Funding Proposal

SAP022: Enhancing Multi-Hazard Early Warning System to increase resilience of Uzbekistan communities to climate change induced hazards

Uzbekistan | United Nations Development Programme (UNDP) | Decision B.28/04

6 April 2021

GREEN CLIMATE FUND

Simplified Approval Process
Funding Proposal

Project/Programme title:	**Enhancing Multi-Hazard Early Warning System to increase resilience of Uzbekistan communities to climate change induced hazards**
Country(ies):	**Uzbekistan**
National Designated Authority(ies):	**Ministry of Investments and Foreign Trade of the Republic of Uzbekistan**
Accredited Entity:	**UNDP**
Date of first submission:	*2020/01/24*
Date of current submission/ version number	*2020/07/22 / V.002*
If available, indicate GCF code:	*This code is assigned to each project upon first submission of a Concept Note or Funding Proposal and remains the same throughout the proposal review process. If you have submitted this project/programme previously please indicate the GCF code here.*

GREEN CLIMATE FUND

Contents

Note to accredited entities on the use of the SAP funding proposal template

- The Simplified Approval Process Pilot Scheme (SAP) supports projects and programmes with a GCF contribution of up to USD 10 million with minimal to no environmental and social risks. Projects and programmes are eligible for SAP if they are ready for scaling up and have the potential for transformation, promoting a paradigm shift to low-emission and climate-resilient development.
- This template is for the SAP funding proposals and is different from the funding proposal template under the standard project and programme cycle. Distinctive features of the SAP funding proposal template are:
  - *Simpler documents*: key documents have been simplified, and presented in a single, up-front list;
  - *Fewer pages*: A shorter form with significantly fewer pages. The total length of funding proposals should **not exceed 20 pages,** annexes can be used to provide details as necessary;
  - *Easier form-filling*: fewer questions and clearer guidance allows more concise and succinct responses for each sub-section, avoiding duplication of information.
- Accredited entities can either directly incorporate information into this proposal, or provide summary information in the proposal with cross-reference to other funding proposal documents such as project appraisal document, pre-feasibility studies, term sheet, legal due diligence report, etc.
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Please use the following name convention for the file name:

"SAP-FP-[Accredited Entity Short Name]-[yymmdd]"

A. PROJECT/PROGRAMME SUMMARY

A.1. Has this FP been submitted as a SAP CN before?			Yes ☒ No ☐		
A.2. Is the Environmental and Social Safeguards Category C or I-3?			Yes ☒ No ☐		
A.3. Project or programme	*Indicate whether this FP refers to a combination of several projects (programme) or one project.* ☒ Project ☐ Programme	**A.4. Public or private sector**	☒ Public sector ☐ Private sector	**A.5. RFP**	Not applicable
A.6. Result area(s)	Mitigation: Reduced emissions from: ☐ Energy access and power generation: Enter number % ☐ Low emission transport: Enter number % ☐ Buildings, cities and industries and appliances: Enter number % ☐ Forestry and land use: Enter number % Adaptation: Increased resilience of: ☒ Most vulnerable people and communities: 100 % ☐ Health and well-being, and food and water security: Enter number % ☐ Infrastructure and built environment: Enter number % ☐ Ecosystem and ecosystem services: Enter number %				
***A.a.*[1] Total investment (GCF + co-finance)**	Amount: 40,639,335 USD		***A.a.1* Total GCF funding requested**	Amount: 9,999,455 USD	
***A.b.* Type of financial instrument requested for the GCF funding**	*Mark all that apply.* ☒ Grant ☐ Loan[2] ☐ Equity ☐ Guarantees ☐ Others:				
A.7. Implementation period	6 years (72 months)				
A.8. Total project/ programme lifespan	15 years (180 months)	**A.9. Expected date of internal approval**	*1/23/2020*		
A.10. Executing Entity information	Government of Uzbekistan (GoU) acting through Ministry of Emergency Situations of the Republic of Uzbekistan (MES)				

A.11. Scalability and potential for transformation (Eligibility for SAP, max. 100 words)

1. The Government of Uzbekistan through its Ministry of Emergency Situations (MES) implements a state program to modernize the early warning system for natural disasters[3]. This GCF project will provide the critical technical and financial resources, access to innovative technologies and expertise for the implementation and scale-up of this national initiative.The GCF project will promote the transformation of climate hazard forecasting and warning from a reactive (ex-post) hazard-based system to one that is proactive (ex-ante), user-oriented and impact-based.
2. The project puts a strong focus on strengthening the “last mile” delivery of disaster-related communication and interaction with end users, including vulnerable communities. The improved capacity of Regional crisis management centers (RCMCs) and local communities to use and interprete climate risk information into practical early responses will directly benefit at least 11 million people (34% of total population) currently at risk from climate hazards and enhance the community resilience as a whole.
3. Uzhydromet’s capacity as a WMO Regional Specialized Meteorological Centre (RSMC) will be strengthened, building on the CAHM[4] (World Bank/WMO) project. The proposed GCF investment will develop automated procedures and modelling capacity that can serve as an example for other developing Central Asian countries, as

[1] This fields will be automatically calculated in the OSS system.
[2] Senior loans and subordinated loans.
[3] Cabinet Resolution No. 242 of the Republic of Uzbekistan "On further improvement of state system for warning and emergency applications of the Republic of Uzbekistan” from 24 August 2011
[4] Central Asian Hydro-Meteorological project

well as being the driver of significant institutional change, catalysing increased efficiency in climate hazard warning generation and dissemination, and developing new operational procedures between MES and Uzhydromet.

A.12. Project/Programme rationale, objectives and approach (max. 300 words)

4. Climate change has been leading to more frequent and more intense hydrometeorological disasters in Uzbekistan and to a greater exposure to these disasters across the country. Uzbekistan sets climate change adaptation as a priority in its first Nationally Determined Contribution (NDC)[5] under the Paris Agreement. In particular, the NDC clearly highlights the need to establish a Multi-Hazard Early Warning System (MHEWS).

5. This project will respond to a critical need of Uzbekistan to modernize its early warning system into an impact-based MHEWS (initially focussed on floods, mudflows, landslides, avalanches and hydrological drought in the more populous and economically important eastern mountainous regions), an essential element of the country's climate risk management framework. In the face of increasing climate risks, this MHEWS will serve to enhance climate resilience of 32 million people of Uzbekistan (indirect beneficiaries), including the most vulnerable and poor rural communities living in mountainous areas currently at risk from climate-induced hazards.

6. Specificially, the project will improve methods and capacities for monitoring, modelling and forecasting climate hazards and risks supported with satellite-based remote sensing, create a central repository and analysis system for hydrometeorological hazard and risk information, improve regulations, coordination and institutional mechanisms for an effective impact-based MHEWS, including the development of forecast-based actions. The project will explore and facilitate the concept of forecast-based-financing (FBF) with the national institutional stakeholders responsible for disaster risk management and financing by developing SOPs and prototype decision-making systems/protocols based on the enhanced impact-based forecasting and warning. As a result, the project will significantly enhance the quality and timeliness of climate and disaster-related information available to decision-makers and the dissemination of such information to the population, as well as develop information and procedures for ex-ante actions.

7. The GCF grant is required to upgrade the existing hazard forecasting and warning system in Uzbekistan so it can effectively deal with the additional pressure brought about through increases in climate variability and change. This requires investments in both new observing technologies, training of technical staff, demonstration of modern approaches to hazard modelling and prediction, as well as development of awareness and educational materials and communications with communities. Together these activities will demonstrate the potential benefits of the upgraded system and contribute to the transformation of the climate and disaster risk management in the country.

B. PROJECT/PROGRAMME DETAILS

B.1. Context and baseline (max. 500 words)

8. Uzbekistan is a lower-middle income, landlocked country located in the heart of the Central Asia. 72% of its territory is flat and extremely arid. Uzbekistan ranks high (24th) in the global natural disaster hotspots list compiled by the World Bank, with 9.3% of the total country area at risk, 65.6% of the population living in risky areas, and 65.5% of the national GDP (USD 12 billion annually) generated from areas at risk[6]. Uzbekistan's capacity to map, monitor and forecast climate risks, as well as act on this information, is however severely limited. Furthermore, many extreme weather events in Uzbekistan go unreported and Uzhydromet and the Ministry of Emergency Situations (MES) are unable to routinely collect data on disasters.

9. Uzbekistan is highly vulnerable to floods and mudflows caused by snowmelt, run-off or by severe storms, with over 2,600 extreme mudflows documented in the past 80 years. Very large floods and mudflows are also caused by outburst floods from mountain lakes. Most damages occur in economically strong and flooding-prone provinces in the east, particularly Andijan and Ferghana, two of the project target regions, which on average lose 3% and 2% respectively of annual GDP to flooding[7]. Based on the preliminary economic analysis (see Annex 10), the economic impact of flooding in Uzbekistan due to climate change can be estimated at US$ 236 million.

[5] http://www4.unfccc.int/Submissions/INDC/Published%20Documents/Uzbekistan/1/INDC%20Uzbekistan%2018-04-2017_Eng_20170419093154_171926.pdf

[6] Dilley, Maxx; Chen, Robert S.; Deichmann, Uwe; Lerner-Lam, Arthur L.; Arnold, Margaret; Agwe, Jonathan; Buys, Piet; Kjevstad, Oddvar; Lyon, Bradfield; Yetman, Gregory. 2005. Natural disaster hotspots: A global risk analysis (English). Washington, DC: World Bank. http://documents.worldbank.org/curated/en/621711468175150317/pdf/344230PAPER0Na101official0use0only1.pdf

[7] World bank (2016) europe and central asia country risk profiles for floods and earthquakes. http://documents.worldbank.org/curated/en/958801481798204368/Europe-and-Central-Asia-Country-risk-profiles-for-floods-and-earthquakes and outlined in Section 5 of the PFS.

