant or unjustified biodiversity loss or the introduction of invasive species.
- **Principle 11: Climate change:** Projects/programs funded by the Fund should not lead to a significant or unjustified gas emissions to greenhouse or other factors of climate change.
- **Principle 12: Pollution Prevention and efficient use of resources:** Projects/programs funded by the Fund must be designed and implemented to meet international standards to maximize efficiency and minimize the use of material resources, production of waste and pollutants
- **Principle 13: Public health:** Projects/programs funded by the Fund must be designed and implemented so as to avoid potentially negative impacts on public health.
- **Principle 14: Cultural and physical heritage :** Projects/programs funded by the Fund must be designed and implemented so as to avoid the alteration, deterioration, or removal of any physical cultural resources, cultural sites and sites with natural values unique recognized as such at the community, national or international level.
- **Principle 15: Land and soil Conservation:** Projects/programs funded by the Fund must be designed and implemented so as to promote the conservation of soils and avoid the degradation or conversion of productive land, or land that make valuable services to the ecosystem.

Gender policy of the Adaptation Fund

The Adaptation Fund (AF) finances climate adaptation projects in developing countries, ensuring equal opportunities for all genders to strengthen resilience to climate change. The AF's updated Gender Policy (GP), approved in March 2021, emphasizes gender equality and human rights, addressing power imbalances and gender gaps. This policy integrates with the Environmental and Social Policy (ESP), requiring compliance to ensure gender considerations throughout project cycles. Early-stage data gathering and stakeholder consultations must engage diverse gender groups, while detailed gender analysis informs the development of gender-responsive measures and implementation

plans. These measures, integrated into project plans and budgets, are monitored and evaluated to ensure sustained gender-responsiveness.
The AF mandates continuous monitoring, evaluation, and updating of gender assessments, ensuring that funded activities contribute to gender equality and transformative changes. The guidance document provides practical recommendations for implementing entities, emphasizing comprehensive gender-responsive stakeholder consultations, integration of gender-responsive measures, and sharing knowledge for capacity-building. By mainstreaming gender considerations, the AF aims to create adaptation projects that not only avoid harm but also proactively promote gender equality and address root causes of gender inequities.
During the entire EIA and SIA, the entire project activities were screened for any environmental and social risks according to the above 15 principles outlines in AF's Environmental and Social Policy as well as gender policy. As noted in the following table, all principles are applicable in the countries and for all sites of the Ganga Brahmaputra Meghna (GBM) River Basin region. Specific principles were analysed on a case-by –case basis during the field visits and in view of the exposure to one or both floods and drought hazards. It is also noted that when a specific risk is applicable and triggered, this could lead to other risks as well. The EIA and SIA identified other dependent risks and a combined mitigation measures will be developed for such risks and its negative impacts, before the project inception and during the course of project activities.

Table 1 : Principles assessed on investigation sites

Sr No	Environmental & Social Principles	Bangladesh	Nepal
1	Compliance with law	✓	✓
2	Access and Equity	✓	✓
3	Marginalized and vulnerable Groups	✓	✓
4	Human Rights	✓	✓
5	Gender Equity and Women Empowerment	✓	✓
6	Core Labour Rights	✓	✓
7	Indigenous peoples	✓	✓
8	Involuntary Resettlement	✓	✓
9	Protection of the Natural Habitats	✓	✓
10	Conservation and Biodiversity	✓	✓
11	Climate Change	✓	✓
12	Pollution Prevention and efficient use of resources	Based on the initial screening, there were no proposed activities that could lead on soil, air or water pollution	Based on the initial screening, there were no activities that could lead on soil, air or water pollution
13	Public Health	✓	✓
14	Physical and Cultural Heritage	✓	✓
15	Land and Soil Conservation	✓	✓

Policy, Legal and Administrative Framework

Bangladesh

Principle 1 of the Environmental and Social Policy (ESP) of the Adaptation Fund mandates that all funded projects and programs must comply with applicable national and international laws. For the GBM river basin project in Bangladesh, environmental and social regulations of the GBM basin will serve as the legal basis for the environmental assessment. Some of the key relevant regulations or acts (the detailed list is available under sections E and F of the HydroSOS BaNe project concept note) for this project include:

- **Environmental Conservation Act (1995, Amended 2000 and 2002):** Primary legislation for environmental protection, covering clearance, critical areas, standards for air, water, noise, and soil, waste discharge limits, and pollution control guidelines. The Department of Environment of Bangladesh Government enforces the Act under the Director General's guidance. Before commencing a new project, the project promoter must obtain Environmental Clearance from the Director General as per the regulations.
- **Environmental Conservation Rules 1997:** Provides the first set of rules under the Environmental Conservation Act 1995, with an amendment in 2010. These provide amongst others standards and guidelines for (i) categorization of industries and development projects including roads and bridges based on actual and anticipated pollution load, (ii) requirement for undertaking an Initial Environmental Examination (IEE) and Environmental Impact Assessment (EIA) as well as formulating an Environmental Management Plan (EMP) according to

categories of industries/development projects/activities, (iii) Procedure for obtaining Environmental Clearance Certificate (ECC), and (iv) Environmental quality standards for air, surface water, groundwater, drinking water, industrial effluents, emissions, noise and vehicular exhausts.

- **National Environment Management Action Plan 1995 :** The National Environmental Management Action Plan was created to tackle particular issues and management needs from 1995 to 2005. It provides a structure for carrying out the recommendations of the National Conservation Strategy.
- **National Environmental Policy 2018:** The National Environmental Policy 2018 was implemented to promote sustainable development in response to environmental disasters, climate change impacts, and natural resource constraints. The policy emphasizes environmental protection, pollution control, biodiversity conservation, and addressing the challenges of climate change**Environment Court Act 2010:** The Bangladesh Environment Court Act of 2010 was established to address conflicts and ensure fairness in cases involving environmental and social harm resulting from development projects. This legislation empowers the government to pursue legal measures against individuals or entities responsible for causing environmental damage in sensitive areas and to society.
- **Bangladesh Water Act 2013 and Bangladesh national water policy 1999:** The Bangladesh Water Act of 2013 addresses various aspects of water management in the country. It provides a comprehensive framework for the regulation, conservation, and equitable distribution of water resources. The act aims to ensure sustainable use of water, promote integrated water resource management, and establish a system for resolving water-related disputes.

Nepal

The Environmental and Social regulation of Nepal is the legal basis for the project Environmental and Social Impact Assessment. Different regulations in terms of the environment and that are applicable in this project are the following:

- **The Constitution of Nepal**

  Article 51: Policies of the State

  (f) Policies relating to Development:

  (g) Policies relating to Protection, Promotion and Use of Natural Resources:

  (1) To protect, promote, and make environmentally friendly and sustainable use of, natural resources available in the country, in consonance with national interest and by adopting the concept of inter-generational equity, and make equitable distribution of benefits, according to priority and preferential right to the local communities.

  (9) To make provisions of advance warning, preparedness, rescue, relief, and rehabilitation in order to mitigate risks from natural disasters.

  (h) Policies relating to Basic Needs of Citizens.
- **Water Resources Act, 1992:** The Act has a provision to utilize the water resources without having a significant adverse effect on the environment due to soil erosion, flood, landslide or similar other reasons.
- **Environmental Protection Act, (2019) :** This act amend and consolidate the prevailing law on environmental protection in order to protect the fundamental right of each citizen to live in a clean and healthy environment, provide the victim with compensation by the polluter for any damage resulting from environmental pollution or degradation, maintain a proper balance between environment and development, mitigate adverse environmental impacts on environment and biodiversity and face the challenges posed by climate change. The act also creates a fund dedicated to environmental protection and establishes a council responsible for overseeing environmental protection and managing climate change at the national level. It also empowers governments to incorporate essential measures for mitigating the adverse impacts and risks of climate change into the sectoral policies, strategies, and action plans implemented by federal, provincial, and local authorities.
- **Disaster Risk Reduction and Management Act, 2017:** The Act emphasizes the reduction of negative environmental and human impacts through effective waste and pollution management. It advocates for enhancing disaster risk reduction, disaster preparedness, disaster dividends, and reconstruction activities to protect economic and social development as well as the environment. The Act also mandates conducting studies and research on various hazards such as river training, flood control, landslides, earthquakes, global warming, climate change, and land use. These studies aim to identify and implement mitigation measures. By focusing on disaster risk reduction and management, the Act indirectly addresses broader environmental and climate-related challenges, promoting a safer and more sustainable future.
- **Disaster Risk Reduction and Management Act, 2017 :** The Disaster Risk Reduction and Management Act, endorsed by the Government of Nepal in 2017, is a pivotal legal instrument designed to guide the comprehensive disaster management cycle within the country. Superseding the Natural Calamity Relief Act of 1982, this Act was promulgated under the authority of the Constitution of Nepal. It acknowledges the critical need for a coordinated and effective framework to implement disaster risk reduction and management activities. The primary aim is to protect public, private, and individual resources, as well as natural and cultural heritage and physical structures, from both natural and man-made disasters.
- **Environmental Protection Regulations, (2020):** The Government of Nepal has further made the regulations based on the Environmental Protection Act, 2076. The regulation has defined a list of projects/activities whether Brief Environmental Study (BES), Initial Environmental Examination (IEE) or Environment Impact Assessment

(EIA) is required. Detailed methodologies for scoping, Terms of Reference, public hearing and reporting mechanism of environmental studies. As per EPR, if there is any establishment of station or metrological radar within the boundary of forest then it is necessary to conduct Brief Environmental Study.

- **National Climate Change Policy, 2019[83] :** The National Climate Change Policy was developed with the goal of contributing to the nation's socio-economic prosperity by fostering a climate-resilient society. The policy aims to promote climate change adaptation within communities, enhance resilience, encourage a green economy, support low carbon emission development, and ensure the effective mobilization of national and international financial resources for climate change mitigation and adaptation. The policy encompasses eight thematic sectors and four cross-cutting sectors, with a specific focus on building, energy, and environment. Climate-friendly villages and cities will be established by developing safe, sustainable, and resilient habitats and infrastructures. The following measures will be undertaken:
  - **Development and Implementation of Standards:** Standards will be developed and implemented for systematic rural and urban settlement infrastructures and buildings.
  - **Green Plantation Initiatives:** Plantation will be carried out on roadsides and unused land, adhering to the concept of green villages and cities.
  - **Incorporation of Low Emission Technologies:** Low emission technologies and adaptation programs will be integrated into settlement development plans to promote climate-friendly villages and cities.

    Roles and Responsibilities of different level of government

    Federal Level: Formulate laws and standards, develop National Adaptation Plan, mobilize financial resources, prepare carbon registry, coordinate at international and national levels, update national data, and participate in international forums related to climate change.

    Province Level: Formulate provincial policies, monitor, and evaluate programs, coordinate with federal and local levels, and implement programs and projects related to climate change.

    Local Level: Formulate local policies, conduct climate change programs, raise public awareness, mobilize volunteer committees and stakeholders, and monitor, evaluate, and document programs within the local level.
- **Vulnerability and Risk Assessment and Identifying Adaptation Options, 2021: Sectoral Report Rural and Urban Settlements (Municipal Level)[84] :** Urban settlements are significantly impacted by climate change, experiencing floods, landslides, droughts, epidemics, heatwaves, and fires. These events lead to loss of life and property, damage to infrastructure and cultural heritage, and disrupt socioeconomic services. They also affect health, sanitation, air and water quality, and increase migration and informal settlements, with the impact being more severe on vulnerable and marginalized groups.

  A study on sensitivity and adaptive capacity to climate events shows that 121 municipalities have high sensitivity, 179 have low adaptive capacity, and 40 have high adaptive capacity. Older municipalities established before 2011 show higher adaptive capacity. Among 293 municipalities, 37 are highly vulnerable, 52 are moderately vulnerable, and 204 are less vulnerable. Established cities like Pokhara, Dharan, Kathmandu, and Biratnagar have high adaptive capacity and low vulnerability.
- **National Adaptation Plan (NAP) – 2021-2050**[85] **:** Nepal's National Adaptation Plan (NAP) aims to align with the UNFCCC agreement, focusing on short-term (by 2025), medium-term (by 2035), and long-term (by 2050) adaptation to climate change impacts. The plan seeks to enhance adaptive capacity and resilience, integrating climate adaptation into policies, programs, and activities. Guided by principles of responsiveness, policy coherence, integration, gender responsiveness, and social inclusion, the NAP fosters multi-stakeholder engagement and cooperation. Aligned with the National Climate Change Policy 2019, the NAP prioritizes 64 interventions categorized across eight thematic sectors and four cross-cutting areas, aimed at addressing Nepal's climate challenges effectively.

  In addition to its core objectives, Nepal's National Adaptation Plan (NAP) prioritizes the development of integrated resettlement and relocation models for populations vulnerable to climate and disaster risks. By 2030, the plan aims to establish emergency holding centers in 50 cities, expanding to 200 cities by 2035 and 500 cities by 2045. By 2040, it targets the relocation of 300 highly vulnerable settlements to safer areas and the upgrading of 300 compact settlements to enhance resilience against climate and disaster risks. Moreover, the plan calls for the development and implementation of integrated land-use plans in all 293 municipalities and 460 rural municipalities by 2040.

83 GoN. (2019a). National Climate Change Policy, 2076 (2019). In Government of Nepal (pp. 1–26). Government of Nepal. https://www.mofe.gov.np/uploads/documents/climatechangepolicyenglishpdf-9975-841-1660734867.pdf

84 MoFE. (2021b). Vulnerability and Risk Assessment and Identifying Adaptation Options: Sectoral Report Rural and Urban Settlements (Municipal Level). In Government of Nepal Ministry of Forests and Environment. https://www.mofe.gov.np/resources/study-reports-3115

85 GoN. (2021). National Adaptation Plan (NAP) 2021-2050. In Government of Nepal (pp. 1–148). Government of Nepal. https://www.mofe.gov.np/uploads/documents/nap-book-finalpdf-1278-504-1700479041.pdf

The NAP also focuses on upgrading and promoting climate-resilient building designs, codes, practices, and construction technologies across Nepal. It advocates for the preparation or revision of climate risk-informed urban and rural development plans. By 2025, the plan aims to develop and disseminate a catalogue of climate-resilient building designs, practices, and construction materials. Additionally, it plans to establish and operationalize 15 new climate-resilient building information and demonstration centers across seven provinces and five physiographic zones by 2030. These initiatives are aimed at enhancing national capacity and readiness to implement climate adaptation strategies effectively.