10. Landslides in spring and avalanche hazards during winter are also significant risks in the country's eastern mountain and foothill areas (particularly along significant transport links such as the Tashkent-Osh highway). Almost 90% of the country's water resources originate from eastern mountain catchments located in neighbouring countries and supplied by rainfall, melting snow and glacial ice. Two major river systems - the Amu Darya and the Syr Darya – constitute 95% of the surface water flow. Mudflow, landslide and flooding risks are most prevalent in the east, with drought affecting the whole country, especially the more arid western areas. Given the high concentration of people, economic activities, and several climate-related hazards (floods, mudflows, landslides and avalanches), the Ferghana valley is subject to high climate-related disaster risks. Maps of climate hazards and exposure risks to population are provided as follows.

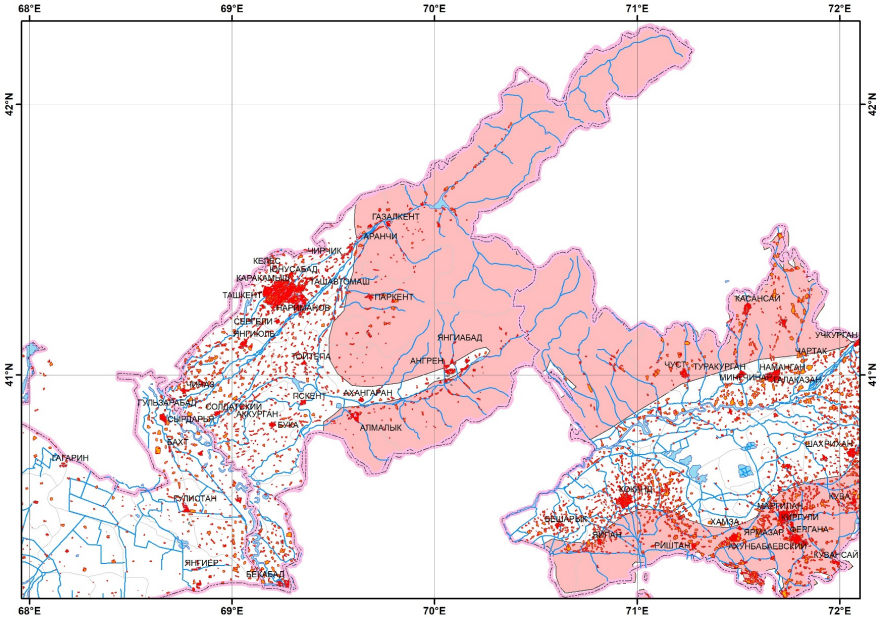


FIGURE 1: EXAMPLE OF AREAS OF MUDFLOW HAZARDS (SHADED) AND POPULATIONS/SETTLEMENTS (RED DOTS) FOR EASTERN UZBEKISTAN.

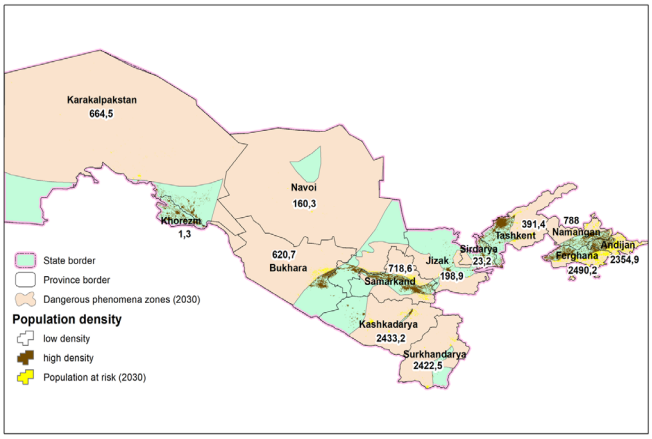


FIGURE 2: NUMBERS OF PEOPLE (THOUSANDS) EXPOSED TO ONE OR MORE HAZARDS (AND THEIR EXTENT) IN EACH PROVINCE IN 2030

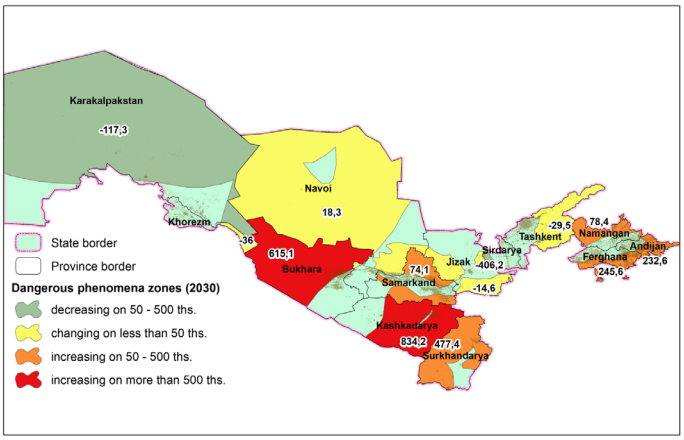


FIGURE 3: CHANGES IN THE NUMBERS OF PEOPLE (THOUSANDS) EXPOSED TO ONE OR MORE HAZARDS BY 2030

Climate change drivers of vulnerability:

11. Climate change is expected to increase the intensity and frequency of hydrometeorological disasters – droughts, floods, mudflows, landslides and storms – putting more Uzbekistan communities and economic assets at risk[8]. The annual average temperature increase since 1950 is 0.27ºC per decade, which is twice the global average. It has led to accelerated evapotranspiration and caused changes in the timing and zones of snow and ice melt,

[8] Third national communication of Uzbekistan under the UNFCCC. 2016. Tashkent http://www.un-gsp.org/sites/default/files/documents/tnc_of_uzbekistan_under_unfccc_english_n.pdf

consequently changes in river flows and increased risk of droughts, floods, mudflows and avalanches. Increases in rainfall intensity lead to increased risk of flooding, mudflow and rainfall-induced landslide risks over the eastern mountain and foothill regions[9].

12. Glaciers presently contribute up to 70% of the water flow in some of the river systems during summer and climate impacts, particularly increased temperatures, changes in rainfall patterns and glacial melting, are anticipated to drastically alter the regional hydrological cycle, exacerbating existing water scarcity problems and water-related conflicts. These changes will not be the same over time, requiring flexible adaptation options which themselves need to be adaptable over time. For example, the rate of glacial melting is projected to increase in the short-term due to rises in temperature, initially leading to increased river flows, flooding, mud slides and soil erosion. In the long-term, however, the decline in glacier volumes is predicted to reduce the flow of the Amu-Darya River and tributaries of the Syr-Darya and Zeravshon Rivers by 25 – 30%[10]. Reductions will be particularly severe in hot, dry years when it is predicted that there will be up to a 70% reduction in river flows.

13. Trends in time and associated p-values (statistical significance) were calculated for climate indices using the ClimPACT2 software[11] (as recommended by WMO[12]) for the 11 stations where daily observations of precipitation, minimum and maximum temperatures were available for the 1990-2018 period. For each station the ClimPACT2 indices were calculated on a monthly and annual basis, and a linear regression used to establish if there had been trends in these indices between 1990 and 2018 and the statistical significance of any such trends. Nearly all the temperature and heatwave-related indices across most stations indicate significant positive trends, confirming the results in the feasibility study that there have been significant increases in temperatures across Uzbekistan since 1990. Trends in both SPI (Standardised Precipitation Index) and SPEI (Evapotranspiration Index) are negative where they are significant and more consistently so for SPEI, indicating that when increases in evapotranspiration are taken into account the intensity of drought at timescales from 3 to 24 months has been getting worse. Lastly trends in measures of rainfall intensity are harder to detect but where they are statistically significant they are positive, again confirming the results presented in the feasibility study that the intensity of precipitation has tended to increase in recent years.

14. Through the GCF readiness support programme, an assessment of expected climate changes and climate-included hazards in Uzbekistan was conducted by Columbia University using an ensemble of CMIP5 models (see Appendix 2 of FS). It clearly shows that changes in climate are expected to increase both the frequency and spatial extent of climate-related hazards (potentially occurring in areas not previously prone to such hazards), thereby increasing demands on the ability of MES, Uzhydromet and other government agencies to monitor and forecast them ahead of time, as well as forewarn affected populations, businesses and sectoral activities.

15. Specifically, warming temperatures are likely to increase the frequency and magnitude of heat waves, as well as evapotranspiration from ecosystems and agricultural lands. Under RCP4.5 precipitation changes vary by region, with earlier drying overall but wetter conditions in the west by the middle and end of the century. Overall wetter conditions increase flood hazards in winter and spring, although much of the precipitation rise comes in the winter and spring while the summers are likely to be drier. Models indicate a clear signal of increasing heavy precipitation events that are associated with flash flood hazards and the potential to destabilize hillslopes for mudflow and landslide hazards. A more vigorous water cycle will also lead to greater interannual and intraseasonal variations between drought and flood events, which will make managing risks more challenging. Warmer temperatures reduce overall snowpack, however there are likely to be strong elevational gradients in the direction of local snowpack changes with low elevations declining and high elevations potentially increasing. It will be particularly important to be able to track the transitional zone between solid and melting snow as it moves to higher altitudes with warmer temperatures, potentially exposing new areas to mudflow, landslide, and snow avalanche hazards.

16. ENSO impact on rainfall in Uzbekistan occurs primarily during the SON season, but is also present during DJF and MAM seasons (being strongest during autumn and spring)[13,14]. The influence during warm ENSO events results

[9] Climate Risk Profile of Uzbekistan prepared by UNDP project “Climate risk management of Uzbekistan”. 2015.

[11] https://www.climdex.org/learn/tools/
[12] http://www.wmo.int/pages/prog/wcp/ccl/meetings/ICT-CSIS/documents/2016/presentations/Herold_WMO_climpact_final.pdf
[13] Mariotti A. (2007) How ENSO impacts precipitation in southwest central Asia. GEOPHYSICAL RESEARCH LETTERS, VOL. 34, L16706, doi:10.1029/2007GL030078
[14] Khaydarov M. and Gerlitz L. (2019) Climate variability and change over Uzbekistan – an analysis based on high resolution CHELSA data. Central Asian Journal of Water Research. 5(2): 1-19. doi: 10.29258/CAJWR/2019-R1.v5-2/1-19.eng.

from an anomalous southwesterly moisture flux from the Arabian Sea and tropical Africa, which increases rainfall. This is confirmed in modelling studies of ENSO and NAO impacts, which further show that during warm/positive events rainfall is enhanced through enhancement of westerly disturbances as they encounter the low pressure trough from the south[15].