- **Gender and Urban Climate Policy, 2015:** The policy underscores the empowerment of women through technology, exemplified by initiatives such as the Barefoot College and Solar Sister, which train women in solar engineering, thus creating employment opportunities and challenging traditional gender roles. It prioritizes enhancing gender balance in decision-making bodies, employing community-based participatory processes, conducting gender impact assessments, and adapting urban transport systems with a gender-sensitive approach. The policy also focuses on promoting adaptation and resilience, with special attention to enhancing community resilience and ensuring equitable access to resources for women. Globally, women remain underrepresented in decision-making roles, influencing planning and outcomes. Key strategies include integrating gender-sensitive perspectives into climate change discussions, addressing socio-economic and political gender disparities, ensuring equal participation of women and men in decision-making processes, and considering their unique needs and capabilities. Building resilience within communities and neighborhoods stands as a primary goal for effective adaptation strategies.
- **Irrigation Policy 2013:** The Government of Nepal's strategy for irrigation development is grounded in the Water Resources Strategy (2002), National Water Plan (2005), Irrigation Development Vision and Action Plan (2006), and Irrigation Policy (2013). These documents emphasize integrating agriculture and irrigation development to maximize investment benefits and provide sustainable services through effective irrigation facilities and local resource mobilization in partnership with users and the government.

  The Irrigation Policy aims to:
  - Provide year-round irrigation to suitable lands through effective water resource utilization.
  - Enhance the institutional capability of Water Users for sustainable system management.
  - Improve the knowledge, skills, and operational capacity of technical human resources, water users, and NGOs in irrigation sector development.

  Key policy elements include:
  - Year-round irrigation services to boost agricultural productivity and extend cropping seasons.
  - A service-oriented management approach for reliable and flexible water services.
  - Shifting operation and maintenance costs to water users for greater efficiency, equity, and sustainability.

  Although predating the new Constitution and needing revision, the policy is climate responsive. It includes strategies like floodwater storage and inter-basin water transfer to address climate-induced water supply variations. It promotes integrated water resources management at the basin scale to address climate change, ensuring year-round irrigation, effective water resource management, and building the institutional capacity of stakeholders.
- **Water Resources Policy 2020 :** In December 2020, the Government of Nepal released a new Water Resources Policy embracing the principles of Integrated Water Resources Management (IWRM) and river basin organizations to enhance water resource management. The policy's goal is to sustainably conserve, manage, and develop water resources for economic prosperity and social transformation. It targets seven objectives: judiciously using water resources to meet multisectoral demands, enhancing national productivity, making science-based decisions, ensuring coordinated efforts among government levels, fulfilling citizen demands for water, minimizing environmental impacts, and reducing water-induced disasters. To achieve these objectives, the policy outlines eleven working strategies, including river basin master planning, prioritizing IWRM and multipurpose uses, developing suitable institutions, encouraging stakeholder participation, increasing research and data utilization, and clarifying the roles of federal, provincial, and local governments.

  The policy also emphasizes protecting project-affected areas and people, ensuring equitable access to energy, drinking water, and irrigation benefits, and minimizing negative impacts on society, culture, and the environment. Effective watershed and basin management, disaster control, and risk reduction are prioritized. Despite these comprehensive strategies, the policy lacks clear delineation of roles and responsibilities across government tiers, potentially causing coordination issues. The policy incorporates IWRM principles and uses river basins as units of water administration, with action plans for strategic planning, water accounting, allocation, and auditing based on scientific data and facts.
- **National Policy for Disaster Risk Reduction, 2018 :** The primary objective of this policy is to significantly reduce losses from both natural and non-natural disasters, encompassing impacts on lives, property, health, livelihoods, production, infrastructure, and cultural and environmental assets. To achieve this, the policy aims to enhance understanding and accessibility of disaster risk information at all levels and to strengthen disaster risk governance

for effective reduction and management. It seeks to integrate disaster risk reduction into all development processes, aligning it with climate change adaptation activities. Additionally, the policy focuses on increasing public and private investment in disaster risk reduction to enhance resilience. Improving disaster preparedness and response is another key objective, which will be achieved through better information management and the expansion of multi-hazard early warning systems. Lastly, the policy emphasizes a "Build Back Better" approach for post-disaster recovery, rehabilitation, and reconstruction

- **Disaster Risk Reduction National Strategic Plan of Action 2018-2030 :** The Disaster Risk Reduction National Strategic Plan of Action is a 12-year national policy (2018-2030) with a multi-sectoral approach aimed at preventing disaster risk, enhancing preparedness, and strengthening resilience to protect lives, property, health, and infrastructure. The policy's strategies focus on building a safer, adaptive, and resilient nation through the development of legal, regulatory, and institutional frameworks at federal, provincial, and local levels. A National Disaster Risk Reduction and Management Authority will be established, and disaster risk reduction will be integrated into sectoral development plans. Public awareness and participation will be promoted, and vulnerability and risk assessments will be conducted for various hazards, including earthquakes, floods, and epidemics. Climatic risk assessments will also be performed for vulnerable infrastructures.
  Key initiatives include developing a Common National Framework for Multi-hazard Risk Assessment, an inter-agency data collection mechanism, and an effective disaster management information system with a focus on vulnerable groups. Special funds and monitoring mechanisms will be set up for retrofitting risky infrastructure, and guidelines will be established for disaster preparedness, response, recovery, and rehabilitation. The policy also plans for an integrated national disaster response system, multi-hazard early warning systems, and the establishment of regulations for operating Emergency Funds and Food Banks. Additionally, agriculture insurance, farmer benefit programs, and food and seed storage facilities will be implemented to address disaster risks in agriculture and food insecurity challenges.
- **Irrigation Master Plan 2019:** The Department of Water Resources and Irrigation's new Irrigation Master Plan, building on the 1990 Master Plan, outlines a long-term strategy for the irrigation sector, prioritizing research and development. Although not yet approved, it emphasizes mainstreaming climate change adaptation and sustainable storage development in the Greater Himalayan Region. The plan highlights using natural systems for water storage, including wetlands conservation, improved watershed management, groundwater recharge, and rainwater harvesting, along with constructing large reservoirs on downstream plains. It also calls for addressing knowledge gaps in sustainable water storage through fresh research studies.
- **Water Resources Strategy 2002**: With this Water resources Strategy formulated in 2002, Nepal aims to significantly improve its citizens' living conditions sustainably. The Water Resources Strategy focuses on providing tangible benefits from water resources in the short term, substantial benefits in the medium term, and maximized benefits in the long term. This strategy is divided into three areas: ensuring security from water-related hazards and sufficient water supply, optimizing water use for various purposes like agriculture, hydropower, and industry, and establishing effective mechanisms such as regional cooperation and data management for sustainable water resource management. The success of the strategy will be evaluated through specific indicators over 5, 15, and 25-year periods.

These regulatory frameworks will allow the implementation of the project activities.

How this project activities can be supportive in implementing the existing laws, policies, and plans of Bangladesh and Nepal?

Bangladesh :

The project will be supportive to reduce the risks and vulnerabilities from climate change in making Bangladesh a climate resilient nation through developing flood and drought risk maps and early warning system and community-based flood and drought management activities. These activities align with National Adaptation Plan (2023-2050) as the plan also has the same. Implementation of the National Adaptation Programme of Action (NAPA) will be enhanced by risk mapping current and projected climate impacts, helping to understand areas affected by flood and drought events.

Bangladesh Environment and Climate-Resilient Sustainable Development (Vision 2021) which focuses on self-sustaining livelihoods through climate change adaptation and disaster mitigation, will be supported by developing flood and drought risk maps with environmental indicators like wetlands and protected areas, promoting a climate-resilient ecosystem. Component 3 of the HydroSOS BaNe project will contribute to the 8th Five Year Plan by saving lives from future climate events and developing livelihoods through local climate change adaptation strategies. Strengthening disaster management, research, knowledge management, capacity building, and institutional resilience will be enhanced by developing hazard maps, community-based flood and drought management, and providing necessary tools and capacity building to improve population resilience which is align with Bangladesh Climate Change Strategy and Action Plan (BCCSAP) as the plan has the same objectives. The project will share results from the HydroSOS project, such as community-based flood and drought management in pilot locations, with Bangladesh

Climate Change Resilience Fund (BCCRF) Guidelines, 2010. This will enable similar tools and approaches to be applied in other communities of Bangladesh with BCCRF funding.
Preparedness and response activities under National Plan for Disaster Management (NPDM) 2021-2025 will be supported by the early warning system (EWS) of the HydroSOS-BaNe project. The aim of the Bangladesh Delta Plan 2100 Formulation Project (BDP 2100) for sustainable development will be supported through an integrated flood and drought early warning system, risk maps, and locally led adaptation measures like raising house levels, improving farming activities, and providing timely warnings to save agricultural crops.
Mobilizing international financing for renewable energy and climate resilience initiatives will be partially supported by HydroSOS through its EWS, risk understanding, preventive measures identification, and empowering populations with locally led adaptation measures which is align with Mujib Climate Prosperity Plan. The EWS will support each ministry and agency in preparing and implementing detailed work plans to fulfil their responsibilities efficiently, ensuring coordinated and effective disaster response and management which will be supportive for the execution of Updated Standing Order on Disaster (2019). The HydroSOS-BaNe project will advance the Sustainable Development Goal (SDGs), particularly in climate change adaptation, disaster management, gender equity, agriculture and environmental protection.

Nepal :

Implementing effective Early Warning Systems (EWS) in Nepal will significantly enhance the country's disaster risk management and support sustainable development, aligning with various national policies and laws. EWS will help mitigate risks from natural hazards such as floods, landslides, and extreme weather events by providing timely alerts, enabling communities to prepare, respond, and recover more efficiently. This approach is in line with the Disaster Risk Reduction and Management Act, 2017, which emphasizes reducing negative environmental and human impacts through enhanced disaster preparedness and response.

The Constitution of Nepal, specifically Article 51(g)(9), mandates provisions for advance warning, preparedness, rescue, relief, and rehabilitation to mitigate risks from natural disasters. EWS directly supports these goals by facilitating early action to prevent loss of life and property, thereby enhancing community resilience. Moreover, the Environmental Protection Act, 2019, highlights the need to mitigate adverse environmental impacts and face climate change challenges, which can be effectively addressed through robust EWS that integrate climate adaptation strategies.

This project will incorporats gender-sensitive approaches which aligns with Nepal's Gender and Urban Climate Policy, 2015. This policy emphasizes women's empowerment, equitable access to resources, and active participation in decision-making processes. EWS will be designed to ensure that alerts and information reach both men and women, considering their specific needs and roles within communities. For example, training women as community-based disaster response leaders will enhance their participation and leverage their local knowledge, contributing to more effective disaster management.

Local livelihoods and environmental sustainability will also be significantly supported through this project. By providing accurate and timely warnings, this project will enable farmers to protect their crops and livestock from impending floods or droughts, thus safeguarding agricultural productivity and food security. The Irrigation Policy, 2013, which aims to provide year-round irrigation and enhance water resource management, can be effectively supported through better planning and water use efficiency in response to climate variability.

The National Climate Change Policy, 2019, and the National Adaptation Plan (NAP) 2021-2050, prioritize building climate-resilient communities and infrastructure. This project of EWS will play a crucial role in achieving these objectives by reducing vulnerabilities and enhancing adaptive capacities at the local level. The implementation of Hydrobane SOS project, which focuses on strengthening early warning systems, exemplify how technological advancements can be harnessed to protect communities and the environment.

This project and EWS will also contribute to environmental protection by preventing soil erosion, floods, and landslides, aligning with the Water Resources Act, 1992, which emphasizes minimizing adverse environmental effects. By integrating EWS with local land-use planning and environmental impact assessments, as outlined in the Environmental Protection Regulations, 2020, Nepal can ensure that development projects are resilient and sustainable.

Moreover, EWS support the goals of the Water Resources Policy 2020 and the National Policy for Disaster Risk Reduction, 2018, by providing crucial data for water resource management and disaster risk reduction. These systems enable the implementation of river basin master planning and the development of effective disaster management frameworks, promoting a balanced approach to environmental conservation and economic development.

In summary, Early Warning Systems are essential tools for enhancing disaster resilience, supporting local livelihoods, and promoting environmental sustainability in Nepal. By aligning with national laws and policies, EWS can ensure a safer and more equitable future for all Nepalese citizens, with special consideration for vulnerable and marginalized groups.

Methodology & Work Plan

The methodology ensures the validity and reliability of the Environment and Social Impact Assessment (ESIA) by providing a systematic approach for data collection, analysis, and interpretation, promoting transparency and trust through scoping meetings, literature reviews, public consultations at local and national levels, and ESIA reports. This participatory and inclusive approach aligns with the guidelines provided in the Terms of Reference (ToR) and the detailed scope of work, ensuring the active involvement of all stakeholders, particularly vulnerable communities like women and the elderly, local government officials, and central-level agencies/ministries.

Scoping Meeting

In Bangladesh, the scoping meeting was held with the Bangladesh Meteorological Department (BMD) to discuss objectives, national agencies to be involved in the consultations, geographic areas (northwestern Kurigram, and western Rajshahi regions) to carry out community consultations, timelines, resources, and data collection methods for the assessment. In case of Nepal scoping meeting was held with Department of Hydrology and Meteorology (DHM) to discuss objectives, identify national agencies focal points for consultation meetings, geographic areas (Kankai, Bangladesh, Tinau River (Palpa, Rupandehi), Tamakoshi River (Dolakha), timelines, etc.

Desk review

The consultant reviewed the project concept note documents and literature related to the HydroSOS BaNe project including the present characteristics and baseline situations, interdisciplinary practices and approaches associated with the use of natural resources (ecosystems and other environmental resources) and social and cultural welfare (livelihood and social system) in the GBM region. The consultant had also reviewed the 15 principles of ESP and Gender policy of Adaptation Fund and examined its compliance.

National agencies and Public Consultation

The list of stakeholders consulted at the national levels is provided in the below Table (full list of names is available under Annex II):

Bangladesh	Nepal
Names of the agencies or department consulted	Names of the agencies or department consulted
Flood Forecasting and Warning Centre (FFWC)	Ministry of Women, Children and Senior Citizens
Bangladesh Water Development Board (BWDB), Ministry of Water Resources	Ministry of Forest and Environment
Water Resources Planning Organization (WARPO)	Ministry of Energy, Water Resources and Irrigation
Department of Agriculture Extension (DAE) , Ministry of Agriculture (MoA)	Department of Hydrology and Meterology
Bangladesh Meteorological Department (BMD)	High Powered Committee for Integrated Development of the Bagmati Civilization
Ministry of Disaster Management & Relief	National Disaster Risk Reduction and Management Authority
	Water and Energy Commission Secretariat
	Department of Water Resource and Irrigation
	Local Government (Bhimeshwor Municipality, Kankai Municipality, Jhapa Rural Municipality, Shivasathakshi Municipality.