17. These ENSO impacts on atmospheric circulation and precipitation translate into different sectoral impacts depending on the timing of changes. Increased precipitation during an El Nino event can be beneficial for winter crops and vegetation phenology, but can result in increased risks of heavy precipitation, mudflows, landslides and avalanches over mountainous areas [16,17].

National priorities and baseline:

18. Agriculture accounts for 18.5% of the annual GDP in Uzbekistan and contributes to more than a quarter of the labor force in the country. A major problem causing the reduced agricultural productivity is inappropriate irrigation (both insufficient and over-irrigation) inadequately informed by climate information. Water resource management is a key development challenge in Uzbekistan, where demand will continue to rise and climate change impacts are likely to reduce water supplies. Expected reductions in the availability of water supply in the main rivers, according to a World Bank assessment of climate risks to the agriculture sector in Uzbekistan, wil likely impact significantly the availability of irrigation water which currently consumes 90% of water resources. Similarly, higher than normal rainfall can cause problems with agriculture; during 2009, cotton had to be replanted four times because of excessive rainfall. These weather and climate-related impacts highlight the potential value that climate-hazard related knowledge can provide.

19. Uzbekistan's first Nationally Determined Contribution (NDC) under the Paris Agreement sets climate change adaptation as a priority for agriculture, water management, social protection, and protection of strategic infrastructure and production facilities. In particular, the NDC clearly highlights the need to establish a MHEWS which will:

    - Raise awareness and improve access to information about climate change for all population groups; and
    - Develop early warning systems for dangerous hydrometeorological hazards which will provide information for climate risk management.

    Relevant climate and disaster related policies and legislation in Uzbekistan are outlined in Section E.5.

20. Uzhydromet is responsible for weather forecasting, hydro-meteorological and agro-meteorological monitoring including monitoring of extreme weather events, the forecasting of water availability and climate research. Uzhydromet also operates and maintains a hydrometeorological observation network which comprises of 85 meteorological stations (75 manual and 10 AWS), 131 hydrological gauging stations (all manual), 3 doppler weather radars (Tashkent, Samarkand and Nukus), 64 observation points of atmospheric air pollution and 17 chemical labs for monitoring environmental pollution (see section 4.1 of the feasibility study (FS)). Twenty one (21) of the 85 stations contribute to international exchange (through the GTS) sending data as SYNOP messages, with 8 additional stations contributing to the exchange of hydrometeorological information with other CIS countries. Whilst hydrometeorological stations are concentrated in the east, AWS are only found in the west and many eastern mountainous regions, which experience spatially heterogeneous rainfall and associated hazards, are not covered (see FS, section 4.1.2). Uzhydromet has demonstrated sufficient capacity to operate and maintain its existing network (including all existing stations since 2010), utilising both public funds and income from services. It has, however, not had access to capital to upgrade (e.g. to automatic systems) and expand these networks (e.g. radars) to cover all hazardous areas.

[15] Syed, F., Giorgi, F., Pal, J. *et al.* (2006) Effect of remote forcings on the winter precipitation of central southwest Asia part 1: observations. *Theor. Appl. Climatol.* **86,**147–160. https://doi.org/10.1007/s00704-005-0217-1

[16] ESCAP (2014) El Nino 2014/2015 Policy implications for Asia and Pacific. Science and policy knowledge series. Integration of disaster risk reduction and climate change adaptation into sustainable development. https://www.unescap.org/sites/default/files/August%202014%20ESCAP%20El%20Nino%202014.pdf

[17] Kirsten M de Beurs et al 2018 Environ. Res. Lett. 13 065018. https://iopscience.iop.org/article/10.1088/1748-9326/aac4d0/pdf

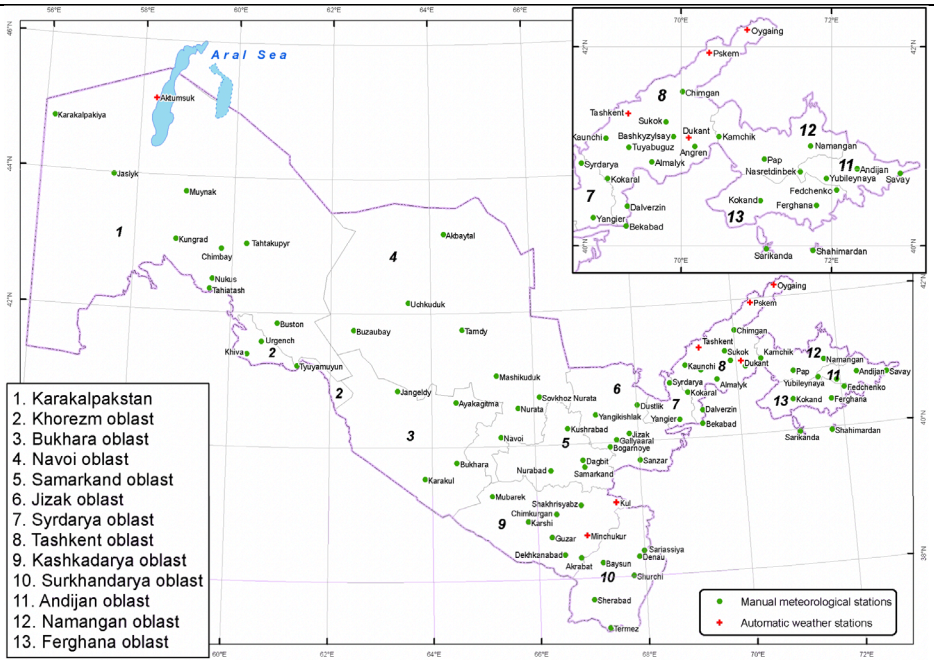
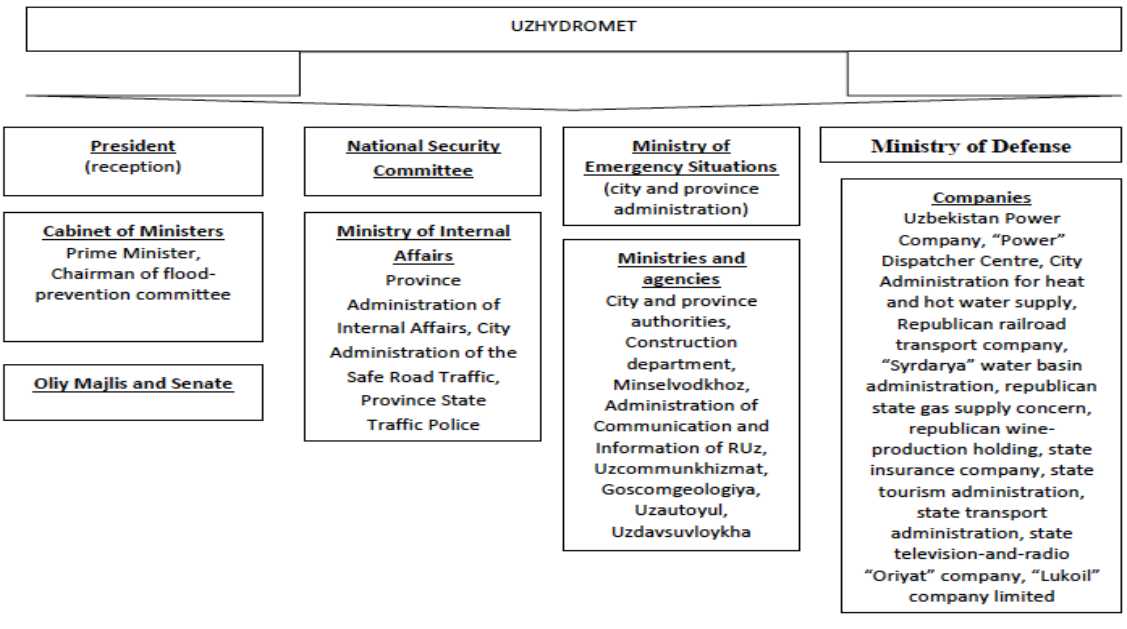


FIGURE 4: METEOROLOGICAL NETWORK OF UZBEKISTAN.

21. The State Emergency Prevention and Response System (SEPRS) defines the system, roles and responsibilities related to the emergency monitoring, forecasting, prevention, early warning and response (EWS is one part of the SEPRS responsibilities). MES is the lead government entity responsible for the overall management, coordination and control over the SEPRS. When there is the risk of hydrometeorological extreme event, Uzhydromet forwards warnings to the MES and other government bodies responsible for decision making (see below diagram of information flow within government agencies). MES is responsible for the distribution of warnings to the population and taking measures to respond to disasters. Public agencies receive warnings about possible storm phenomena, mudflow or avalanches which can cause damage to transport and other communications. For the risk of drought and low water, warnings are forwarded by MAWR. The dissemination of hydrometeorological information in ministries and agencies is by fax and via the internet. However, the dissemination of warnings to the public utilises are done via television, radio, newspapers, the website of Uzhydromet (www.meteo.uz), and SMS messages, with appropriate recommendations for addressing risks e.g. during heat waves, avalanches and mudflows. During mudflows/avalanches, warnings are forwarded to all government bodies responsible for operation and maintenance of roads and recreation activities. Whilst under the (SEPRS), MES can convene representatives of each institution to provide feedback on current risks, this is usually only done when risks are perceived to be high or in reaction to an ongoing crisis. There is no systematic ongoing monitoring of risks in a single environment where all risks can be considered together, which reduces the capability to deal with and identify multi-hazard risks. A detailed analysis of institutional coordination between relevant agencies can be found in sections 3.2 and 3.3 of the FS.



Related projects and synergy analysis:

22. There are several projects directly relevant to this proposal, including:

- the GCF project "Climate Adaptation and Mitigation Program for the Aral Sea Basin (CAMP4ASB)"[18] managed by the World Bank;
- UNDP/Adaptation Fund (AF) project "Developing climate resilience of farming communities in the drought prone parts of Uzbekistan"[19];
- the second phase of the regional CAHM project "Upgrading of Hydrometeorological Services of Central Asian countries (Uzbekistan, Kyrgyzstan and Tajikistan)" implemented by the World Meteorological Organization (WMO) and the World Bank;
- the project "Integrated natural resources management in drought-prone and salt-affected agricultural production landscapes in Central Asia and Turkey (CACILM2)"[20] managed by FAO;
- National Adaptation Planning project under GCF Readiness Programme implemented by UNDP with Uzhydromet (2020-2022) will advance medium- and long-term adaptation planning and will contribute to enhanced coordination mechanism for multi-sectoral adaptation planning and implementation at different levels.

23. The following table provides a summary of related projects including key performance asessment, investment synergies to this proposal and upscale potentials :

#	Project name	Key performance assessment	Synergies with proposed GCF investment	Upscale potental
1	"Developing climate resilience of farming communities in the drought prone parts of Uzbekistan" (2014-2020) focusing on Karakalpakstan region, implemented by UNDP with funding support from Adaptation Fund	The project has passed its midpoint and delivered technical and economic assessments for the Drought Early Warning System (DEWS) in the Amu Darya river and Aral Sea basin (Karakalpakstan), which will serve as a prototype for the proposed GCF investment.	• hydrometeorological observing infrastructure • satellite/earth remote sensing technologies • drought/crop forecasting	Build on the project experience and lessons learnt to expand the coverage of DEWS to two additional river systems in Uzbekistan. (see section 4.2.5.1 of FS for details)
2	Regional CA project "Upgrading of Hydrometeorological Services of Central Asian countries (Uzbekistan, Kyrgyzstan and Tajikistan) – CAHM project" – supported by WMO and the World Bank (on-going)	Four Hydromet agencies (Kazakhstan, the Kyrgyz Republic, Tajikistan and Uzbekistan) have agreed to a common methodology to verify hydromet forecasting accuracy, completed installation of a regional distance learning system, and reached consensus on guidelines and approaches to regional procedures for emergency prevention. Introduction of a cascade method of severe weather forecasting (SWFDP-CA) in Central Asia is ongoing in Uzbekistan.	• regional climate services • weather forecasting • regional training	Use the experience and lessons learned on improvement of monitoring network and capacity building of Uzhydromet staff.
3	A Climate Adaptation and Mitigation Program for the Aral Sea Basin (CAMP4ASB) - World Bank with funding from	The Uzbek component officially started in April 2017. Procurement for the meteorological monitoring equipment initiatied in Tajikistan and Uzbekistan; delivery contracts	• hydrometeorological observing infrastructure	CAMP4ASB project will develop climate change knowledge services for climate change

[18] http://carececo.org/en/main/activity/projects/programma-po-adaptatsii-k-izmeneniyu-klimata-i-smyagcheniyu-ego-posledstviy-dlya-basseyna-aralskogo-/
[19] http://www.uz.undp.org/content/uzbekistan/en/home/operations/projects/environment_and_energy/developing-climate-resilience-of-farming-communities-in-the-drou.html
[20] http://www.fao.org/in-action/cacilm-2/ru/

	GCF (2015-2021) focus on Tajikistan and Uzbekistan	for 50 weather stations and 2 mobile eco-labs signed for Uzbekistan; successfully held the 2nd Central Asia Conference on Climate Change (CACCC-2019, April 3-4, Tashkent, Uzbekistan), and a series (4) of workshops on seasonal water availability forecasting based on snow cover assessment for the staff of national Hydromets; fostered the region's academic research on CC and water resources management in Central Asia; enhanced the competencies on climate and hydrological forecasting of universities' faculties; integration of courses on GIS, climate and hydrological modeling to Universities curricular in CA; as well as launched and supported the Central Asian Civil Society Organizations Coalition on Climate (Central Asian CSO Coalition on Climate or Coalition).		assessments and decision-making. There may be an opportunity to strengthen these by utilizing risk knowledge and information developed through the proposed GCF investment.
4	"Central Asian Countries Initiative for Land Management" (CACILM), a partnership program between the countries of Central Asia and the donor community – FAO supported Due to the fact that the countries of the region showed interest in continuing cooperation under the CACILM program, the GEF has allocated additional funding to start a second phase for regional activities. Turkey also joined the second phase of CACILM.	The project aims to expand the scope of integrated natural resource management (ICMP) to ensure sustainability and adaptation of agriculture to drought risks. Regional components included the following: i) cooperation and exchange of knowledge on drought forecasting and early warning; ii) the economics of land degradation and the valuation of ecosystem services with an emphasis on drought and salinity problems; iii) experience and knowledge sharing At the national level, the project had two components: a) Mitigating the effects of drought in high-risk areas of desertification in the face of climate change; b) Fight against salinization of irrigated lands and mitigation of climate change in the middle reaches of the Amudarya river basin.	• hydrometeorological observing infrastructure • satellite/earth remote sensing technologies • drought/crop forecasting	Engage key stakeholders and end-users to share project experience on drought forecasting and early warning through engagement channels created by NFCS and Climate Outlook Forum
5	National Adaptation Plan (NAP) in Uzbekistan - UNDP in collaboration	Uzbekistan's NDC, submitted in 2017 outlines the country's planning process to strengthen	The main beneficiaries of GCF financing support	The proposed GCF investment will work in coordination with

	with the Uzbekistan NDA and financially supported by GCF	adaptation and mitigation actions including political measures, implementation of climate actions, development of scientific research and education as a priority. The project aims to advance medium- and long-term adaptation planning in Uzbekistan and enable the Republic of Uzbekistan to integrate climate change adaptation requirements into developmental planning and processes. An adaptation financing and investment strategy for Uzbekistan will be developed. NAP was approved by GCF, implementation is due to start.	will be the Center of Hydrometeorological Services (Uzhydromet) as well as stakeholders from 5 key sectors (agriculture, water, health, housing and emergency management) and provincial governments in the three target provinces (Karakalpakstan, Bukhara and Khorezm).	NAP project and facilitate the integration of CC adaptation at national level.
6	"Business Forum of Uzbekistan phase 3: inclusive business models" funded by UNDP/Chamber of Commerce (2014-2017)	Developed partnerships with fruit and horticulture farmers to install weather stations and provide monitoring and services for forecasting pests/diseases and irrigation requirements(http://chamber.uz/en/news/998). Initially the project utilized weather equipment and forecasting services from Austria (IMETOS) and US (ACCUWEATHER). The project is currently working with an Uzbek company to develop local service providers, equipment and information sources.	• hydrometeorological observing infrastructure • inclusive business models and public private dialogue	Use the practices of installation of weather stations for agro-producers and potential benefits and relation to the hydro-stations.
7	UNDP/CCI joint project "Enhancing the adaptation and strengthening the resilience of farming to Climate Change Risks in Fergana Valley" with funding support of Russia-UNDP Trust Fund for Development (2019-2021)	In cooperation with the State Plants Quarantine Inspection installed and established a network of 9 agrometeorological stations for provision of weather forecasts, early warnings on expected disease and pests outbreaks, and recommendations to farmers on advanced agricultural technologies and practices. The project in partnership with the Inspection is going to establish an automated warning/information delivery system to end-users of the services.	• agrometeorological observing infrastructure • automated early warning communication system to end-users	The approach on establishing the automated system and working with small farmers and households will be studied and lessons learned for integration of best practices to the proposed GCF investment.

24. This GCF project will address remaining gaps in the efficiency of hydro-meteorological observation network by introducing automatic data feeds and expanding coverage of the hydrometeorogical monitoring system (by adding hydrometeorological and upper air stations, doppler radars), as well as building the capacity to model hazards, combine with information on vulnerability and exposure, and analyse risks as part of an integrated monitoring, forecasting and dissemination system.

25. In particular, this GCF project proposal will build on the experience of a UNDP/AF project to continue installing/upgrading 25 automatic meteorological stations (AMS) in Uzbekistan. As a result of the modernization and improved efficiency of meteorological information transfer, Uzhydromet is expected to see a number of direct and indirect economic benefits, including an estimated increase of revenue from specialized services by 10% through the creation of a database archive. This proposal also seeks to expand the coverage of Drought Early Warning

System (DEWS) – developed by UNDP/AF project for the Amu Darya river and Aral Sea basin (Karakalpakstan), to two additional river systems in Uzbekistan. The GCF proposal will also strengthen the "last-mile delivery" of disaster-related communication and user-interaction with communities at risk, an outreach gap that was identified in the UNDP/AF project as "insufficiently covered due to limited budget" (see Feasibility Study, Sections 3.4 and 4.2.5.1 for detailes on the baseline projects; see Annex 11 for mid-term review of the AF project).

26. Details of related projects can be found in section 3.4 of FS.

Barriers to a more effective generation and use of climate information for climate risk management:

27. The current national EWS is inadequate to secure effective climate risk management in the face of increasing climate change impacts due to a number of barriers and gaps. The barrier analysis is summarized below according to the first three elements of the UNISDR framework for Early Warning Systems: risk knowledge, observation, monitoring and forecasting, and dissemination and communication of risk information and warnings. In this proposal, we focus on these three elements because: a) they are the most under-utilised and inefficient aspects of the current national system; b) the response capacity (the 4th component) is well-coordinated (between MES and other humanitarian actors e.g. IFRC) and funded; c) in order to move from a currently reactive (ex-poste) to a proactive (ex-ante) system, the first three components need to be strengthened; d) given limited resources under the SAP funding window, it is more cost-effective to focus on the first three components.