The Public Consultation site was selected on the basis of the Pilot test site of HydroSoS. The site also includes flood areas, water deficit areas, settlement of marginalized and indigenous people.

Focus Group Discussion at Local Level

Four focus group discussions (FGDs) were conducted in flood-prone Kurigram and drought-prone Rajshahi districts in Bangladesh, with a total of 74 participants (69 males and 5 females), including community leaders, NGO personnel, school teachers, religious leaders, indigenous people, traders, women, and progressive farmers. In Nepal, 3 FGDs were held in flood-prone and drought-prone districts, involving 40 participants (20 males and 20 females including 1 person with disability), consisting of community leaders, NGO personnel, experts, and local stakeholders. The field visit was conducted during Nepal's rainy and cultivation season, presenting significant challenges in meeting with many participants. Most were occupied with agricultural activities and flood preparedness in the site area, making it difficult to engage with them. The number of participants by location is detailed in Table 4.

Table 2 : Number of Focus Group Discussion: Bangladesh

S.No	Name of Upazila	Name of District	Name of Division	No. of participants		
				Male	Female	Total
Bangladesh						
1.	Nageswari	Kurigram	Rangpur	19	04	23

2.	Burungamari			15	00	15
3.	Tanore	Rajshahi	Rajshahi	19	00	19
4.	Godagari			16	01	17
Total				**69**	**05**	**74**

Table 3 : Number of Focus Group Discussion: Nepal

S.N.	Name of River Basin	RM/M	Male	Female	Total
1.	Tamakoshi River (Dolakha)	Bhimeshwor M	6	4 (1PWD)	10
2.	Kankai River	Kankai M	2	-	30
		Jhapa RM	12	15	
		Shivasathalshi M	-	1	

Key Informant Interview at National Level in Bangladesh

The data was also collected through Key Informant Interviews (KIIs) using a semi-structured checklist at the national level. The key informants included a Superintending Engineer and Hydrological Adviser, an Executive Engineer from the Bangladesh Water Development Board, a Principal Scientific Officer from the Water Resource Planning Organization, a Senior National Agromet Technical Coordinator from the Department of Agricultural Extension, Meteorologists from the Bangladesh Meteorological Department, and a Disaster Management Specialist from the Department of Disaster Management.

Key Stakeholder Consultation and Public Consultation

The consultant carried out the consultation with the Ministry of Energy, Water Resources and Irrigation, Ministry of Forest and Environment, Ministry of Women, Children and Senior Citizens, National Disaster Risk Reduction and Management Authority in close coordination with the Department of Hydrology and Meteorology about the process of conducting EIA and SIA and preparing the Environmental and social risk management plan.

The Consultant visited the flood and drought prone area and conducted the consultation with the local people including women, members of the marginalized, vulnerable and minority groups and indigenous people, to assess the potential environmental and social risks of the proposed project activities.

Key Informant Interview at Local Level

KII Interview: Bangladesh

The data was collected through Key Informant Interviews (KIIs) using a semi-structured checklist at the local level. There were 7 key informants, including Executive Engineers from the Bangladesh Water Development Board, Meteorologists from the Bangladesh Meteorological Department, Upazila Agriculture Officers from the Department of Agricultural Extension, and personnel from NGOs.

KII Interview: Nepal

Engaging the community throughout various phases facilitates a two-way exchange of information, enhancing the entire process. The expert and assessment teams presented planning and climate-related scientific information in an accessible manner, raising awareness about current and future climate change risks within the community. This engagement helped the team understand the ground-level scenario of exposure, vulnerability, adaptive capacity, and risk, along with the community's knowledge on these subjects. Participatory data collection methods captured the main challenges faced by community members and their perceptions of current and future risks and challenges, enabling the identification of context-sensitive solutions that enhance adaptive capacity while incorporating indigenous/local knowledge and practices.

Community engagement throughout the entire process was built for ownership of the planning process and related interventions, leading to higher levels of accountability, more inclusive, and climate-resilient planning and development. This engagement was facilitated through Key Informant Interviews (KII), stakeholder consultations, and workshops. These sessions involved policymakers, policy implementation actors, academia, experts, and stakeholders at local, provincial, and national levels. Key aspects considered included:

- participatory workshops with consistent participant engagement.
- Conducting culturally sensitive facilitation.
- Ensuring perspectives of vulnerable groups through separate focus group discussions or KII.

The list of participants in the FGDs and KIIs is enclosed in Appendix-II and the pre-prepared semi-structured checklist for FGDs and KIIs is enclosed in Appendix I.

Environment and Social Impact Assessment (ESIA) Report

The ESIA report evaluates a project's potential environmental and social impacts before its execution. It identifies and assesses positive and negative effects, developing strategies to enhance benefits and mitigate adverse impacts. The report improves project design, promotes environmentally sensitive decision-making, increases accountability, and integrates projects into their environmental and social settings. Benefits include reducing environmental damage,

improving socio-economic outcomes, and enhancing project acceptance by local communities. The report also proposes mitigation measures for the 15 Environmental and Social Principles (ESP) and Gender principles of the Adaptation Fund. Key elements of the report include objectives, methodology, impact analysis, and conclusions.

Concerns of the Stakeholders in Bangladesh and Nepal

Stakeholder consultations used a participative approach involving field visits, document review, and interviews with local communities, technical services, agricultural producers, and women's and youth associations. This participatory consultation and involvement of various stakeholders allowed us to identify general existing environmental and social issues that could be supported by the project activities, aiding in the project's effective implementation and long-term sustainability.

Each meeting discussed the project's objectives and activities, focusing on possible positive and negative economic, social, and environmental impacts due to the project. National stakeholders acknowledged potential indirect risks but emphasized that the project's non-structural measures (early warning system and dissemination, risk mapping, community-based flood and drought management activities, capacity building) would support in timely information about the climate change events and support in preparedness and adaptative measures at all levels , eventually minimize negative impacts. This has been a challenge until now to receive timely warnings and advisory services from the national services for localized events such as floods and drought. The proposed project will strengthen the capacity at the national and local levels with technical and non-technical tools, knowledge, sharing of experiences, etc. Technical institutions are committed to developing tools to mitigate adverse effects.

All 15 principles for the Adaptive Fund (AF) were discussed during stakeholders' consultation meetings and Key Informant Interviews (KII) with stakeholders at both the Upazila and national levels. In these discussions, stakeholders indicated that the project don't have the any direct social or environmental risks related to human rights, conservation and biodiversity, climate change, pollution prevention and resource efficiency, public health, physical and cultural heritage, and land and soil conservation. This is because the project does have any direct activities concerning these issues. Instead, it aims to raise awareness about them through its community capacity-building programs.

Table 4 : Project Relevance and Recognition from Stakeholders for having the HydroSOS BaNe project

National	• Scope of technical and instrumental improvement of the associated institutions • Unsustainable flood and drought control strategies
local	• Lack of coordination among stakeholders in flood and drought management • Poor community participation in early warning systems
Community	• Complex early warning systems and inadequate dissemination skills • Ineffective post-flood and drought initiatives • Frequent flooding and drought in both Bangladesh and Nepal

Key concerned raised by the local stakeholders during field consultation

There were three categories of stakeholders include producers, local elites, teachers, Up representatives and NGO representatives at rural areas; technical service providers include agriculturist and metrologist at Upazila level; hydrologist, meteorologist, environmentalist and disaster management specialist at national level. Similarly, in Nepal, stakeholders were categories as National level, Regional Level, local government level and community level.

The concern of the rural level focus on

- Inaccurate and delayed warning message dissemination
- In effective seasonal forecasting
- Complex and non-understandable forecasting
- Inactivate Union Disaster Management Committee/Local disaster management committee
- Poor community participation in dissemination systems
- No alternative livelihoods support in impending period
- Inconsistent rainfall and prolonged dry periods hinder crop growth
- Lower rainfall reduces groundwater recharge and surface water availability
- Droughts cause economic hardship for farmers as agriculture is the main livelihood
- Prolonged drought conditions lead to soil erosion, soil moisture and loss of soil fertility.
- Water scarcity can lead to poor sanitation and health issues.

The concern of the Upazila technical stakeholders focus on

- No drought forecasting systems
- Not maintaining the chain of command
- Lack of coordination among the agencies
- Poor engagement of other departments with forecasting and warning agencies
- No local level platform for follow up and monitoring

The concern of the national level stakeholders focuses on

- Numerical calculation for three days lead-time accuracy is possible but accuracy for mid and long term can be possible through probabilistic rainfall forecasting
- Poor coverage for forecasting and early warning messages dissemination
- Coordination gap among the Bangladesh Meteorological Department (BMD), Department of Disaster Management (DDM), Bangladesh Water Development Board and Flood (BWDB) and Forecasting and Warning Centre (FFWC)
- Coordination gap between the different Governmental Agency, working in early warning system and disaster prepardeness (DHM,Moha)
- No/Poor drought monitoring system
- Apps should be used to send the voice alerts to the vulnerable community for preparedness.
- Inadequate data sourcing from neighbour countries
- Back dated danger level for forecasting systems

Cost Effectiveness of HydroSOS Project

The HydroSOS project's Environmental and Social Impact Assessment (ESIA) study emphasizes the importance of scaling up traditional structural measures, such as embankments, fences, and dikes, by considering forward-looking hazard profiles in relation to climate change scenarios. Given the inherent uncertainties of how climate change will alter hydrological regimes and the local expression of these inevitable changes, it is crucial to implement measures that provide both immediate and long-term adaptation benefits. This approach contrasts with costly, short-term, and infrastructure-oriented disaster risk reduction methods.

Bilateral Partnerships and Last-Mile Services

A key element of the cost-effectiveness of this approach is the deepening of bilateral partnerships on last-mile weather, water, and climate services. Leveraging and sharing expertise and best practices from both countries can generate reliable information, translate it into user-specific advisories, and disseminate it to last-mile users for socio-economic and environmental benefits. This collaborative approach marks a significant shift from previous practices, as seen in the HydroSOS BaNe project.

Enhancing Climate Adaptive Capacities

The proposed project aims to cost-effectively enhance the climate adaptive capacities and resilience of communities facing hydro-climatic risks. By integrating local, national, and regional adaptation strategies and implementation mechanisms, it focuses on the comprehensive monitoring and management of water resources. Floods and droughts, prevalent in both countries, necessitate a robust, cost-efficient solution.

Strengthening National Services

The project will strengthen the capacities of the National Meteorological and Hydrological Services (NMHSs) through an innovative and tailored Regional Hydro-Meteorological Early Warning System, providing short-term and seasonal forecasts. This system will be embedded into a Long-term Integrated Water Resource Information System. By fostering cross-border collaboration, this initiative will enhance the overall impact by leveraging shared resources and knowledge. Concrete adaptation actions, developed through a participatory process, will be executed in an integrated manner. This cross-border collaboration ensures the sustainability and effectiveness of the project, ultimately leading to a more resilient and adaptive response to hydro-climatic challenges.

Impact and Historical Context

Between 2011 and 2022 in Nepal, there were 1,811 flood-related incidents, resulting in 876 deaths and 209 injuries. Additionally, 65,295 families were affected, 563 people were reported missing, 11,787 private houses were completely destroyed, and 42,060 private houses were partially damaged[86]. The Post Disaster Needs Assessment (PDNA) estimated that total damage caused by floods is about USD 584.7 million, with total recovery needed was estimated to be about USD 705.1 million[87].

Flooding in Bangladesh causes annual loss of around USD 1 billion. Furthermore, increasing drought periods in Bangladesh, exacerbated by climate change, threaten significant agricultural losses by 2050. Wheat production may decline by up to 32%, maize productivity by 20%, and other crops like sugarcane, soybeans, and sorghum by 7-10%, resulting in a cumulative loss of USD 36 billion (3.1% of annual agricultural GDP)[88].

Benefits of Early Warning Systems

The implementation of Flood Early Warning Systems (FEWS) has significantly mitigated flood risk impacts, contributing to a decline in flood disasters from 157 in 2000 to 126 in 2017 and reducing the mortality rate by 45%—

[86] Adhikari, P. B., & Khanal, N. (2024). Seasonal variations of disasters in Nepal. Bibechana, 21(1), 1–11. https://doi.org/10.3126/bibechana.v21i1.54503

[87] Post flood Recovery Needs Assessent, Nepal Flood 2017, National Planning Commission,website: https://www.undp.org/sites/g/files/zskgke326/files/migration/np/PFRNA-Report.pdf

[88] UNDRR (2020). Disaster Risk Reduction in Bangladesh: Status Report 2020. Bangkok, Thailand, United Nations Office for Disaster Risk Reduction (UNDRR), Regional Office for Asia and the Pacific

from 6,025 deaths annually in 2000 to 3,331 in 2017. The number of people affected by floods decreased from 73 million in 2000 to 55 million in 2017, representing a 24% reduction[89].

Investments in EWS have shown substantial benefits. In developing countries, economic analysis suggested that each dollar spent on flood early warning could return USD 7.3 in an optimal scenario and USD 3.7 in a modest scenario over 20 years. Upgrading hydro-meteorological systems and early warning capacities in developing countries to match developed countries' standards could yield cost-benefit ratios between 4:1 and 36:1. Global flood-related financial losses from 2000 to 2017 were USD 27 billion, and even a conservative 1% reduction in these losses through early warnings would result in significant savings. A study analyzing the cost-benefit of EWS in Nepal shows that most households perceive EWS as beneficial and reliable, with individual households able to save USD 1083 by preventing loss to their property, livestock, vehicles, and health. Respondents were also willing to pay an annual fee of USD 0.70 for five years, if the EWS were managed by community disaster committees, a fee sufficient to cover the system's annual maintenance and operating cost. Additionally, improving the forecast lead time by one hour can increase current savings by 1.83 times[90].

In Bangladesh, early warning systems have demonstrated a benefit of approximately USD 559 for every dollar invested over 10 years[91]. These examples underscore the profound economic and human life-saving benefits of investing in EWS, particularly in flood-prone regions like Bangladesh and Nepal, where the returns on investment are notably high.