28. A feasibility study has been conducted in the preparation of this project and a number of gaps and barriers have been identified to the implementation of an effective impact-based MHEWS in Uzbekistan:

29. *Insufficient national technical capacities for hydro-meteorological monitoring, modelling, risk assessment and mapping.*

30. Uzhydromet has insufficient technical capabilities, ageing and inadequate equipment and software for data gathering and processing, inefficient data collection channels for real-time monitoring, risk assessment, mapping and impact forecasting based on the distribution of population, assets and infrastructure. Presently most of the surface monitoring equipment deployed by Uzhydromet is manually operated and not adequate for real-time relaying of observations of rainfall, temperature, snowfall, river flows and dam levels, for early warning of observed hazards. Coverage of eastern high mountainous areas, where several hazards are prevalent, is also limited. Advanced remote sensing technologies and methods for monitoring and assessing risks beyond the current coverage of existing observation sites (which are located based on current risks), are not utilized extensively. The capacity of national institutions to use and apply complex and data-intensive hazard modelling (for mudflows, floods, hydrological droughts and landslides) and assessment tools for monitoring and analysis of associated risks is another significant barrier. Previous and ongoing technical assistance to Uzhydromet has helped to address some of these barriers (e.g. investment in AWS etc.), but there remain gaps largely because: i) a lack of available government funds to upgrade equipment (though sufficient to maintain existing infrastructure); ii) investment has been mostly linked to project-specific geographic areas.

31. Specific technical barriers include:

32. Limited accessible, reliable and up to date monitoring data on weather/climate, hydrology and geophysical processes (to be addressed by Activity 1.1);

33. Limited use of remote sensing technologies (currently using MODIS) to improve coverage of areas not monitored through surface/field equipment e.g. EU COPERNICUS data (to be addressed by Activity 1.3);

34. Interpretation of some climate-related hazards (landslides, avalanches and mudflows) is currently undertaken through a process of expert review, without models/tools to help synthesize all available information e.g. landslide/mudflow risk models and visualization/GIS systems to intersect hazard forecasts with social vulnerability data to identify risks (to be addressed by Activity 1.2 and 2.1);

35. Insufficient information about transboundary hazards and risks (80% of floods and mudflows are formed outside of Uzbekistan). There are legal and institutional arrangements in the form of bilateral agreements between the National Hydrometeorological Services of the neighboring Central Asian states on the disaster data sharing and warning. However, there are significant capacity constraints on using remote sensing (though MODIS is used to determine Pamir/Tien Shan high altitude snowpack affecting river discharges etc.), GIS technologies (for analyzing risks), data processing and hazard-specific modelling tools (to be addressed by Activity 1.2); and

36. Uzhydromet takes part in the regional climate outlook forum (NEACOF) but national and sub-national climate outlook forums are infrequent (to be addressed by Activity 3.1).

37. *Insufficient institutional and technical capacities for timely multi-hazard forecasting and early warning, as well as effective communication and dissemination of disaster-related information.*

38. The generation and dissemination of hydrometeorological data is centralized at Uzhydromet, making it difficult for other ministries to directly access the data without putting in official request. This further restricts the innovative use of data, for example in real-time applications by other government agencies. The effectiveness of a multi-hazard forecasting and early warning system thus relys on the capacity of Uzhydromet to translate hydrometeorological information into hazard-related information (e.g. hydrological drought, mudflow and flood occurrence etc.), and also on the capacity of MES to coordinate the dissemination and inter-agency responses of multi-hazard forecasting and early warning, using various communication channels at national and regional levels.

39. At present, MES requires its regional offices to seek approval from the central office before responding to any reported hazards, which slows down response times. Existing organizational structure of MES, due to its relatively small number of personnel, does not ensure the full-scale coverage and effectiveness of emergency response and prevention measures. Warnings and advisories are not tailored to user needs and, as forecasts do not always indicate the area at potential risk, the messages are not geographically-specific. Moreover, warnings do not contain specific information on the potential impacts, nor do they identify specific thresholds of danger/risk which can be used to warn communities or trigger forecast based actions.

40. The lack of site-specific forecasts and risk information also hinders MES to adopt a more pro-active approach on prevention/mitigation of damages and losses, as compared to the current reactive (ex-poste) process to disasters after they have occurred. Whilst there has been some work with communities in Karakalpakstan to utilise forecasts of hydrological drought and with communities to understand and respond to earthquakes, there has been limited interactions with communities on how to interpret and respond to warnings on climate-related hazards in the eastern regions.

41. The following key gaps need to be tackled through GCF investments and co-financing:

42. Within Uzbekistan Regional (provincial) Crisis Management Centres (RCMCs), there is a lack of IT and communication facilities and access to critical and up-to-date information of climate-induced hazards and response measures, as well as communication boards to be able to warn the public, which limits their capacities to assess, communicate and proactively respond to evolving situations (to be addressed by Activity 2.3);

43. Limited skilled and qualified staff to run/programme hazard forecast models, manage IT systems and utilize tools for dynamically assessing risks (combining up to date information on vulnerable populations, assets and infrastructure). This can be addressed using either cloud-based servers and infrastructure or local servers and IT infrastructure. Given the nationally sensitive nature of some of the data (e.g. asset and infrastructure exposure) the latter is preferred by GoU (to be addressed by Activity 2.2);

44. Regulations and inter-agency coordination are largely based on information gathered through disaster-management structures e.g. Malhallas (local social institutions, serving as the link between central government and communities), and the media, as well as reports through different ministries. With real-time monitoring and forecasting networks in place, these will need to be reviewed and upgraded to allow for an effective climate risk management and real-time early warning system: risk assessment methodologies (including thresholds for forecast based actions), technical guidance and regulations, national communication and warning protocols. This includes procedures to account for improvements in efficiencies of data transmission, hazard analysis, and SOPs to define forecast based ex-ante roles and actions, as well as capacity to handle increased communications from the public (crowd sourcing) (to be addressed by Activity 2.1 and 2.2);

45. Currently the revenue generation of specialized hydrometeological services at Uzhydromet (refer to FS section 4.1.1) makes up only 6.5-8.3% of its annual budget, with civil aviation and transportation being the largest customers. Uzhydromet has developed clear income streams yet paid services are infrequent. With improved monitoring and information storage capability, Uzhydromet can grow revenue from selling specialized services to business and agriculture users. MES is open to promote public private partnership in the delivery of early warning services, however the lack of a value-chain approach to identify business needs and priorities might hinder scale-up efforts (to be addressed by Activity 3.2);

46. Dissemination of warnings, alerts and “last-mile” communication to targeted areas and populations: currently MES uses mobile technologies to distribute SMS alerts to the whole population, but not targeted to mobile phones in the location of the predicted/observed hazards. Public message boards are used successfully in remote mountain areas with limited mobile coverage. However, these boards are only found in a few locations and do not cover all high risk areas (to be addressed by Activity 3.3); and

47. Communities have limited capacities to effectively utilize and understand climate hazard related information and advisories, including their options in responding to a hazard. Thus, there is a critical need to strengnthen the co-design and co-production of disaster-related information with key stakeholders and end-users, through engagement channels created by National Framework for Climate Services (NFCS) (to be addressed by Activity 3.1 and 3.3).

B.2. Project/Programme description (max. 1,000 words)

48. The **project objective** is to enhance the efficiency and coverage of multi-hazard early warning system for climate change induced hazards in Uzbekistan in view of the projected climate change impacts. The approach combines principles articulated in the Global Framework for Climate Services (GFCS) with a 'value-chain' approach to target specific weaknesses in the delivery of early warning services, given the specific modes of operation, current infrastructure, technical capacities and institutional arrangements in Uzbekistan. The project will introduce the impact-based MHEWS based on the socio-economic risk modelling and will explore and facilitate elements of forecast-based financing as an innovative paradigm-shifting approach to the use of climate data in decision-making. In particular, the project will:

    a. Improve methods and data/models used to monitor and forecast variables needed to derive climate characteristics;
    b. Develop the capacity of national agencies to model climate-related hazards (hydrological drought, landslides, mudflows and avalanches) and to utilize modern weather and seasonal forecasting techniques;
    c. Expand areas and geophysical/biophysical observations using satellite-based remote sensing (including the monitoring of precipitation, vegetation, snow cover and landslip/slides) to monitor and assess hazard risks over extensive regions of Uzbekistan, especially those regions where it is impractical to place observational equipment;
    d. Introduce a socio-economic risk and vulnerability modelling as an integral element of the impact-based multi-hazard EWS;
    e. Create a central repository/facility incorporating an advanced information management system for the management, forecasting and monitoring of hydrometeorological processes;
    f. Enhance the regulatory framework, coordination and institutional mechanisms for an effective impact-based MHEWS and promote better regional cooperation for managing transboundary risks through existing and new regional coordination platforms; and
    g. Strengthen the "last mile" delivery of disaster-related communication and interaction with end users, in particular those in the communities with highest risks in Uzbekistan.

49. In order to transform the current EWS in Uzbekistan from a reactive system to one based on preventive warnings ahead of an event, it is necessary to:

    i) improve the efficiency in collecting and generating/forecasting weather and climate information; and
    ii) develop methods and operational systems which translate weather/climate information/forecasts into actionable warnings and disseminate them to users who understand their content and how best to react.