Non-Structural vs. Structural Measures based on Local consultation

Stakeholders at both national and local levels emphasize the cost-effectiveness and sustainability of non-structural measures, such as Early Warning Systems (EWS), risk maps, and knowledge-building activities. These measures are appreciated for their ability to save lives by providing timely alerts and strengthening community preparedness. In contrast, structural measures generally have higher initial costs due to technical expertise, construction, and material expenses, and they require significant ongoing maintenance. Non-structural measures typically have lower environmental impacts, promoting sustainable practices, while structural measures can cause habitat disruption, biodiversity loss, reduced cultivable land, and altered natural water flows, leading to significant indirect economic losses.

Local communities acknowledge the necessity of structural measures due to the frequent occurrence of floods and droughts in their areas. However, national experts highlight that non-structural measures are less expensive to implement initially and have lower maintenance costs. Additionally, non-structural measures usually have minimal displacement effects, unlike structural measures, which can displace communities. Accurate seasonal predictions help farmers make informed decisions about planting and harvesting times, selecting crop varieties, and managing water resources efficiently. This proactive approach not only enhances agricultural productivity but also strengthens food security and resilience against climatic uncertainties.

Long-Term, Integrated Strategies

By focusing on long-term, integrated, and cost-effective strategies, this project aims to create a sustainable and resilient future for communities in both countries, addressing the pressing challenges posed by climate change. Increasing the population's knowledge on flood and drought management and implementing ecosystem adaptation measures to climate change will provide a sustainable basis for the successful implementation of similar programs. Monitoring project activities and outcome analyses will enable relevant authorities and governments to model necessary actions and implement them in other areas.

Table 5 : Summary of the cost-effectiveness approaches of the HydroSOS BaNe project

HydroSOS BaNe project component/outputs	**Proposed HydroSOS BaNe project beneficiaries and benefits**	**Alternatives to proposed approach and cost (USD)**	**Potential social and environmental risks associated with the Alternative approaches (without the HydroSOS BaNe project) as discussed with the stakeholders of Bangladesh and Nepal**
Risk-based preparedness and adaptation to climate variabilities, water use stresses and environmental uncertainties	Development of preparedness and adaptation measures based on dynamic risk assessment and risk-based plans. Differential risk	Disaster risk reduction measures such as the resettlement of vulnerable communities, involve much higher cost, but with limited benefits and detrimental environmental consequences	Lack of social security, and livelihood options. Cultural differences in the new locality. Acquiring lands for resettlement due to already populated areas and construction of houses will be costly

[89] : Perera et. al. 2019. Flood Early Warning Systems: A Review Of Benefits, Challenges And Prospects. UNU-INWEH Report Series, Issue 08. United Nations University Institute for Water, Environment and Health, Hamilton, Canada.

[90] Rai, R. K., van den Homberg, M. J. C., Ghimire, G. P., & McQuistan, C. (2020). Cost-benefit analysis of flood early warning system in the Karnali River Basin of Nepal. International Journal of Disaster Risk Reduction, 47(January), 101534. https://doi.org/10.1016/j.ijdrr.2020.101534

[91] Subbiah, A. R., Lolita, B., & Ramraj, N. (2008). Background Paper on Assessment of the Economics of Early Warning Systems for Disaster Risk Reduction World Bank Group for Disaster Reduction and recovery. Retrieved from https://econadapt-library.eu/ node/1546

	identification and prioritization for vulnerable sections including gender, elderly, disabled. Capacity building at the local community level for making use of risk maps and available information Incorporation of emerging risk from climate change perspective into development planning	The approximate cost for developing structural disaster risk reduction measures in the selected vulnerable will be around 300 Million USD Conventional risk maps fail to incorporate climate change induced risks and thus will be ineffective	and might be prone to other hazards. Houses constructed in the risk areas are impacted by growing climate change events. Not having impact based risk information is leading to economical losses of the population. Displacement can lead to the breakdown of community networks and social cohesion, impacting mental health and well-being. Higher incidence of poverty and inequality due to inadequate support for vulnerable sections during resettlement. Environmental degradation due to large-scale construction activities
Strengthening water resources management through access to hydro-meteorological information and augment regional /national capacity to monitor and assess Hydro-Meteorological hazards	Regional level data sharing will help better utilization of water resources and climate change events Regional approach is critical to mitigate hydro-meteorological hazards through integrated approach to floods and drought monitoring and EWS Participation of communities in designing EWS for floods and droughts. Increasing productivity and better health and utility through access to water resources. Systematic documentation of climatic change effects and filling of gaps in existing observational network	and droughts are developed separately and operate independently without being integrated at the basin scale Water resource management framework is country specific and without real time data or meta-data sharing Techno-centric EWS installed without community consultation and participation leading to lack of effectiveness and ownership The alternative solution would be to construct dams and reservoirs in vulnerable areas for flood control and irrigation channels, which will approximately cost around 150-300 Million USD, or the next solution would be to reconstruct or retrofit the vulnerable community infrastructure, which would be expensive (approximately 100-150 Million USD) and time consuming due to the need to retrofit in communities and in downstream areas	Existing national EWS systems are not designed jointly with the local stakeholders and warning services are not timely and impact-specific. Also regional aspects are not considered for monitoring of weather, water and climate events. It has been informed from the stakeholders that having timely warning advisories on weather and water will improve 50 % of livelihood or agriculture production, 90 % saving of lives or injuries to population. Construction of dams and reservoirs will be costly measures and impact the environmental and ecosystem services in the countries (in Nepal where most of the rivers are in terrain and mountainous regions) especially use of explosive, removal of houses and cultural heritage etc. Also, the construction of structural measures could impact social and economic sectors as storage of water will not allow populations to use water for irrigation, water use, fishing etc. Also, dams and reservoirs will not provide a guarantee of controlling floods. Alteration of natural water flows can impact downstream ecosystems and agricultural areas.
Water and climate resilient regional cooperation arrangements together with National and regional stakeholders, and community involvement	Operationalization of an integrated Climate adaptation with disaster risk reduction approach at a regional and national levels Community empowerment through	Disaster Risk Reduction and Climate Adaptation programs and policies executed separately without synergy and joint strategy Limited Community involvement and programs without integrating science-based risk mapping	Existing Policies and plans are not aligned with the needs of local or community stakeholders which might not provide associated socio-economic benefits. Some of the polices and plans at the country level needs an update with the involvement of stakeholders

	involvement in refining national and local policies for effective and efficient implementation of adaptation plan and development practices Sharing of knowledge and practices with other communities of the region	and thus failing to be useful Community knowledge sharing is not provided with other neighboring countries/communities The development and update of national policies and programmes will cost approximately 10 Million USD without any concrete output and benefit to stakeholders	from all sectors and at all levels. Inadequate community engagement can lead to a lack of ownership and participation in risk reduction and adaptation measures. Potential for increased vulnerability due to the exclusion of local knowledge and practices in policy formulation. Inadequate regional cooperation can hinder the effective management of transboundary environmental issues, such as water resource management and biodiversity conservation. Lack of integrated planning can lead to missed opportunities for enhancing ecosystem resilience through coordinated adaptation measures.

General Suggestions and recommendations of the stakeholders of Bangladesh and Nepal for the HydroSOS BaNe project

- Digital dashboard can be setting at public gathering place like the Union Parishad (Local level administrative unit)/Local Government or junction of community center or market place to disseminate the early warning messages directly from central office.
- Establish rainfall trigger thresholds tailored to the specific hydrological and environmental conditions of an area, improving the accuracy and effectiveness of flood forecasting and early warning systems.
- Strengthen the regional coordination for real time data from the neighbouring country.
- Strengthening the coordination gap among the Bangladesh Meteorological Department (BMD), Department of Disaster Management (DDM), Bangladesh Water Development Board and Flood (BWDB) and Forecasting and Warning Centre (FFWC)
- Strengthening the coordination gap among DHM, NDRRMA, MOHA,
- By using both Standardized Precipitation Index (SPI) and the Standardized Precipitation Evapotranspiration Index (SPEI) can be used for drought monitoring.
- Strengthening regional coordination for real time data sourcing
- Ensure the involvement of community, NGO representatives and farmers organization, Union Parishad etc at risk areas in risk mapping.
- Strengthen the institutional capacity of the involved institutions with this project.
- Capacity building training to the local populations and technical staff in flood preparedness, response, and recovery strategies.
- Increase agricultural productivity with flood and drought-resistant crops and climate-smart technology.

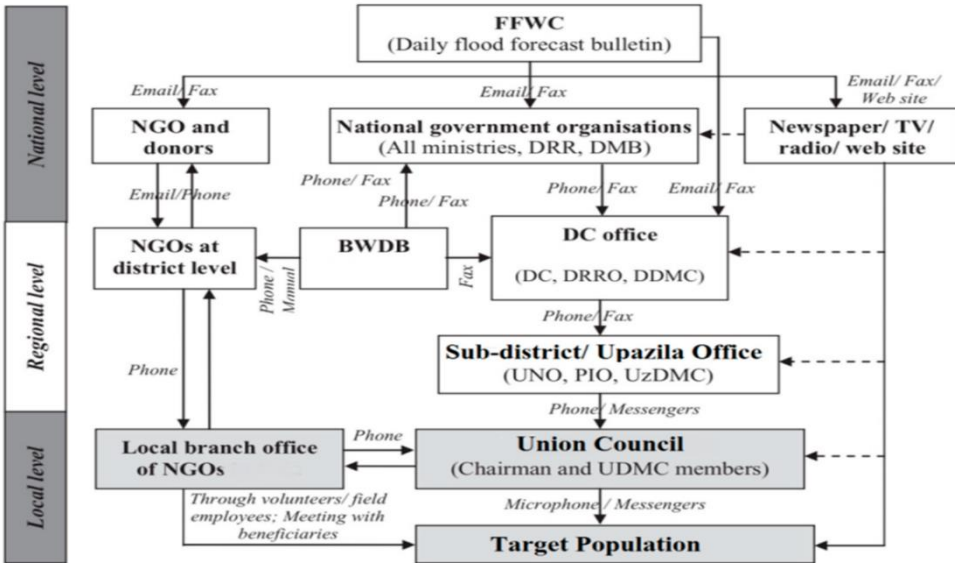


Figure 13 FEW disseminations network from national to Union Parished in Bangladesh
Source: https://www.mdpi.com/1660-4601/18/24/13010

Additional Comments in Nepal:

Suggestion and recommendation from stakeholders

Some of the additional comments that were received during the consultation in Nepal.

- The project should partner with an organization that works with the Early Warning System (EWS) instead of running independently.
- The project needs well-trained focal persons at the district, municipal, and community levels.
- The project must maintain and strengthen the existing information dissemination hierarchy during and after implementation.

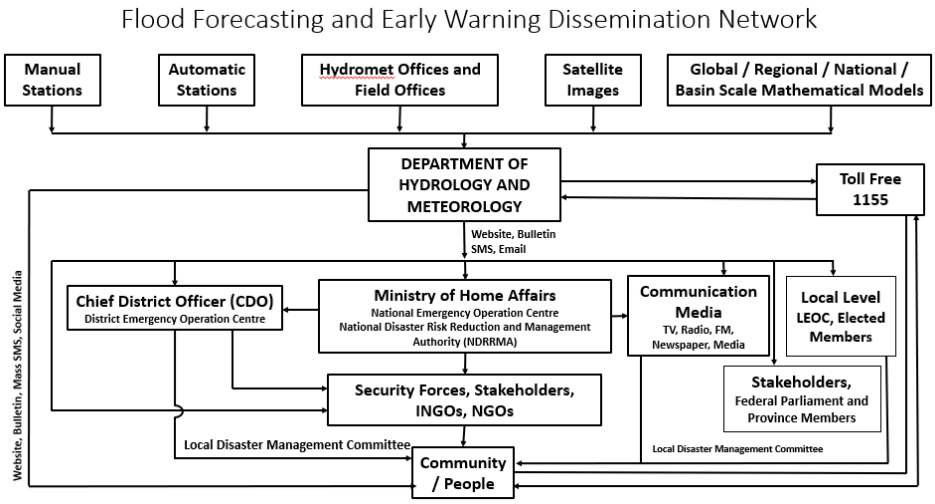


Figure 14: Hierarchy of Information dissemination system

- Involve and train political leaders and parties to support this project and its implementation.
- Hold discussions to create a safe environment for vulnerable groups, especially pregnant women, the elderly, and people with disabilities. Use integrated and participatory approaches such as:
  - Mother Groups (Aama Samuha)
  - Co-operatives (Sahakari)
  - Youth clubs
  - *Khabar Daari*
  - Caller tunes or voice messages
  - Regular Community meetings and consultation
- To make this project realistic and reliable to current situation, validation and authorization process have to monitored well to gain people belief on this modeling project

- The early warning system greatly impacts agriculture. Plan to maintain accurate data to improve the agricultural sector through this project.
- To reach more people, the early warning system should be available in local languages and incorporate indigenous methods such as traditional messenger [92] etc.
- Plan for regular dissemination of the system during power outages.
- There are policy obstacles for transporting plant species between districts. The government should simplify these policies.
- A detailed study is needed to determine the impact of this model on agriculture, hydrology, and other infrastructure
- To offset negative impacts from incorrect forecasts, implement compensation mechanisms like insurance should be implemented by government or project.
- Study the impact of water use in detail on different aspect should be done.
- Conduct a risk assessment of the project/system, including four pillars: risk knowledge, monitoring and observation, communication and dissemination, and response capability.

Suggestion on climate change issue

- **Rising Temperatures:** Communities are experiencing an increase in temperature. This trend needs to be monitored and addressed through appropriate climate adaptation strategies.
- **New Vegetation:** The introduction of new types of vegetation is occurring. This change should be studied to understand its impact on local ecosystems and agriculture.
- **Declining Sparrow Population:** There is a noticeable decrease in the sparrow population. Efforts should be made to investigate the causes and implement measures to protect these birds.
- **Drought and Water Shortages:** Due to drought, groundwater levels are dropping, and tube wells are drying out. It's crucial to develop water conservation strategies and alternative water sources to address this issue.
- **Soil and Land Erosion:** Sustainable land and soil management is essential. Special attention should be given to preventing soil erosion and land degradation to maintain healthy and productive land.

Identification And Analysis of Environmental and Social Impact

The environmental and social impacts were assessed through the discussion on the results of the projects with the stakeholders, by reviewing literature and publications and observations. Social impacts encompass changes in individuals' lifestyles, work dynamics, relationships, organizational affiliations, and societal roles resulting from an event. Hydrological status and outlook systems have broad applications across different scales. Given water's essential role in all aspects of life, these systems hold substantial potential to benefit multiple sectors including environment, industry, agriculture, public water supply, and energy[93].

[92] ancestral job which was to be delivering the message to the people about important dates and events by shouting out loud and visiting limited number of houses assigned to them

[93] Hydrological Status and Outlooks. https://www.ceh.ac.uk/sites/default/files/2021-11/sustainable-water-guide-chap6-hydrological-status-v2.pdf

Assessment of the impacts according to the stakeholder consulted.

Table 6 : Assessment of the Impacts

Expected results of the project	Environmental Impacts		Social Impacts	
	Positive	**Negative**	**Positive**	**Negative**
Improved risk knowledge through risk map development and dissemination.	Major for the reducing the flood and drought impacts on environment.	No negative impacts are foreseen	Major for reducing of flood and drought impacts on human-made surroundings.	
Bridging the gap in integrating knowledge about future scenarios (economic, urban, climate, etc.)			Essential for acquiring knowledge and increasing resilience.	
Risk management strategies incorporated into short, medium, and long-term development plans.	Major for the reduction of the environmental consequences	No negative impacts are foreseen	Major by minimizing social consequences, fostering a more equitable and healthy society.	
Enhanced forecasting tools for floods, droughts, and Early Warnings systems (EWS) with improved cross-border coordination to reduce disaster risks in vulnerable communities.	Major for contribute to long-term environmental sustainability and resilience of vulnerable communities.		Major for effective management of disasters, accuracy in EWS, ensured preparedness.	
Development of medium- and long-term adaptation and mitigation measures (both structural and non-structural) in priority areas, with updates based on lessons learned and monitoring tools.	Major for the increase of protection measures for watercourses and forests	Minor related with effect onland use planning and , water resources management	Major for the reduction of the consequences of disasters on the biophysical environment, including all living and non living components	Minor for the management of the residual effects (relocation of communities) of the impacts if any
Raising awareness among vulnerable populations about hydro meteorological risks and promoting prevention, preparedness, response, and mitigation strategies through educational programs that utilize participatory solutions.	Enhanced community preparedness and response, which leads to substantial environmental protection and resilience.		Crucial for enhancing population resilience and understanding the true scientific causes of extreme events.	
Improved and tested tools for planning and operational mechanisms to ensure effective preparation and response to floods and droughts.	Major for the prevention of disaster management, ecosystem and resilience		Major for the improving overall social cohesion and resilience against future disasters.	
Local and national, including weather and hydrological authorities, receive training in risk management and possess a clear understanding of their roles and coordination mechanisms	Major for the improvement of environmental monitoring and resource management		Major for enhancing the public safety and community resilience	
A collaborative process is established to ensure that these instruments and strategies are embraced by local communities and tailored to their specific contexts	Adoption and maintaining practices that protect and conserve the natural resources.		Major for stronger community cohesion, improve trust in institutions, and increase resilience to social challenges.	Minor because there is a risk of internal conflicts or one community receiving

Expected results of the project	Environmental Impacts		Social Impacts	
	Positive	Negative	Positive	Negative
				more benefits than other

Environmental and social impacts of the project

A cross-analysis of the actions foreseen by the project and the field investigations at the level of the national parts of the GBM region, , helped to identify positive and negative impacts of the project of integrated management of floods and droughts. Project activities analysis, consultation with different level of people and field observation in the targeted project areas in the GBM river basin helped find both positive and negative impacts of the HydroSOS-BaNe project. These impacts are environmental and social, and are ranked positive or negative. The analysis of these impacts will allow to propose further mitigation measures.

The positive impacts:

- Build Institutional capacity to take the appropriate measures to reduce the vulnerability of the community in the targeted project areas
- Ensure accurate forecasting and early warning messages dissemination
- Lead time will be maintained for forecasting
- Develop effective coordination among the concern department and agencies.
- Develop various tools and techniques for risk mitigation through forecasting and early warning
- Disaster Management Committee will play active role in early warning systems
- Full community of the targeted areas will be able to receive the right time early warning message.
- Development of the community capacity to take right time preparedness for disasters.
- Reduce risk of marginalized and vulnerable people by involving in the project.
- Women participation in the project to reduce the women vulnerability
- Help in managing water resources more effectively and also maintaining and restoring ecological balance by providing early warning
- It will Empowers communities with timely information and tools to prepare for and respond to floods or droughts, reducing potential loss of life and livelihoods
- Raises awareness about hydrological risks, fostering a culture of preparedness and adaptive behavior among the population

The negative impacts:

- Trust gap will be created if not maintain the accuracy of the forecasting messages.
- May be failed short-mid- and long-term forecasting accurately
- Inaccurate for forecasting may cause unacceptance by the community.
- Due to any reason the forecasting delayed may not be effective for the community.
- Coordination gap among the different departments and agencies may slow down the process
- Inactive Disaster Management Committee make barrier to reach to remotely located vulnerable groups.
- Resettlement may happen after risk mapping which may create the loss of livelihoods of the community of the identified risk areas.
- Over-reliance on technology for forecasting could lead to neglect of traditional knowledge and practices related to water management

Overall, while the Hydrological Status and Outlook System offers significant benefits in terms of environmental sustainability and community resilience, careful implementation and consideration of local contexts are essential to mitigate potential negative impacts.

Table 7 : Identification and Analysis of Potential Environmental and Social Impacts by the HydroSOS-BaNe project stakeholders in both Nepal and Bangladesh

Screening questions	Impact			
	Environmental		Social	
	Positive	Negative	Positive	Negative
Safeguard Standard 1: Compliance with the law				
Compliance with the national laws, acts and policies.	Ensure compliances with all necessary national laws, acts and policies to ensure easy and timely project implementation. following the protocols, and procedures of the national and local governments in the two countries. Before implementation of the activities, a concept note or ToR will be shared with the stakeholders to check if there is any noncompliance with any laws, acts and policies Following the agreement, implementation of the activities will be carried out	There is no negative impacts foreseen	Safeguard the rights, livelihoods, and well-being of communities at risk.	
Safeguard Standard 2: Access and equity				
Access all community members to the early warning messages.	The project will ensure representatives of all vulnerable groups will participate in all training and workshops, and will share the knowledge gained with their communities.	Considering the limited budget, it might be possible that some individuals are not able to participate. The project will request trained individuals of the community to share knowledge with others	Ensured peoples participation, cohesion and collective approaches to protect live and livelihoods.	
Safeguard Standard 3: Marginalized and vulnerable groups				
Including the marginalized and vulnerable groups, in the planning and implementation.	This project will enhance community preparedness, reduce losses, and protect biodiversity.	Difficulty may arise as the groups will have insufficient knowledge and access to technological devices and methodology	The real needs about livelihoods, resiliency will be focused and develop as per plan accordingly.	
Safeguard Standard 4: Human rights				

Screening questions	Impact			
	Environmental		Social	
	Positive	Negative	Positive	Negative
Potential human rights issues associated with the project.	This project is not going to take any direct activity to impact in the human right issues. But human rights issues will be addressed by the activities done by the project during disasters. All human right laws (freedom of speech, access to information etc.) will be applied during implementation		Basic human rights including access to food, shelter and information will facilitated during the impending period.	
Safeguard Standard 5: Gender equality and women empowerment				
Impact of women's participation in decision-making processes	The gender equity, leadership, women empowerment and ownership will be developed through various activities such as Gender mainstreaming into flood management, community based activities . That helps the social and ecosystem protection.	In Bangladesh, participation of women might be limited due to restricted cultural norms. As much as possible women staff will be employed in the project to engage women of the communities in decision-making and implementation of the activities	Ensure the identification and addressing of the real women issues that reduce the losses and make the harmony of peace in the society.	Women's participation in disaster preparedness and decision-making is often limited due to cultural and social norms, also due to lack of knowledge about the technology and reluctant to learn.
Safeguard Standard 6: Conservation and biodiversity				
Reduce the threats to biodiversity in the ecosystem of the project.	The indirect impact of the devastation will be reduced by early warning messages, which will help mitigate threats to biodiversity in the project's ecosystem. Risk maps will provide information on protected and wetland areas that could be preserved for managing flooding and drought events		Supporting livelihoods, food, and culture and enhance the resilience of the community.	
Safeguard Standard 7: Climate change				

Screening questions	Impact			
	Environmental		Social	
	Positive	Negative	Positive	Negative
Potential climate change impacts during its implementation period	The project does not have activities that harm the environment; instead, it focuses on enhancing the community's adaptation capacity and resilience by providing information, implementing adaptative measures (raising of houses, agriculture practices, alternative livelihoods etc.) and trainings		Build capacity of local communities on climate change adaptation that enhance the productivity and income generation.	
Safeguard Standard 8: Pollution prevention and efficient use of resources				
Pollution prevention and efficient use of resources	Project doesn't have any activity to pollute any areas . However, pollution management and mitigation measured will be increased through awareness.		Enhanced community health and safety as pollution risks are identified and mitigated.	
Safeguard Standard 9: Protection of the natural habitats				
Natural habitats that could be affected by the project.	There is no project activity that will affect natural habitats. The project will focus on awareness building to enhance conservation efforts.		Strengthened community engagement in habitat protection and restoration efforts.	
Safeguard Standard 10: Public health				
Public health issues that could arise from the project activities and have environmental and social impact?	The project does not involve any health hazardous or public health-related activities. Disease incidence will be reduced through health awareness activities.		Building awareness of best practices for health-related safety delivering messages on health and hygiene issues during disasters.	
Safeguard Standard 11: Cultural and physical heritage				

Screening questions	Impact			
	Environmental		Social	
	Positive	Negative	Positive	Negative
Minimize the impact on cultural and physical heritage sites due to flood or drought.	Project doesn't have any activity that could affect the cultural and physical heritages, rather the community awareness will raise on the importance of heritages.		Project activities will be supportive for the preservation of Cultural identity and history.	
Safeguard Standard 12: Involuntary resettlement				
Impacts of identifying the communities that are likely to be affected by involuntary resettlement.	Normally no direct resettlement activities will occur but after risk mapping for the implementation of better plan for safety and security, so communities might have to be resettled	Minor to disruption of local ecosystems, biodiversity, and natural habitats and community cohesion.	Resettled community will get safe location with alternative livelihoods options.	Minor for loss of land and income generation activities.
Safeguard Standard 13: Indigenous peoples				
Rights of indigenous peoples are respected and protected during our project.	The rights of indigenous peoples can help conserve their traditional lands, ecosystems, and natural resources through their participation and traditional knowledge.		Protection of the rights, traditional knowledge, social inclusion, cultural preservation for the indigenous people and will also help in enhancing resilience.	
Safeguard Standard 14: Core labour rights				
Compliance with the countries designated labour laws	Labor laws that guarantee fair wages and provide financial protections making them less vulnerable to the economic shocks of disaster.		Access to resources, financial aid, and technical assistance these farmers will be ensured.	
Safeguard Standard 15: Land and soil conservation				

Screening questions	Impact			
	Environmental		Social	
	Positive	Negative	Positive	Negative
Conserve land and soil in the face of flood or drought conditions associated with the project.	Implementing land and soil conservation practices can significantly enhance resilience to flood and drought conditions, reducing soil erosion and improving water retention.		These conservation practices stabilize farm production during extreme weather, ensuring food security and livelihoods.	
Additional Screening Questions for Cost-Effectiveness Measures				
Cost-effectiveness of the Early warning systems, community-based activities, and risk maps/	Methods like early warning systems and risk maps typically involve using existing natural features and systems (like rivers or weather patterns) more effectively.		Engaging communities empowers them to understand and effectively respond to climate risks, promoting resilience and adaptive capacity.	

Mitigation And Enhancement of The Identified Negative Impacts

Mitigation and Enhancement of the Identified Impacts

The impacts identified above in the light of the implementation of the project should be accompanied by mitigation (for negative impacts) actions and enhancement (for those positive). The following table provides a proposal of these measures in terms of each impact.

Table 8 : ***Mitigation and enhancement of the impacts***

Item	Impacts	Impact Type	Mitigation /enhancement actions	Responsibility (WMO, National agencies, local or community)
1	Inaccuracy and delay forecasting and warning messages dissemination.	Negative Minor & Indirect	- Numerical calculation for three days lead-time accuracy is possible but accuracy for mid and long term can be possible through probabilistic rainfall forecasting. - Institutional capacity building in forecasting and early warning message dissemination systems. - Establish rainfall trigger thresholds tailored to the specific hydrological and environmental conditions of an area, improving the accuracy and effectiveness of flood forecasting and early warning systems.	- Bangladesh Meteorological Department (BMD) and Bangladesh Water Development Board - Department of Hydrology and Meteorology Nepal

2	Poor changes of the people of drought prone areas		- By using both Standardized Precipitation Index (SPI) and the Standardized Precipitation Evapotranspiration Index (SPEI) can be used for drought monitoring. - Development of inlet and outlet water flow	- Bangladesh Meteorological Department (BMD) - Department of Hydrology and Meteorology Nepal
3	Warning messages are not understandable.	Negative Minor & Indirect	- Introduction of locally based danger level for forecasting systems - Develop apps with the help of google to send the SMS to the persons informing the water level of their areas.	- Flood Forecasting and Warning Centre (FFWC) - Bangladesh Water Development Board (BWDB) - Department of Hydrology and Meteorology Nepal - Local Government and community
4	The marginalized groups will have insufficient knowledge and access to technological devices.	Negative Minor & Indirect	- To avoid the exclusion of marginalized and vulnerable communities, local radio channels and traditional practices will be implemented to reach these groups especially women, girls, elderly, physically challenged individuals.	- Flood Forecasting and Warning Centre (FFWC) - Bangladesh Water Development Board (BWDB) - Department of Hydrology and Meteorology Nepal - Local Government and community
5	Women participation to disaster preparedness and decision making is often limited due to cultural and social norms.	Negative Minor & Indirect	- Women facilitator will be engaged to bring the women in focus. -	- Union Disaster Management Committee (UDMC) - Department of Hydrology and Meteorology Nepal - Local Government and community
6	Limited community access to warning messages	Negative Minor & Indirect	- Apps should be used to send the voice alerts to the vulnerable community for preparedness. - Build capacity of some community people than they will be responsible for further dissemination - Activation of the Disaster Management Committee to use the human resources in dissemination process.	- Bangladesh Meteorological Department (BMD) - Union Disaster Management Committee (UDMC) - Department of Hydrology and Meteorology Nepal - Local Government and community
7	Coordination gap among the implementing entities, other departments of the countries and regional data sourcing agencies	Negative Minor & Indirect	- Strengthen coordination among the agencies for quick decision and execution. - Strengthening collaborative relationship for data sourcing from neighbour countries - Formation of national and regional level advisory platform.	- Bangladesh Meteorological Department (BMD) - Bangladesh Water Development Board (BWDB) - NDRRMA, Nepal - Department of Hydrology and Meteorology Nepal - Local Government and community