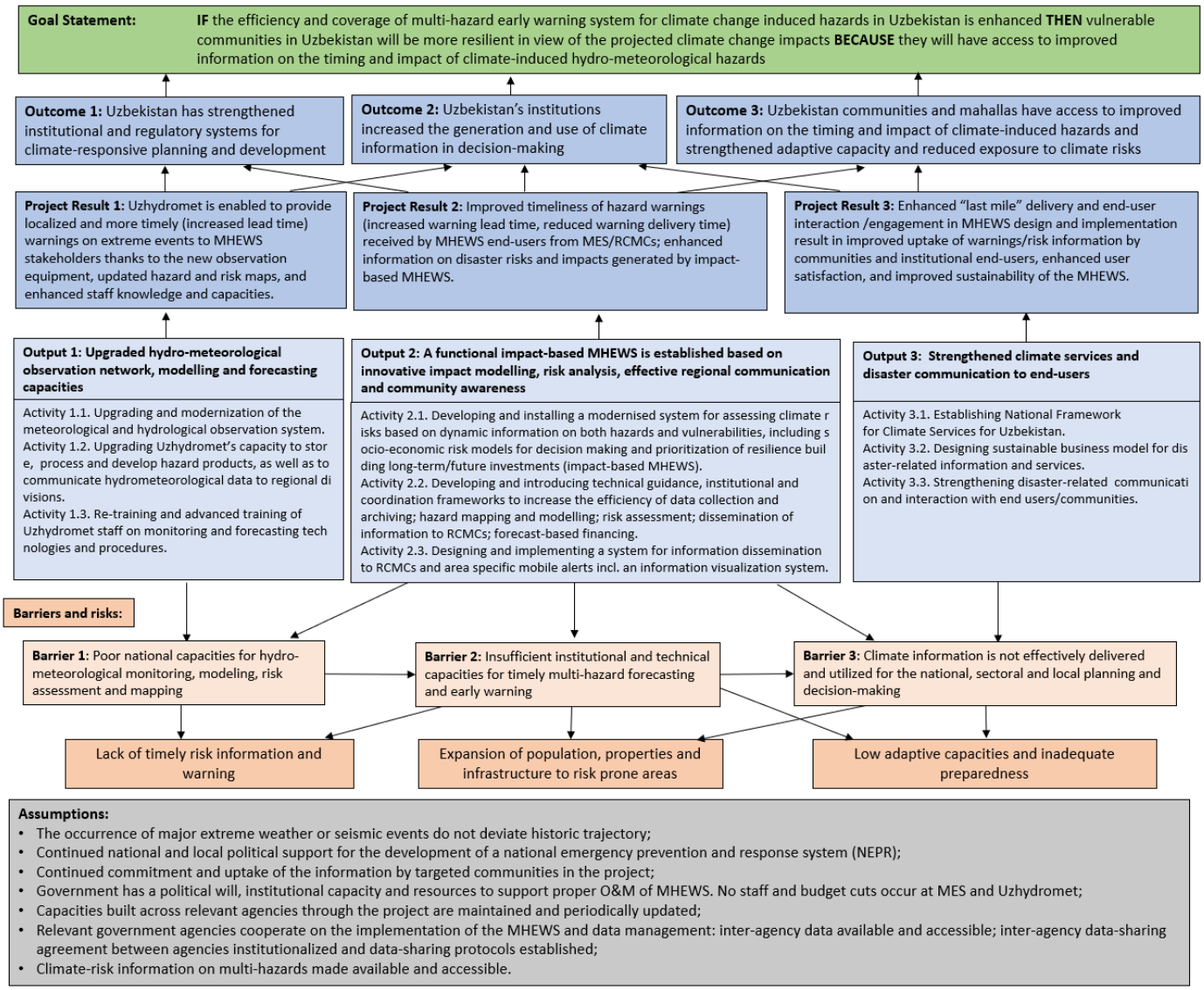
50. Output 1 will address the first element by investing in automatic hydro-meterological monitoring infrastructure required for the generation of hazard-specific forecasting and risk models. Output 2 and Output 3 focus on the second aspect, building the systems and modelling capacity to generate impact-based forecasts[21,22], creating dissemination channels to first responders and communities through updated communication technologies to enable real-time risk analysis and evaluation, as well as working with communities at risk to be able to interpret, understand and react to those warnings.

51. Building upon the feasibility analysis, this proposed project will address risks of avalanches, flooding, droughts, landslides, and mudflows. This project is designed to enhance the capability of detecting, monitoring, analysis and forecasting of these climate hazards in Uzbekistan, and develop impact-based risk knowledge products to enable warning dissemination and forecast-based actions in targeted areas. More specifically, the project has identified 15 districts located in seven provinces in eastern Uzbekistan as hazard-prone target regions. They are: Qoichirchik, Bostanlik, Sirdarya, Saihunabad, S. Rashidov, Gallaaral, Bulungur, Jambai, Koshrabad, Kitab, Yakkabag, Dehkanabad, Chust, Turakurgan, and Dangarin. The establishment of an effective MHEWS will allow the creation of geographically explicit risk maps with vulnerablity assessment on population, assets and infrastructure in target regions. Business sectors such as aviation, transport, agriculture (water irrigation services), insurance will likely

[21] https://public.wmo.int/en/resources/bulletin/impact-based-forecasting-and-warning-weather-ready-nations
[22] https://www.wmo.int/pages/prog/www/DPFS/Meetings/ET-OWFPS_Montreal2016/documents/WMOGuidelinesonMulti-hazardImpact-basedForecastandWarningServices.pdf

benefit from improved hazard forecasting and alerting services to prevent potential disruption of services, delays and loss of agricultural productivity and incomes in target regions.

Theory of Change Diagram



Output 1: Upgraded hydro-meteorological observation network, modelling and forecasting capacities

52. The proposed intervention will create a more efficient monitoring network for weather, climate, hydrology and cryosphere, through both upgrading existing (automating) and installing new monitoring equipment (automatic weather stations (AWS), automatic hydrological stations, upper air sounding stations, and strategically placed low cost radars. This equipment and other existing data streams will be integrated into high availability/redundant single databases. Hazard-specific forecasting procedures will be developed and operationalized for climate-induced hazards. Training of Uzhydromet staff to undertake forecasting, operation and maintenance and data QA/QC/archiving procedures will also accompany these activities. Activities follow the GFCS and in this output are designed to address aspects related to: i) observations and monitoring; and ii) research, modelling and prediction. Uzhydromet will be the immediate beneficiary under all activities of Output 1, while their end beneficiaries include all the users of the upgraded hydro-meteorological observation network, modelling and forecasting capacities.

53. **Activity 1.1** Upgrading and modernization of the meteorological and hydrological Observation System. This will include upgrading/automation of 25 meteorological observation stations and equipment (software, workstations etc), modernizing the ground-based infrastructure (telemetry processing, hydrogen generators etc) for 2 upper-air stations (Uzhydromet/GoU will support the establishment of 2 more), installing 2 online X-band doppler radar systems to cover current gaps in mountainous areas, upgrading and technical equipment of 90 hydrological

stations , and establishing benchmarks and up to date equipment for instrument calibration (vacuum chambers, mobile laboratory etc). AWS and hydrological stations will be installed/upgraded at existing facilities and premises of key locations in the mountains above hazardous valleys and in the areas of high precipitation/landslides/mudflow risks, not already covered by investments through the CACILM and CAMP4ASB projects, as shown in Figure 46 (page 66) of the FS. Uzhydromet is strongly engaged with the WMO and maintains its standards and compatibility with existing systems. In particular it requires that goods and service comply with WMO 2003 Guidelines on Climate Observation Networks and Systems (TD No. 1185) and WMO Guide to Meteorological Instruments and Methods of Observation (the CIMO Guide No. 8, 2014 edition / 2017 update). These requirements will be taken into account during project implementation, and demonstrated compatibility with existing systems is part of any procurement (ITB/RFQ) tender documents under UNDP processes. All equipment will report data to central servers at Uzhydromet and will conform to WMO standards, including reporting to the Global Climate Observing System (GCOS), Global Basic Observing Network (GBON) and Global Telecommunication System (GTS). The project will also assist the government to identify long-term requirements and to enable budgeting and planning for the maintenance of all observing systems.

54. **Activity 1.2** Upgrading Uzhydromet's capacity to store, process and develop hazard products, as well as to communicate hydrometeorological data to regional divisions. This is a climate services information system (as described in GFCS) and involves the establishment of an operations centre, ICT servers and networking equipment to integrate data streams (hydrometeorological and satellite-based observations) and automate processes and analyses (including hazard forecasts). Software and processing routines will enable data and maps to be exported in common formats for sharing with partners and importing into the MES risk management system (see activity 2.1 below). A local cloud-based solution will be implemented to store and manage data that will benefit from offsite backups and easier access for the MES risk management system. Specifically this activity will: i) Integrate hydrometeorological data (from both automatic and manually operated stations) into a single database as a basis for developing products based on all available observed data. Automatically transmitted data from different providers/manufacturers will be integrated and undergo quality control/assurance within a single database in real time and will be available for interrogation via geo-visualization software. This activity will also: i) Expand the hydrological drought early warning system for Amu Darya (developed by the UNDP/AF project) to the Syr Darya and Zeravshon rivers. All historical streamflow and flood data for the two rivers will be collected and forecast models, with data ingestion and data processing routines, will be derived; ii) Develop automatic procedures for calculating avalanche risk in real time. Software and code will be developed to automatically update avalanche hazard maps based on snow accumulation from satellites (and AWS) and established procedures for estimating avalanche extent; iii) Develop code and procedures for automatically calculating mudflow risk maps based on precipitation observations and forecasts for 2-3 days lead time; iv) Develop a landslide risk model for Eastern Uzbekistan based on geophysical and geotechnical characteristics, including subsurface water and extreme rainfall. The skill of all developed forecast systems will be assessed using retroactive forecasts and used to assess their utility for forecast based actions in activity 2.1 and 2.2.

55. **Activity 1.3** Re-training and advanced training of Uzhydromet staff on monitoring and forecasting technologies and procedures (training of MES staff is covered in output 2 below). International experts will train weather forecasters to work with new products of the KOSMO model (with a resolution of 13 km and 2 km). Refresher courses and advanced training will be provided for new software and equipment, including the introduction of new methods for the analysis and prediction of hydrometeorologically important variables and climate hazards. The project will facilitate organization of on-the-job trainings, engagement with universities, courses and seminars with the involvement of foreign specialists. Training of IT specialists of Uzhydromet will be conducted for work with the computer center and operation of the KOSMO model, the UNIMAS, MITRA information reception and transmission system, workstation software (for weather forecasters, agrometeorologists, GIS-METEO, etc.) and EU Copernicus programme on satellite data, all of which will be used for impact-based forecasting where needed. Trainings on AWS installation, general user training and technical support will be provided. These increased capacities will also assist Uzhydromet in fulfilling its regional role as a WMO RMSC, in accordance with the GFCS capacity development, and help improve their capacity for regional cooperation.