8	Less involvement of women in the warning messages dissemination process.	Negative Minor & Indirect	- Provide motivational training by female trainer to increase the number of women engagements.	- Department of Hydrology and Meteorology Nepal - Local Government and community
9	Reduction of the vulnerability of the people living in the GBM river basin population	Positive-Direct	- Promote project methodologies and tools for the other part of the countries (region outside of the GBM Basin) - Training and information gathering of the actors for the post-project evaluation.	- Bangladesh Meteorological Department (BMD) - Bangladesh Water Development Board (BWDB) - Department of Hydrology and Meteorology Nepal - Local Government and community

Checklist Of Adaptation Fund

S. N.	AF's Environmental and Social Policy	No further assessment required for compliance	Potential impacts and risks – further assessment and management required for compliance
1	Compliance with the law	• During the EIA and SIA process, stakeholders stated that the project will ensure that national laws and guidelines for the GBM river basin will be followed during adaptation measures and capacity development activities. No prior environmental or construction permissions are needed as no physical or structural constructions are planned.	However, if there is need of installation of Met-station on forest area in Nepal, then according to law, Brief environment study will be necessary which will be done as per EPR 2020.
2	Access and Equity	• Chosen participants are expected to share training knowledge with other community or organization members. • This dissemination aims to ensure fair and equitable access to all project benefits. • Beneficiary selection will be conducted in consultation with: ❖ Local practices ❖ Traditions ❖ Access to social facilities Pilot testing in each river basin will: • Offer opportunities to involve all stakeholders • Include vulnerable groups	• The project includes capacity development activities, but only a small percentage of the communities will be able to participate. • These community representatives will be responsible for sharing the information with broader groups.
3	Marginalized and Vulnerable groups	The project will help reduce existing inequalities in EWS for floods and droughts, especially for marginalized or vulnerable groups dependent on agriculture or living in urban areas.	It was described by the FGD participants during public consultation that the vulnerable and marginalized groups will have insufficient

S. N.	AF's Environmental and Social Policy	No further assessment required for compliance	Potential impacts and risks – further assessment and management required for compliance
			knowledge and access to technological devices such as mobile phones or lack of good cellular connectivity. This risk will be overcome developing tools, technology and strategy.
4	Human Rights	The issue was discussed with the stakeholders and all agreed that there is no activity under this project that could violet the human rights of the community people of the targeted areas.	The project will promote the basic human rights, extend supports to get the access to basic needs and information.
5	Gender Equality and Women's Empowerment	The importance of the women's empowerment, leadership and participation was emphasized by the stakeholders during EIA and SIA. The proposed project will improve gender equity and women's empowerment through providing capacity building training. The trained women will play active role in strengthening the community preparedness.	It was recommended by the stakeholders in the KII and FGD that women's participation in disaster preparedness and decision-making is often limited due to cultural and social norms. So planning participatory activities will ensure that women and representatives of women's associations are sufficiently well represented.
6	Core Labour Rights	During the discussion of the labour rights issue in the EIA and SIA process the stakeholders stated that the project will be implemented and managed in compliance with the country's designated labor laws. Child labor will be forbidden both within the organization and other project partners.	
7	Indigenous Peoples	During the EIA and SIA process, stakeholders stated that the indigenous population in the region would be consulted and involved in the design and implementation of project activities. The traditional knowledge of indigenous people on flood and drought will be valuable.	The FGD and KII mentioned that the strategies include participation, training, equitable benefit-sharing mechanisms, will ensure compliance with indigenous peoples' issues.
8	Involuntary Resettlement	The project does not involve activities that will directly cause involuntary resettlement of communities. However, mapping flood and drought risk areas may lead to population displacement if some areas are classified as high risk for life loss. Based on scientific evidence, agencies will propose new prevention plans to prohibit	A safeguard approach will be established to minimize the negative effects of involuntary resettlements. Affected populations will be informed of their rights, aware of grievance mechanisms,

S. N.	AF's Environmental and Social Policy	No further assessment required for compliance	Potential impacts and risks – further assessment and management required for compliance
		future settlements in these high-risk areas. Resettlement plan have to formulated by the governmental agency if any resettlement occurs.	consulted on options, and offered resettlement alternatives or fair compensation.
9	Protection of the Natural Habitats	It was mentioned by the KII and FGD participants of the stakeholder's consultation that there are no potential direct risks to the protection of ecosystems and its natural habitats and biological diversity through the project activities.	Existing and new policies, plans, and activities to protect natural habitats will be reviewed with stakeholders to ensure legal protection of critical habitats.
10	Conservation and Biological Diversity	The various stakeholders briefed during the consultation for the preparation of EIA and SIA stated that there are no direct risks to biodiversity conservation, as the project does not involve any intervention in natural resources or the introduction of new species. However, it may lead to changes in agricultural and irrigation practices, as well as pesticide use, to improve production.	The project will encourage biodiversity conservation activities, such as reforestation and nature-based solutions, through assessments at pilot sites with national agencies. It will also promote capacity building and peer learning to enhance the efficient management of natural resources, including aquatic species, animals, and forests.
11	Climate Change	During the EIA and SIA process the findings of the climate change issue described by the stakeholders that the There are no activity of this project may cause the emission of greenhouse gases and also no activities of deforestation, thus having no impact on climate change. Additionally, the project will enhance local flood and drought resilience and improve governance, policies, and plans for climate change adaptation at both national and regional levels.	Community resilience will be enhanced through the awareness building activities and additional supports in agricultural and income generating activities for the poor community
12	Pollution Prevention and Resource Efficiency	In the stakeholder consultation during the EIA and SIA process the findings described that there are no intervention project are expected to result in water, air and soil pollution.	The project will strengthen technical and organizational capacities for the rational use of water at both national and transboundary levels with clear guidelines, policies, and action plans.

S. N.	AF's Environmental and Social Policy	No further assessment required for compliance	Potential impacts and risks – further assessment and management required for compliance
13	Public Health	According to the EIA and SIA findings it is mentioned by all concern that the project activities should not negatively impact public health. Instead, they will help prevent natural disasters and improve access to health facilities. However, population displacement due to disasters could lead to epidemics due to poor hygiene.	The project will identify flood-prone communities and raise awareness of health-related safety during capacity-building activities. It will also regularly inform and educate the population about diseases associated with floodwater, such as malaria, typhoid fever, amoebiasis, and cholera.
14	Physical and Cultural Heritage	In the stakeholder consultation during the EIA and SIA process it was stated that the project does not have any activity related to affecting physical and cultural heritages.	The participatory design and mapping approach will involve local communities and authorities to identify areas of physical and cultural significance and ensure that community-based flood and drought management activities will not negatively impact them
15	Lands and Soil Conservation	The project will promote soil and land resource conservation, focusing on natural and environmentally friendly solutions.	The project aims to enhance agricultural practices and strengthen the capacity of farmers and technicians.

Environmental and Social Risk Management Plan Report

CHAPTER 1: BACKGROUND

The Environmental and Social Risk Management Plan (ESRMP) is a vital part of the project's management framework. It is developed from the Environmental and Social Impact Assessment (ESIA) findings to effectively handle and reduce potential identified environmental and social risks which mighr arise during the planning and implementation of the project activities . This strategic plan ensures standard procedures for resolving any impacts ensuring equitable, timely and sustainable development, regulatory compliance, and safeguards the well-being of impacted communities and ecosystems. It's also support in mitigating or managing impacts from extreme events like floods and droughts on vulnerable households and environmental degradation.

1.1 Description of the project

1.1.1 Situation in the targeted project countries

Serious problems of flooding and drought are increasingly recurrent in Bangladesh and Nepal in the Ganga Brahmaputra Meghna (GBM) river basin in a context of variability and persistent climate changes. These natural disasters negatively impact the population with material damage to property and loss of life. The assessment of gaps for capacity-building at the transboundary level shows the need to improve and complete adaptation plans, strategies, investments in policies, and measures on the threats due to climate change, particularly floods and drought. In light of the needs expressed by Bangladesh, it became imperative to proceed with drafting a project proposal to be submitted for funding to the Adaptation Fund (AF).

1.1.2 Project objectives

The overall objective of the project ‘HydroSOS-BaNe’ is to strengthen the capacity of adaptation and resilience of communities and agencies towards the impact of climate change with integrated flood and drought management.

1.1.3 Specific Objectives of the Assessment

Helping in the implementation of joint and coordinated measures to improve the development of the social and economic environment through a mapping of risks of floods and drought and future scenarios for the variability and climate change.

Support stakeholders in the basin in the development of integrated end-to-end early warning systems against floods and droughts as well as activities of capacity-building for climate adaptation measures and mainstreaming gender.

Provide policy and management guidance by sharing scientific information, knowledge and best practices for integrated disaster risk reduction and climate adaptation in the basin.

1.1.4 Environmental and social policy of the Adaptation Fund

The Adaptation Fund (the Fund) finances projects and climate adaptation programs benefiting vulnerable communities in developing countries that are Parties to the Kyoto Protocol. Its environmental and social policy aligns with sustainable economic and social development, emphasizing environmentally sound management of natural resources. Similarly, the gender policy (GP) promotes gender mainstreaming to ensure equal opportunities for women and men in building resilience, addressing differentiated vulnerabilities, and adapting to climate change impacts. The environmental and social assessment for the GBM river Basin project adheres to these principles and the 15 principles of the Fund's environmental and social policy.

1.1.5 Political, legal and institutional framework

Environmental and social impact studies (ESIA), including the ESRMP, are mandatory in the six riparian countries of the GBM river basin, aligning with national environmental and social management policies. The ESRMP complies with current legislation requiring environmental assessments for projects with potential negative impacts. Managing the GBM river basin project involves coordination with various stakeholders, including ministries of environment, civil protection, agriculture, and water resources, as well as national meteorological agencies, local authorities, organizations, associations, and NGOs in the project area.

CHAPTER 2: ENVIRONMENTAL AND SOCIAL RISK MANAGEMENT PLAN (ESRMP)

2.1 Introduction

The Environmental and Social Risk Management Plan (ESRMP) is a critical part of our project's framework, developed from the Environmental and Social Impact Assessment (ESIA) to manage and mitigate environmental and social risks. It ensures sustainable development, regulatory compliance, and protects communities and ecosystems. ESRMP, aligned with Adaptation Fund principles, addresses impact from extreme events like floods and droughts on vulnerable households and the environment.

2.2 Objectives of the Environmental and Social Risk Management Plan (ESRMP)

The Environmental and Social Risk Management Plan (ESRMP) is designed to achieve a set of strategic objectives that align with the principles of sustainable development, regulatory compliance, and stakeholder engagement. The key objectives of the ESRMP are as follows:

Identify potential environmental and social impacts associated with the project’s activities.

Develop and implement mitigation measures to prevent, reduce, or manage adverse environmental and social impacts.
Increase awareness of environmental and social risks among stakeholders.
Establish robust monitoring systems to track the implementation and effectiveness of mitigation measures.
Promote and provide means for adequate stakeholder engagement.
Implement a grievance redress mechanism to address stakeholder concerns and complaints in a timely and effective manner.

2.3 Methods applied in the preparation of the ESRMP

The HydroSOSBaNe Project used a participatory approach, consulting all stakeholders. Data collection included public consultations in flood-prone and drought-prone areas of Bangladesh and Nepal, using semi-structured checklists. Various community members, including local leaders, NGO personnel, teachers, religious figures, indigenous people, and organizational representatives, were involved, with a focus on minorities and vulnerable groups. Key Informant Interviews (KIIs) were also conducted with specialists from key agencies. This approach, involving four public consultations and seven KIIs, laid a strong foundation for developing the Environmental and Social Risk Management Plan, ensuring diverse perspectives and local knowledge were considered.

Table 9 : Environmental and social context and basic conditions

A portion of the GBM basin	Risks exposure	Livelihoods / social system	Ecosystems and other environmental resources
Burungamari Upazila, and Nageswari Upazila under Kurigram district, Bangladesh	Flood	Low capacity and access to early warning information, high levels of poverty, poor agricultural practices, inadequate enforcement of environmental laws, etc.	Ecosystems include riverine ecosystems, floodplain wetlands; seasonal water bodies (Wetlands) riparian forests and grasslands. Environmental resources include fertile alluvial soil, diverse fish species, migratory bird habitats, aquatic vegetation, freshwater sources, etc.
Godagari Upazila, and Tanore Upazila under Rajshahi district, Bangladesh	Drought	Extensive agriculture and breeding, low capacity and access to early warning information, high level of poverty, poor agricultural practices Inadequate enforcement of environmental laws, etc.	Ecosystems include dry deciduous forest, Barind Tract ecosystem, scrubland, grassland and agricultural land. Other environmental resources include groundwater aquifers, drought- resistant vegetation, soil with high clay content, mineral deposits, limited surface water bodies, etc.
Kankai (Jhapa)	Flood and Drought	The region of Kankai (Jhapa) has vulnerable populations which experienced both flash and riverine flooding. It has fertile terai plains which borders with India.	Generally flat land in the Terai with the Siwaliks on the north, Place is natural habitat of Shorearobusta; Acacia catechu, Dalbergiasissoo and other riverine forests and grasslands, The acacia catechu-dalbergiasissoo forest is found on newly deposited alluvium, often gravelly along streams and rivers.The other riverine forest consists of tropical evergreen forest dominated by syzygiumcumini (black plum) tropical deciduous forest usually dominated by Bombaxceiba (simal), Holopteliaintegrifolia (cheptepagro) and Trewianudiflora (pindar) species
Tamakoshi River (Dolakha)	Transboundary and GLOF	This river in Dolakha region is a transboundary river with China. This site is useful for testing of potential GLOF events. this region has frequent landslides, flooding and risk of GLOF	area is mostly middle mountains and hill which is rich in timber and other naturals resources , outbrust,Pinus wallichiana, Pinus oxburghii, Alnus nepalensis, Rhododendron species, and Quercus species are the common tree species of this district. Muntiacus muntjak, Panther parades, Ursus thibetanus, Capricornis sumatraensis, and Naemorhedus goral are some common wild life species which are commonly found in this district

CHAPTER 3: POTENTIAL ENVIRONMENTAL AND SOCIAL IMPACTS AND MITIGATION MEASURES

Environmental and social impact assessments (ESIAs) are critical processes in the planning and implementation of any project, particularly those with the potential to affect the natural environment and local communities. These assessments aim to identify, predict, and evaluate the possible impacts of projects and propose measures to mitigate negative consequences.

Table 10 : Potential Environmental Impacts and Mitigation Measure

Item	Impact	Mitigation measures	Entities Charge in	Implement ation site	Entity of monitoring	Tracking indicator
Potential Environmental Impacts and Mitigation Measures						

1	Poor access to forecasting and warning message.	Provide capacity building training to a group of people then the trained people will share the knowledge to others.	BMD and BWDB DHM, MOHA	GBM river basin	BMD, BWDB, DHM and WMO	List of participants
2	Limited women participation due to cultural and social norms	Provide training on women empowerment to ensure planning and decision making.	Resource persons project, BMD and BWDB, DHM	GBM river basin	BMD, BWDB, DHM and WMO	List of participants
3	Indirect involuntary resettlement.	The population will be informed of their rights, aware of grievance mechanisms, consulted on options, and fair compensation.	BMD and BWDB, DHM	GBM river basin	BMD, BWDB, DHM and WMO	List of participants
4	Change in agricultural and irrigation pattern.	Provide technical services and capacity building training for farmers, fisherman etc. Specific advisory should be provided to various local stakeholders from Meteo and hydro agencies	Resource persons project, BMD and BWDB,DHM	GBM river basin	BMD, BWDB,DHM and WMO	List of participants
5	Poor hygiene and sanitation after disaster.	Build awareness on water borne disease. Include this aspect in community based flood management activities Also on national and location disaster management plan	Resource persons project, BMD and BWDB and DHM	GBM river basin	BMD, BWDB, DHM and WMO	List of participants
6	Underutilization of women's environmental knowledge and skills.	Taking skill Development initiatives for women, and creating equal Opportunities for women and men	Resource persons project, DHM BMD and BWDB	GBM river basin	BMD, BWDB. DHM and WMO	List of participants

CHAPTER 4: MONITORING AND FOLLOW UP PROGRAMME

World Metrological Organization (WMO), Bangladesh Meteorological Department (BMD) and Bangladesh Water Development Board (BWDB) will be responsible for overseeing the implementation of the Environmental and Social Risk Management Plan (ESRMP) across the project levels. These institutions will receive support from various national authorities for environmental and social protection.

A monitoring and evaluation (M&E) system will be developed to support the implementation and decision-makers in designing, implementing and adjusting the program activities. The M&E arrangements will be structured and organized at local, national and regional or transboundary. The implementation of ESRMP activities is incorporated into the project's overall monitoring and evaluation framework, with associated costs included in the project budget. Monitoring activities are based on updated checklists with the local, national and regional project progress reports through semi-structural interviews or focus-group discussions, field visits consultation, and technical activity reports.

Table 11 : Institutions involved in the implementation of the ESRMP

Actors involved	**Responsibility for risk identification and monitoring**	**Supporting entity**	**Responsibility for implementing measures**
World Meteorological Organization on (WMO)	WMO oversees project implementation and coordination. It develops Environment and Social Management Systems (ESMS) to identify environmental and social risks in compliance with the Environmental and Social Policy (ESP) of the Adaptation Fund (AF) and national laws. Before project activities begin, ESIA and ESRMP are prepared. These assessments and plans are regularly monitored and disseminated, including a grievance mechanism for the project.	External Consultants, other executing, agencies, and national environment and social agencies.	Ensure safeguard actions are defined in compliance with the national regulations and implemented for the activities which can create social and environmental risks. Supervise the implementation of the response activities under the ESRMP coordination with the bodies responsible for the management of water, environment and social welfare. Monitor the progress of the risk-minimizing actions or measures with the executing partners.
Bangladesh Meteorological Department (BMD)	BMD is the national project execution and monitoring entity. BMD will implement the technical activities through local agencies, NGOs and private partners forming a network of technical support groups. They will support the study, prepare the contact lists of people, arrange inception and validation meetings and aware the stakeholders on ESIA and ESRMP.	Other executing agencies, and national environment and social agencies	Follow-up of the study and implementation of the activities of the ESRMP about the bodies responsible for the management of water and environment, and monitor the progress of the risks minimizing action.
Bangladesh Water Development Board (BWDB)	BWDB is the project execution and monitoring entity. BWDB is responsible for the execution of the project activities and disseminates flood forecasting and early warning messages. They will support the study, prepare the contact lists of people, arrange inception and validation meetings and aware the stakeholders on ESIA and ESRMP. Flood Forecasting and Warning Centre (FFWC) of Bangladesh Water Development Board (BWDB) will collect hydrological data from 109 water level stations and 74 rainfall stations to provide flood warnings. FFWC is involved in the preparation of flood status reports at the national level. Based on the report they disseminate flood early warning to the stakeholders.	Other executing agencies, and national environment and Social agencies	Follow-up of the study and implementation of the activities of the ESRMP about the bodies responsible for the management of water and environment, and monitor the progress of the risks minimizing action.

Department of Hydrology and Meteorology	The main objective of DHM is to collect, process, publish, and disseminate hydrological and meteorological data across Nepal. This data supports water resource planning, development, and research, and verifies extreme events. DHM aims to aid the country's overall water resource development and provide timely information to save lives and property during extreme events. Mandated by the Government of Nepal, DHM monitors river hydrology, water quality, sediment, limnology, snow hydrology, glaciology, weather, climate, agro-meteorology, air quality, and solar energy. It provides general and aviation weather forecasts, issues periodic climate bulletins, and generates agrometeorological notices for the Agriculture Management and Information System (AMIS). During the monsoon season, DHM offers 24/7 flood forecasting and early warning services to the public and related agencies.	Other executing agencies, and national environment and Social agencies	Follow-up of the study and implementation of the activities of the ESRMP about the bodies responsible for the management of water and environment, and monitor the progress of the risks minimizing action.
Local governments and community groups	Local governments and community groups play crucial roles in risk identification and monitoring.Local governments are responsible for conducting comprehensive risk assessments, developing and maintaining hazard maps, and collecting and analyzing data on historical disaster events to understand risk patterns and trends. They must also establish and maintain early warning systems to alert communities of impending hazards. Community groups, on the other hand, support these efforts by providing local knowledge, participating in data collection, and helping to disseminate early warnings. They engage in continuous monitoring of local conditions and report potential risks to authorities, ensuring timely and effective responses to emerging threats.	External Consultants, other executing, agencies, and national environment and social agencies.	Follow-up of the study and implementation of the activities of the ESRMP about the bodies responsible for the management of water and environment, and monitor the progress of the risks minimizing action.

CHAPTER 6: GRIEVANCE MECHANISM FOR THE STAKEHOLDERS

The GRM provides various channels for submitting grievances, such as in-person, hotlines, email, and written correspondence, functioning at both local and central levels. Clear procedures for handling complaints include receiving, registering, investigating, and resolving them within defined timelines, maintaining confidentiality, and protecting complainants from retaliation. Regular public reports on grievance resolutions ensure transparency and build trust.

The GRM also focuses on vulnerable groups, offering multiple reporting channels like email, social media, postal mail, and a 24/7 hotline, along with complaint books at administrative offices. Feedback is gathered through short surveys after activities to continuously improve the process. The project team is committed to addressing grievances promptly and fairly, allowing for anonymous submissions and encouraging open dialogue.

Grievances are carefully documented on a registration form and managed by the Project Management Unit (PMU) safeguards officer, ensuring timely redress and communication with the complainant. The grievance process involves four levels: field-level resolution within three days, escalation to the Project Execution Unit within seven days, further escalation to the Project Implementation Unit within 15 days, and final referral to the PMU for resolution within 30 days. Major unresolved issues may be taken to the country's legal system or the World Meteorological Organization (WMO) Accountability Mechanism.

Overall, the GRM aims to maintain positive relationships with beneficiaries, prevent issues from escalating, and support the project's success and sustainability by providing a structured approach to conflict resolution.

Step 1: Identify and Engage Key Actors in the Project/Community

Conducting an effective stakeholder assessment is crucial to identify and engage trusted community leaders, ensuring representation from various groups such as women and indigenous people. These leaders play a vital role in developing, communicating, and educating others about the grievance mechanism. This step ensures diverse perspectives are included in the design process, gains commitment from key decision-makers for a swift response to complaints, builds trust between the project and the community, and fosters constructive engagement between grievance mechanism staff and the community.

Step 2: Understand the Current Environment

After identifying and engaging key stakeholders, project staff and community partners should assess potential grievances and existing local methods for handling them. This involves frequent community visits to understand their concerns about the project and traditional conflict resolution methods. Project staff can share their ideas for a grievance mechanism and gather valuable feedback from the community. This step helps design a suitable grievance mechanism by identifying available tools and the types of complaints it will likely address.

Step 3: Define the Scope of Grievances

To understand the current environment, regularly visit the community and talk with project staff involved in daily operations to learn about their interactions with community members. This forms the basis for defining the purpose and goals of the grievance mechanism. Knowing the scope of grievances helps determine the mechanism's capacity and resource requirements.

Step 4: Determine the Purpose and Goals of the Grievance Mechanism

As the final step in the initial implementation process, project staff should collaborate with community members to address the purpose and goals of the grievance mechanism, both short-term and long-term. They need to decide whether issues like criminal activity complaints, labor grievances, commercial disputes, or government policy concerns fall within the mechanism's scope. This step is crucial for establishing a mutual understanding of what the grievance mechanism will and will not address. Community and company meetings are essential for achieving consensus. Without this consensus, the grievance mechanism may lack legitimacy and fail to provide the necessary feedback to address community concerns and manage risks.

Step 5: Issue Resolution

First Level Grievance:

Aggrieved persons at the local level or community who have a grievance or complaint start the process by contacting the local project staff, organization, or authorities. After receiving the complaint, the field-level responsible person will take three days to address the issue and identify measures for prevention or management. If the grievance is resolved, a report will be developed and shared with the executing entities for risk tracking. If the grievance is not addressed at this level, it progresses to the next level.

Second Level Grievance:

All grievances that cannot be addressed within three days at the field level will be jointly reviewed by the Grievance Redress Committee (GRC) at the Project Execution Unit level. The In-charge will attempt to resolve them within seven days. The In-charge of the Project Execution Unit will be responsible for monitoring the process. The person of the Project Execution Unit will be from the Bangladesh Meteorological Department (BMD)/DHM.

Third Level Grievance:

The In-charge of the Project Execution Unit will refer any unresolved or major issues to the responsible person from the Project Implementation Unit (PIU) to resolve them within 15 days. The World Meteorological Organization (WMO) will be responsible for project implementation.

Fourth Level Grievance:
Very major issues that are beyond the jurisdictional authority of the GRC, those that have the potential to cause social conflicts or environmental damage, or those that remain unresolved at the PIU level will be referred to the Project Management Unit (PMU) to be resolved within 30 days.

Step 6: Issue Closure Report

An issue closure report will be submitted to the WMO and the Adaptation Fund. All paperwork (details of grievances) needs to be completed by the PIU safeguards assistant and circulated to the respective In-charge of the Project Execution Unit and Project Implementation Unit at least a week in advance of the scheduled meetings. All decisions taken at different levels will be communicated to the Project Management Unit. Despite the project management, an aggrieved person shall have access to the country's legal system at any stage, and accessing the country's legal system can run parallel to accessing the GRM and is not dependent on the negative outcome of the GRM. If the established GRM is not in a position to resolve the issue, the project-affected person (PAP) can also use the WMO Accountability Mechanism (AM) by directly contacting (in writing) the Complaint Receiving Officer (CRO) at WMO headquarters or the WMO Bangladesh Resident Mission (BRM) or DHM Nepal.

Step 7: Record Tracking

All records of grievances and resolutions will be meticulously tracked and documented to ensure transparency and accountability. This helps in continuous improvement of the grievance mechanism and in building trust with the community.

This comprehensive grievance mechanism ensures that the HydroSOS BaNe project can effectively address and resolve complaints, fostering a collaborative and transparent relationship with the community and other stakeholders.

Grievance Redresses Committee

Grievance Redresses will be formed at local and national level to take the steps to resolve issues if any arise. The members of the committee will be from Bangladesh Meteorological Department , Bangladesh Water Development Board, Department of Disaster Management and representative from Local Government Administration (Union Parishad). In case of Nepal, the members of the committee will be from DHM, MOHA, NDRRMA and representative from local government

Grievance Redresses Process

At the Implementing Agency level, the grievance mechanism will be regularly monitored for the complaints from the beneficiaries or stakeholders who will share their feedback directly through the post mail, phone, fax or email using the below details.