Output 2: A functional impact-based Multi-Hazard Early Warning System is established based on innovative impact modelling, risk analyses, effective regional communication and community awareness

56. The proposed intervention will integrate and develop ICT systems to use the hydro-meteorological hazards predicted in output 1, and combine these with vulnerability data to identify risks and provide information for planning and mitigating their impacts. It will improve the efficiency of the current early warning system by automating the sharing and production of risk-related data, as well as the communication of warnings. The project will also develop

methodologies for and support hazard and risk mapping and risk zoning for key climate-induced hazards (floods, landslides, mudflows, droughts and avalanche). Specifically it will introduce an advanced, impact-based information management system for combining data on socio-economics (population, livelihoods, poverty indicators), infrastructure (roads, utilities, buildings, bridges etc) and the natural environment (landcover, vegetation, soils etc) in order to operationally assess the risks associated with each hazard forecast. This information will be transmitted and shared with RCMCs in key hazard-prone districts in Uzbekistan so that regional teams have the most up to date information available for planning their operations. Building on the existing mobile-based public dissemination platforms, the project will develop geographically specific risk based warnings tailored to the areas affected by each hazard (e.g. mudflows, avalanches, landslides and flooding). Based on the user interaction guideline of GFCS, inputs from consulations with key stakeholders and end-users (activities 3.1 and 3.3) will inform the design and dissemination of warnings and alerts to communities at risk. MES and its RCMCs will be the immediate beneficiaries under all activities of Output 2, while their end beneficiaries include all the users of the Multi-Hazard Early Warning System.

57. **Activity 2.1** Developing and installing a modernised and efficient system for assessing climate risks based on dynamic information on both hazards and vulnerabilities, including socio-economic risk models for decision making and prioritization of resilience building long-term/future investments. This would enable establishing an impact-based MHEWS, where hazard forecasting is linked to the risk and exposure information (socio-economic risk model). This involves installing both hardware and software to enable an advanced, impact-based information management system to be built, which will combine data on current vulnerabilities (e.g. indicators of poverty, education, health, housing etc), public and private assets (including infrastructure, roads, railways, housing, mines, airports, hospitals, schools etc), the environment (crops, lakes, rivers, tourism areas etc) and hazard impacts (input from Output 1) to operationally assess the risks associated with each hazard forecast. Based on evaluated risks and the skill of each impact-based forecast, a set of feasible ex-ante actions will be identified for different lead times. This activity will also develop software and standard operating procedures to automatically ingest hydrological and meteorological observations, weather and seasonal forecasts, and derived drought/avalanche/mudflow/landslide forecasts from Uzhydromet (through activity 1.2) into the system to be combined with available vulnerability data. Traning to MES staff will be delivered on risk assessment, operations and maintenance of the systems. The system will also import long-term climate change scenarios to be used for forward planning and evaluation of future risks.

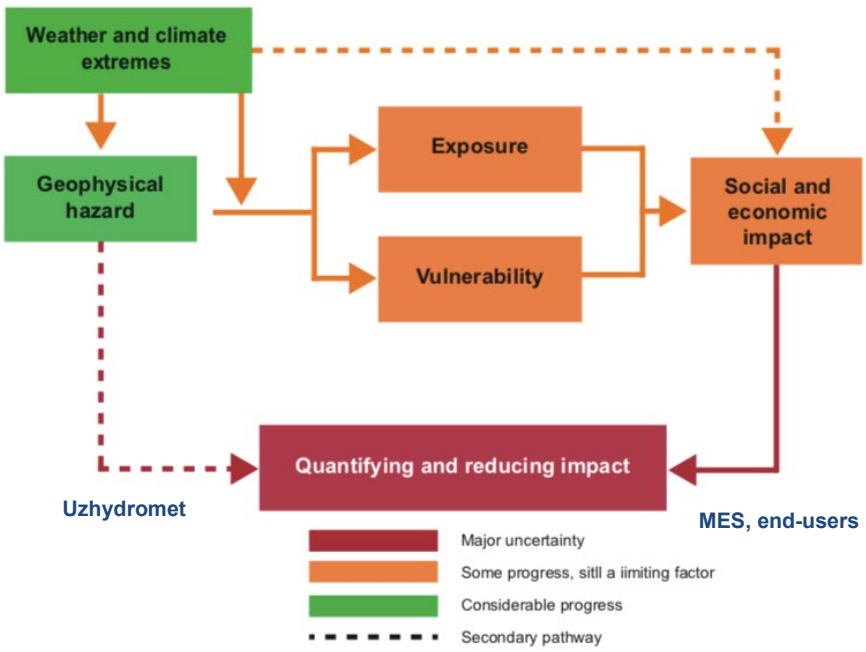


Figure 5: From WMO Guidelines on Multi-Hazard Imact-Based Forecast and Warning Services

58. **Activity 2.2** Developing and introducing technical guidance, institutional and coordination frameworks to increase the efficiency of: i) data collection and archiving (activities 1.1 and 1.2); ii) hazard mapping and modelling (activity 1.2); iii) risk assessment (activity 2.1); iv) impact-based warning and forecast-based actions (activity 3.2); and v) dissemination of information to RCMCs (activity 2.3). These protocols are also required to ensure that new climate

information sources (e.g. AWS, AWLS, radar and satellite observations – activity 1.1) are translated into products that are useful for decision making and investment by MES and Uzhydromet (based on feedback obtained through activities 3.1 and 3.3). Thus, under this activity the project will explore and facilitate promotion of forecast-based-financing (FBF) by developing draft SOPs and prototype FBF protocols/decision-making systems. This activity will include development of SOPs (both for ingesting and sharing data, as well as for forecast based actions to be undertaken when specific risk-related triggers/thresholds are reached), a national to regional EWS protocol, and communication protocols to accompany introduction of the new technologies. Guidance and procedures will be developed to support the application of socio-economic risk models and enhanced risk zoning in development planning and decision-making (activity 2.1). Corresponding training to MES staff will be delivered.

59. **Activity 2.3** Designing and implementing a system for information dissemination to RCMCs and area specific mobile alerts including an information visualization system for RCMCs with software. This involves setting up information visualisation and analysis systems (video walls, telecommunication systems, servers and ICT storage) at 7 RCMS, to enable them to visualise the maps and impact forecast information provided through the risk analysis and warning system (activity 2.1) and combine it with local (regionally available) information on current vulnerabilities and field-based information. This will enable them to better target advice and direct regional response teams. This activity will further develop (improving the existing MES dissemination system) area-specific mobile and SMS based warnings for mudflows, avalanches, landslides and flooding. This will reduce the chance of false alarms sent to those not at risk, as well as improve the content based on information from the improved MES risk and impact-based forecast system (activity 2.1 and 2.2). Inputs from consulations with key stakeholders and end-users (activities 3.1 and 3.3) will be used to design the dissemination system, following the co-design and co-production user interaction guideline of GFCS.

Output 3: Strengthened climate services and disaster communication to end users

60. The proposed intervention will strengthen the effectiveness of delivering climate information services and disaster warnings to users in Uzbekistan at two levels. On the overall national level, the project will initiate the establishment of the National Framework of Climate Services as a mechanism to systematically bring together producers and users of hydrometeorological and climate information and to ensure that information and services reach their end recipients both in the various sectors of the government and the society and at the different geographic levels down to local communities. Disaster-related information and services being the specific focus of the project, it will work with the various public and private stakeholders to reorient the existing financial / economic model behind the provision of such services to make it more cost-efficient and sustainable in the long-term, i.a. using private investment and partnership opportunities on the domestic and the international markets. Finally, on the warning dissemination and communication aspect, updated communication technolgoies will be utilised to support real-time risk evaluation by Regional disaster managemen agencies (RCMCs) and first responders and ensure ‘last-mile’ delivery of early warning risk information to the communities at risk and population at large. In collaboration with Red Crescent Society and other community-level NGOs, RCMC will organize trainings and annual community forums to help communities at risk better interpret, understand and react to those warnings, as well as facilitate forecast-based actions and responses. Uzhydromet (and, in the long run, other parts of the Government of Uzbekistan, as well as other providers and users of climate services) will be the beneficiaries under Activity 3.1, as the NFCS provides a platform where the various service providers and end-users are engaged in the co-designing, testing and co-production to improve the content and delivery of products and services. Uzhydromet and MES (and Uzbekistan’s Government in the long run) will be the beneficiaries of Activity 3.2, as the development and promotion of a sustainable business model for disaster-related information and services in Uzbekistan will provide additional operational funding to the two institutions which currently to a large extent rely on government budgets. MES and its RCMCs as well as the communities in the 15 targeted districts as well as Uzbekistan’s population at large will be the beneficiaries under Activity 3.3.
61. **Activity 3.1** Establishing National Framework for Climate Services for Uzbekistan
The Global Framework for Climate Services (GFCS), promoted and facilitated by the World Meteorological Organization in cooperation with GFCS partner organisations, is a framework that envisions better risk management and more efficient adaptation to climate variability and change through improvements in the quality, delivery and use of climate-related information in planning, policy and practice. GFCS, i.a. endorsed by the GCF Climate Services Strategy, focuses on developing and delivering information services in agriculture and food security, disaster risk reduction, energy, health and water, and organises its work around observations and monitoring; climate services information systems; research, modelling and pre- diction; user interface platforms; and capacity development. A strong focus of GFCS is on a multi-stakeholder approach to the definition and the actual delivery of services, thus bringing users and co-producers of climate and hydrometeorological information together and to

the centre of the design and production process as opposed to more traditional supply-driven approaches. The establishment of the NFCS would typically involve:
i) an assessment of gaps, needs and user perspectives (i.a. through interviews) with respect to the current and desirable climate services;
ii) based on this assessment, the drafting of NFCS Uzbekistan concept and action plan;
iii) extensive consultations regarding the concept with the various sectors, users and co-producers of climate services; and
iv) reaching a broad agreement and Governmental endorsement for NFCS implementation.