Bangladesh Meteorological Department

E-24, Agargaon, Dhaka-1207, Bangladesh Phone: +88 02 41025730, 41025731, 41025705
Fax: +88 02 41025726, 41025727, 41025728; Email: info@bmd.gov.bd ; swc@bmd.gov.bd

Bangladesh Water Development Board

16 Merul Badda, Dhaka 1215, Bangladesh; Email(s): shamal1967@yahoo.com, se.pffc@bwdb.gov.bd
Contact person: Dr. Shamal Chandra Das; Phone: +8801759693375

Department of Hydrology and Meteorology in Nepal

Government of Nepal, Ministry of Energy, Water Resources and Irrigation, , Babarmahal, Kathmandu, Nepal +977- 1-5319052, 5358224, 5358276, 5319007, dg@dhm.gov.np

National Disaster Risk Reduction and Management Authority

Singhadurbar, Kathmandu, Nepal, P.O. Box no. 213213, Telephone: 01-4211194 / 4211197 / 4211195, Email: info@bipad.gov.np, ndrrma@gmail.com, admin@ndrrma.gov.np, Web Link: www.bipad.gov.np

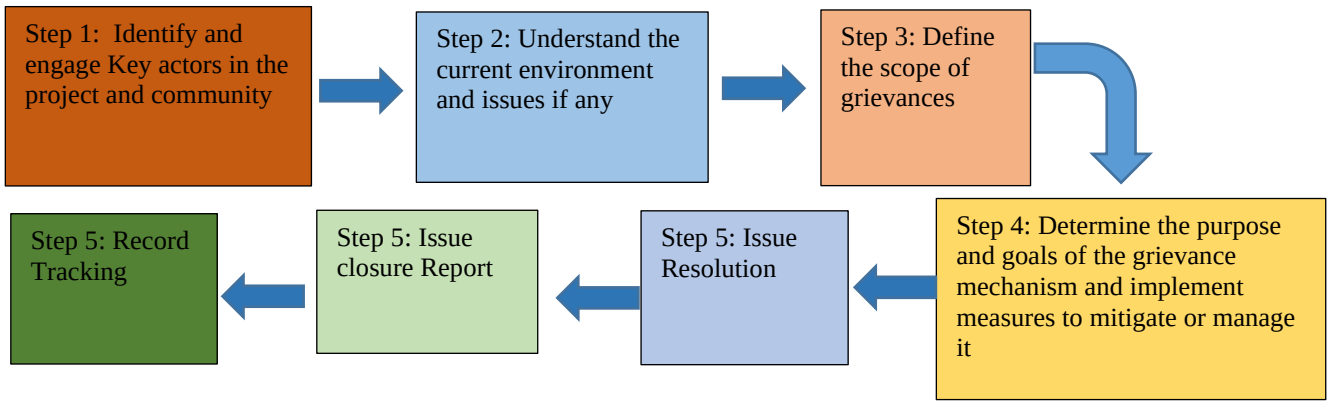
World Meteorological Organization

Associated Programme on Flood Management/Integrated Drought Management Programme 7bis, avenue de la PaixCase Postale No. 2300; CH-1211 Geneva 2, Switzerland Tel.: + 41 (0) 22730 81 11 and email: floodmanagement@wmo.int

Adaptation Fund

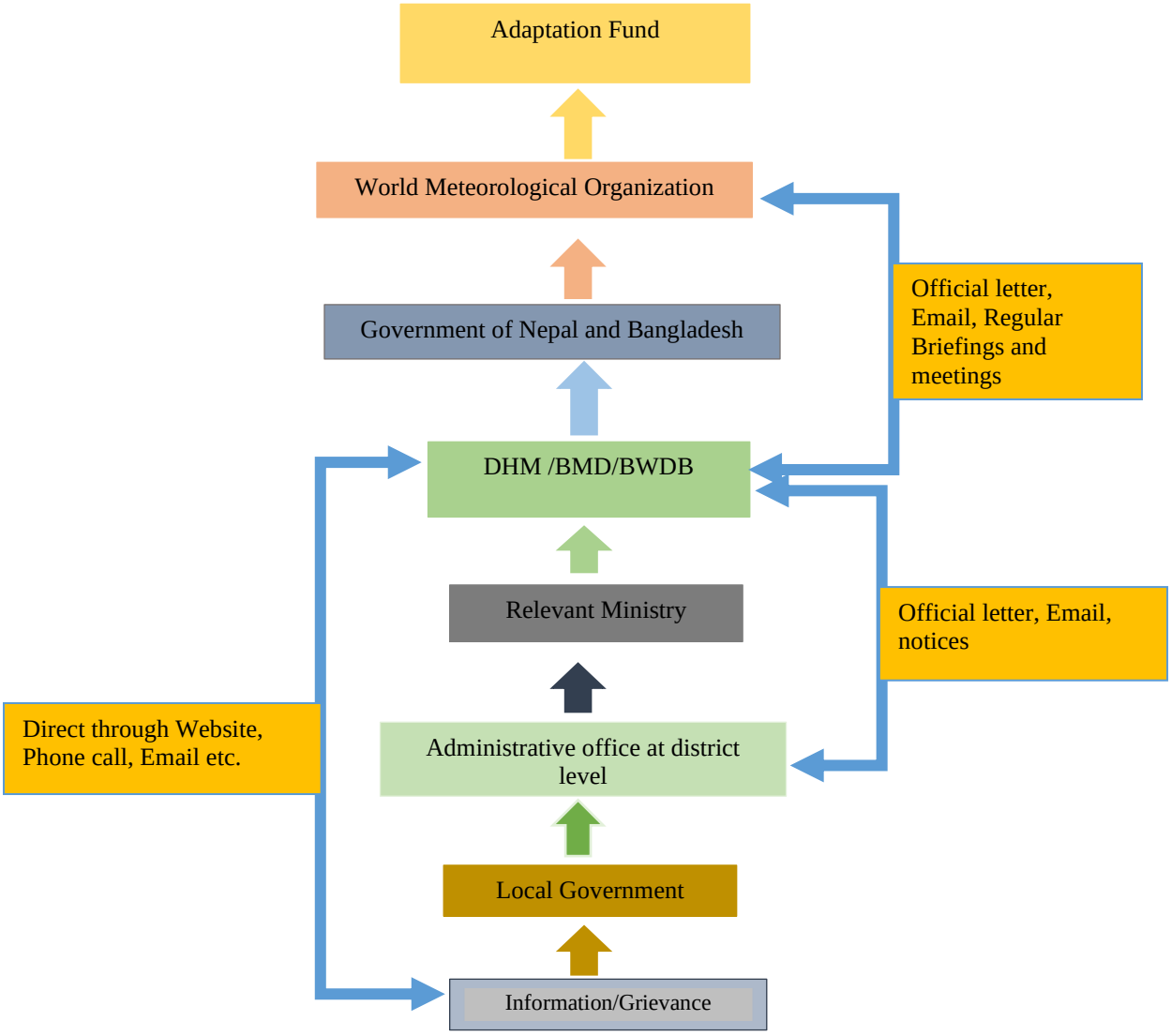
Issues or Grievances can be directly reported to the Adaptation Fund using the below form or contact address https://www.adaptation-fund.org/contact/
Adaptation Fund Postal Address
Adaptation Fund Board Secretariat ; Mail stop: N 7-700 ; 1818 H Street NW ; Washington DC 20433; USA; +1.202.473.0701 (v) ; +1.202.522.3240 (f)

Diagram 1: Identification of risks or issues on social and environmental principles of the Adaptation Fund



https://www.cao-grm.org/purpose-design-and-implementation

Diagram 2: Grievance Mechanism Chart and procedure for risk mitigation and management



CHAPTER 7: Conclusion for ESRMP

The Environmental and Social Impact Assessment (ESIA) systematically evaluated the potential impacts, focusing on flood and drought forecasting and early warning systems. Through comprehensive assessments and stakeholder consultations, the ESIA identified key environmental and social concerns. The project is expected to have both positive and negative impacts. Positively, it will enhance flood and drought forecasting, early warning systems, economic development, and livelihoods. The ESIA findings should guide decision-makers to implement the project responsibly, maximizing benefits while minimizing negative impacts on the environment and communities. An Environmental and Social Risk Management Plan (ESRMP) supports this report, outlining procedures to address risks during project implementation.

Overall Conclusion of the EIA and SIA study carried out for the HydroSOS BaNe project

The environmental and social assessment report of the project is the result of consultations and data collection at various levels of the GBM river basin. These consultations have supported the synthesis of reports and other documents that were consulted by the consultant before, during, and after his mission.
The purpose of the ESIA report is to identify the potential impacts that may be caused by the implementation of the project on integrated management of floods and droughts in the GBM river basin area. It should be noted that this project, carried out by the WMO and its collaborators, is supported by all stakeholders consulted due to the relevance of the actions envisaged and the context of recent extreme climate events that pose major constraints to any production actions for the benefit of citizens. Few concerns were raised, and recommendations have been made by the consulted stakeholders, which served to identify expected impacts and propose measures for proper management during the project implementation. An environmental and social risk management plan is developed in support of this report, summarizing the procedures to resolve any risks encountered during the project implementation.

WMO Annex - Google Drive (Annex are provided in the below Google drive)

Annex I- Questionnaire Bangladesh.docx
Annex I- Questionnaire Nepal.docx
Annex II- Participant List_Nepal.docx
Annex II- Participants List_Bangladesh.docx
Annex III-Photograph Bangladesh and Nepal.docx

Annex 4: Consultation with the national partners of the two countries to understand the roles and responsibilities at the national level

Consultation with the National Partners to fulfill the tasks of the HydroSOS-GBM Project Project in the preparation phase by WMO and NMHSs of the GBM countries to be submitted to the Adaptation Fund

Written by: Institute Bangladesh Delegates

DDM: Dept. of Disaster Management
DAE: Dept of Agriculture Extension
BWDB: BANGLADESH WATER DEVELOPMENT BOARD
BMD: BANGLADESH METEOROLOGICAL DEPARTMENT
WARPO: WATER RESOURCE PLANNING ORGANIZATION

Expected outcomes	**Planned activities**	**Concerned country: BANGLADESH**		**Remarks/comments regarding existing projects or available resources**
For more details see pre-concept note		Main Contributing Agency	Need of Support	
1.1 Development of Floods and Drought risk maps	• Inventory of Vulnerability, capacity, exposure, and risk (VCER) for flood and drought events	DDM, BWDB, DAE BMD, BWDB, DDM	YES YES	
	• Hazard maps (with return periods)	BWDB, BMD, DDM, DAEA BWDB and BMD	YES	
	• Database			
	• Capacity development			
	• Communication tools			
1.2 Climate scenarios	• Inventory of climate information and scenarios • Consultation to define the impacts of climate variability on the risks indicators (population, agriculture, irrigation, water resources, infrastructures etc.)	DOE, BMD DOE, DDM, BWDB	YES YES	
1.3 Long-term Risk Management Strategies	• Guidance document • Capacity development	DDM, BWDB DDM, BWDB	YES YES	
1.4 Community-based flood and drought management	• Self-help capacities and preparedness measures for floods	BWDB, DAE, NGO	YES	

	and drought management in the communities			
1.5 Capacity development related to Nature-based solutions to flood and drought management	Nature-based solutions related training will be delivered	BWDB, DAE	YES	
2.1 web-based HydroSOS and Early warning systems	• Inventory of Hydro-meteo data and sharing with the product and services development • Creation of the operational center and connections to the national services • Development of warning Thresholds • Procedure for defining impact-based forecasts • Water resources assessment and management • Design and development of web-based HydroSOS-GBM platform • Establishment of hydro-climate outlooks forum at the regional level	BMD, BWDB BMD, BWDB, DAE BWDB, DAE BWDB, DAE BWDB BWDB, DAE, BMD BMD, BWDB	YES	
2.2 Demonstration of HydroSOS-EWS on the pilot sites	• Awareness meeting • Perform testing during monsoon and dry season in 8-10 sites (see map and site details on the pre-concept note)	DDM, DAE BMD, BWDB	YES	
2.3 Awareness through Education Programs	• Workshop on mainstreaming Gender in E2E-EWS-FF and IFM	DDM, DAE	YES	
3.1 Policy and Institutional strengthening	• Review of policies and plans • Awareness at the transboundary, national and local levels	WARPO, WMO BWDB	YES	
3.2 Long term impact at national and regional level	• Linkage with national climate adaptation plans (NAPA, NDC, NAP) and transboundary action plan • Capacity development of the policy makers	DOE, WMO WMO	YES	

3.3 Awareness at local level	• Organize community consultation with the civil society • Develop a framework of actions	NGO, DDM, DAE WMO	YES	
Regional water resources policy and plans linking with socio-economic benefits	Review, update or new development of the policies			

Consultation with the National Partners to fulfill the tasks of the HydroSOS-BaNe Project
Project in the preparation phase by WMO and NMHSs of the GBM countries to be submitted to the Adaptation Fund

Written by: Nepalese Delegates

Expected outcomes	**Planned activities**	**Concerned country: Nepal**		**Remarks/comments for existing projects or available resources**
For more details see pre-concept note		Main Contributing Agency	Need of Support	
1.1 Development of Floods and Drought risk maps	• Inventory of Vulnerability, capacity, exposure and risk (VCER) for flood and drought hazard • Database • • Capacity development • • Communication tools	NDARMA DWRI DHM DHM DHM, NDRRMA		All form of software and hardware capacity building ll form of software and hardware capacity building
1.2 Climate scenarios	• Inventory of climate information and scenarios • Consultation to define the impacts of climate variability on the risk maps	MOFE MDFE and aDHM		
1.3 Long-term Risk management strategies	• Guidance document • • Capacity development	MOHA, MOFE, MOEWRI NDRRMA, DHM		
1.4 Community-based flood and drought management	• Self-help capacities and preparedness to floods and drought in the communities	DHM, NDRRMA INGO. Local Govt.		
1.5 Capacity development related to Nature-based solutions to flood and drought management				

2.1 web-based HydroSOS and Early warning systems	• Inventory of Hydro-meteo data and sharing with the product and services development • Creation of the operational centre and connections to the national services • Development of warning Thresholds • Procedure for defining impact-based forecasts • Water resources assessment and management • Design and development of web-based HydroSOS-GBM platform • Establishment of hydro-climate outlooks forum at the regional level	DHM MOHA-NDRRMA DHM DHM, NDRRMA MOENRI, WECS DHM+NDRRMA DHM+NDRRMA		
2.2 Demonstration of HydroSOS-GBM on the pilot sites	• Awareness meeting • Perform testing during monsoon and dry season in 8-10 sites (see map and site details on the pre-concept note)	DHM+NDRRMA DHM		
2.3 Awareness through education programs	• Workshop on mainstreaming Gender in E2E-EWS-FF and IFM	MOE, MOEWRI, DHM, NDRRMA, INGO'S, Local Govt.		
3.1 Policy and Institutional strengthening	• Review of policies and plans • • Awareness at transboundary, national and local level	MOEWRI, MOHA MOFE, Local Govt.		
3.2 Long term impact at national and regional level	• Linkage with national climate adaptation plans (NAPA, NDC, NAP) and	MOFE, MOEWRI, MOHA DHM, NDRRMA, DWRI		

	transboundary action plan • Capacity development of the policy makers			
3.3 Awareness at local level	• Organize community consultation with the civil society • Develop a framework of actions	MOFAGA, MOEWRI, IHM MOHA, NDRRMA		
Regional water resources policy and plans linking with socio-economic benefits	• Review, update or new development of the policies			

Note: Any other activities left out, will be communicated during the letter stage of concept note preparation.

DHM: Dept. of Hydrology and Meteorology
NDRRMA: National Disaster Risk Reduction and Management Authority
MOEWRI: Ministry of Energy Water Resource and Agriculture
MOFE: Ministry of Forest and Environment
MOHA: Ministry of Home Affairs
DWRI: Dept of Water Resource and Irrigation
WECS: Water and Energy Commission Secretariat
MOE: Ministry of Education
MOF: Ministry of Finance
MOFAGA: Ministry of Federal Affairs and General Administration

Annex 5: National and Regional Consultation workshops between the executing partners, national agencies, and regional entity of the HydroSOS BaNe project

National workshop - Nepal_WMO.pdf organized in 2022

National workshop report-Bangladesh_WMO.pdf organized in 2022

Regional workshop report-HydroSOS-BaNe project preparation.pdf organized in June 2023

HydroSOS BaNe regional workshop report - 26-28 June 2024.docx organized in June 2024

Annex 6: Commitment letters for Long-term Sustainability of HydroSOS Early Warning System (EWS)