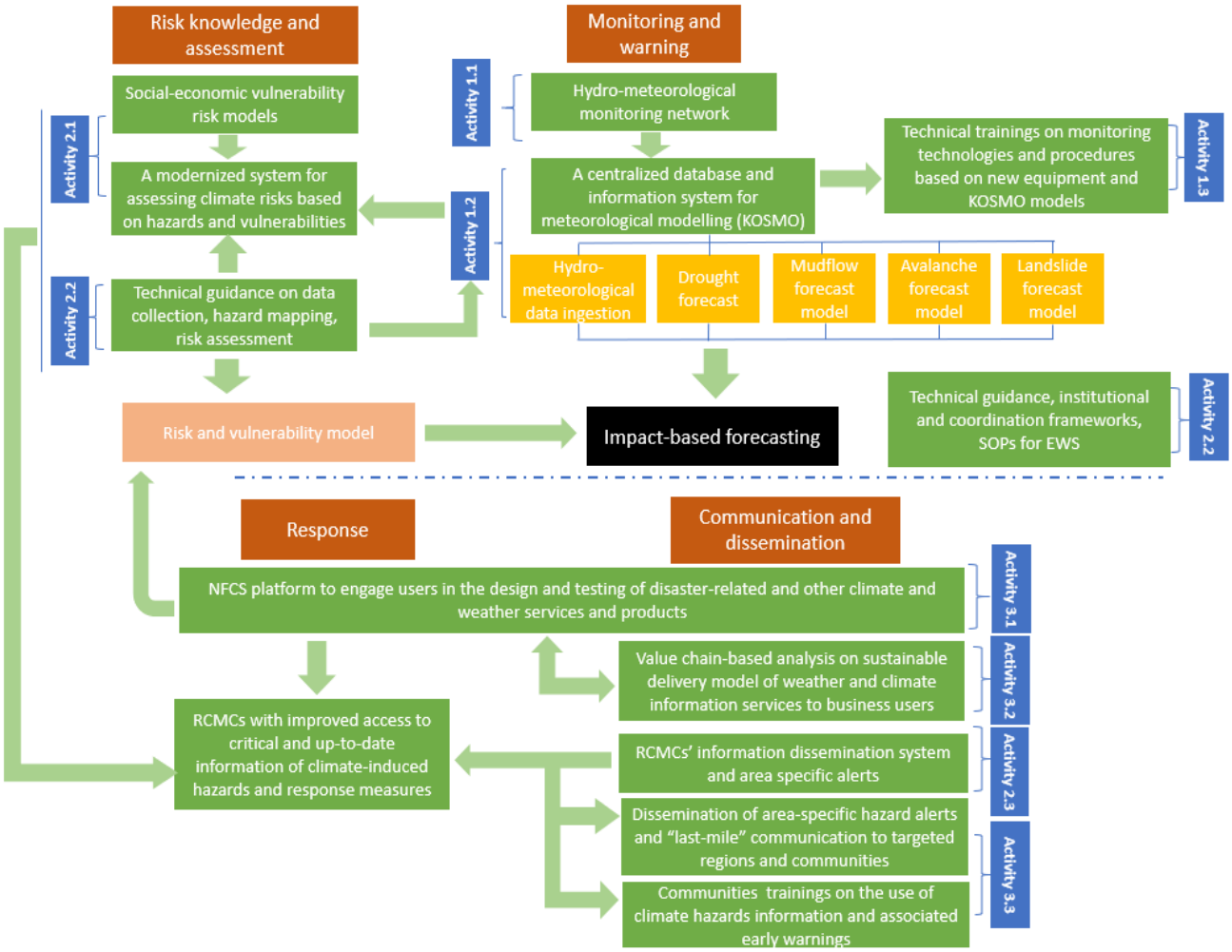
62. Following an accepted WMO blueprint for the conceptualising and establishment of a NFCS, the project will undertake a baseline assessment of climate services in Uzbekistan, followed by multi-stakeholder consultations and the participatory development of the country's NFCS concept and Action Plan to be endorsed both by stakeholders and at the high executive level, ready for implementation once supplementary NFCS-earmarked funds become available as a follow-up to the project.

    As part of this activity, a platform will be set up to engage end users in the design and testing of new disaster-related climate information services and products. Similarly, a National Climate Outlook Forum will be established and supported as one mechanism to help shape and deliver climate services with longer time horizon, i.a. with a particular focus on disasters such as hydrological droughts. A connection will then established between the Forum and WMO's Regional Climate Fora operating in Europe (NEACOF) as well as Asia (FOCRAII). Both the NFCS user dialogue platform and the National Climate Outlook Forum will (as well as the NFCS process at large) will be managed by Uzhydromet.
63. **Activity 3.2** Designing sustainable business model for disaster-related information and services
    While it may not be realistic to expect any significant level of private financing during project implementation given the existing public service management model and the time required for transition, there is long-term potential for private sector investment in climate information services and for expanded service provision to private sector based on enhanced hydrometeorological and climate information in Uzbekistan, including those related to natural disasters and early warning. Linked to the NFCS process above, the project will conduct a comprehensive analysis and discussion of long-term sustainable financing options for disaster-related services in Uzbekistan beyond current state-funding model, in particular drawing on blended finance through dedicated national funds and public-private partnership opportunities. This will include seeking financing, from both public and private sources, for forecast based (ex-ante) actions identified in activities 2.1 and 2.2. Based on the analysis and consultations, a sustainable value chain-based business model for disaster-related information will be developed and agreed with the key stakeholders, and the necessary legal and organisation changes will be outlined and planned on the national (adjustment of legislation) and the inter-institutional levels (Uzhydromet, Ministry of Emergency Situations, users of the services, private investors).
64. **Activity 3.3** Strengthening disaster warning dissemination and communication with end users
    The project will significantly strengthen interaction with the end users with the aim to communicate and facilitate proactive responses to disaster information and warnings in Uzbekistan. Within the 15 RCMCs, outdoor communication boards[23] will be set up in identified communities at highest risk to alert and inform the population in real time about threats or emergencies, following which, through cooperation between MES RCMCs and the Red Crescent Society, communities will be trained to interpret and use information on climate hazards and early warnings. Printed visual information (leaflets) will be provided to RCMCs and Uzbekistan's communities on climate hazards and associated early warnings. With expected increase of user interaction level, regional staff of MES RCMCs will be further trained in the effective use of this information to suppport community interactions (crowd sourcing and survey data) and formulate forecast-based actions following the guidelines developed in Activity 2.2. Similarly, easy-to-understand and visual information will be channelled to mass media through existing agreements between them and MES / Uzhydromet, as well as to national NGOs. Finally, this activity will also complement the prior Activity 2.3 in the development of region-specific (as opposed to the currently used national-wide) broadcasting of early warnings, with the use of other modern communication channels such as social media and electronic

[23] These are physical boards used to relay warnings and messages, to be installed/set up by MES in targeted districts (including in hazard-prone areas with limited mobile receptions or not immediately reachable by a Regional Crisis Management Center). Boards will be installed in popular public places used by communities or on regular commuter transport routes.

messenger subscription groups. In addition, the project will establish a platform for organizing annual community forums on community-based EWS engaging target communities and representatives of vulnerable groups to exchange information, lessons learned, successes and opportunities. Through such platforms regular competitions will be organized engaging both youth and the most active community representative to advocate for structural and non-structure mesures and ensure their inclusiveness.

CONCEPTUAL DIAGRAM OF THE IMPACT-BASED MHEWS



B.3. Implementation / institutional arrangements (max. 750 words)

65. The project will be implemented following UNDP's National Implementation Modality (NIM), according to the Standard Basic Assistance Agreement between UNDP and the Government of Uzbekistan (10 June 1993) and the policies and procedures outlined in the UNDP Programme and Operations Policies and Procedures (POPP) (see https://info.undp.org/global/popp/ppm/Pages/Defining-a-Project.aspx)

66. The Executing Entity for this project is the Government of Uzbekistan acting through the Ministry of Emergency Situations of the Republic of Uzbekistan (MES). **MES** is accountable to UNDP for managing the project, including the monitoring and evaluation of project interventions, achieving project outcomes, and for the effective use of UNDP resources. As stated in Financial Regulation 27.02 of the UNDP Financial Regulations and Rules, an Executing Entity (or „Implementing Partner" in UNDP terminology) is "the entity to which the Administrator has entrusted the implementation of UNDP assistance specified in a signed project document along with the assumption of full responsibility and accountability for the effective use of UNDP resources and the delivery of outputs, as set forth in such document." By signing a project document an Executing Entity enters into an agreement with UNDP to manage the project and achieve the results defined in the relevant documents. The accountability of an implementing partner is to:

- Report, fairly and accurately, on project progress against agreed work plans in accordance with the reporting schedule and formats included in the project agreement;

- Maintain documentation and evidence that describes the proper and prudent use of project resources in conformity to the project agreement and in accordance with applicable regulations and procedures. This documentation will be available on request to project monitors (project assurance role) and designated auditors.

67. UNDP, in agreement with the GoU, will provide implementation support (support to NIM) as agreed in the Letter of Agreement on Support Services signed between MES on behalf of the GoU and the UNDP. Such project support services include procurement support and payments to vendors. The selection, engagement and payment with respect to each vendor shall be carried out by UNDP in accordance with the annual work plans, procurement plans and budgets established and approved by the Executing Entity. See the *Funding Flow Diagrame* and the *Project Implementation Diagrame* below. UNDP will also provide oversight through the Country Office in Uzbekistan, and BPPS/UNDP Nature, Climate and Energy Unit in Istanbul and HQ.

68. UNDP provides a three – tier oversight and quality assurance role involving UNDP staff in Country Offices and at regional and headquarters levels. This includes management of funds, programme quality assurance, fiduciary risk management, timely delivery of financial and programme reports to GCF and other requirements as per the AMA.The quality assurance role supports the Project Board by carrying out objective and independent project oversight and monitoring functions. This role ensures appropriate project management milestones are managed and completed. Project Assurance must be independent of the Project Management function; the Project Board cannot delegate any of its quality assurance responsibilities to the Project Manager. The project assurance role is covered by the accredited entity fee provided by the GCF. As an Accredited Entity to the GCF, UNDP is required to deliver GCF-specific oversight and quality assurance services including: (i) Day-to-day oversight supervision, (ii) Oversight of project completion, (iii) Oversight of project reporting. UNDP's responsibilities are outlined in the AMA that has been entered into between GCF and UNDP and will also be outlined in the FAA for this project. The FAA and AMA will govern UNDP's responsibilities for GCF. The 'senior supplier' role of UNDP is to represent the interests of the parties, which provide funding and/or technical expertise to the project (designing, developing, facilitating, procuring, implementing) and is covered by the accredited entity fee provided by the GCF. The senior supplier's primary function within the Board is to provide guidance regarding the technical feasibility of the project. Furthermore, as the Senior Supplier, UNDP provides quality assurance for the project, ensures adherence to the NIM Guidelines and ensures compliance with GCF and UNDP policies and procedures.

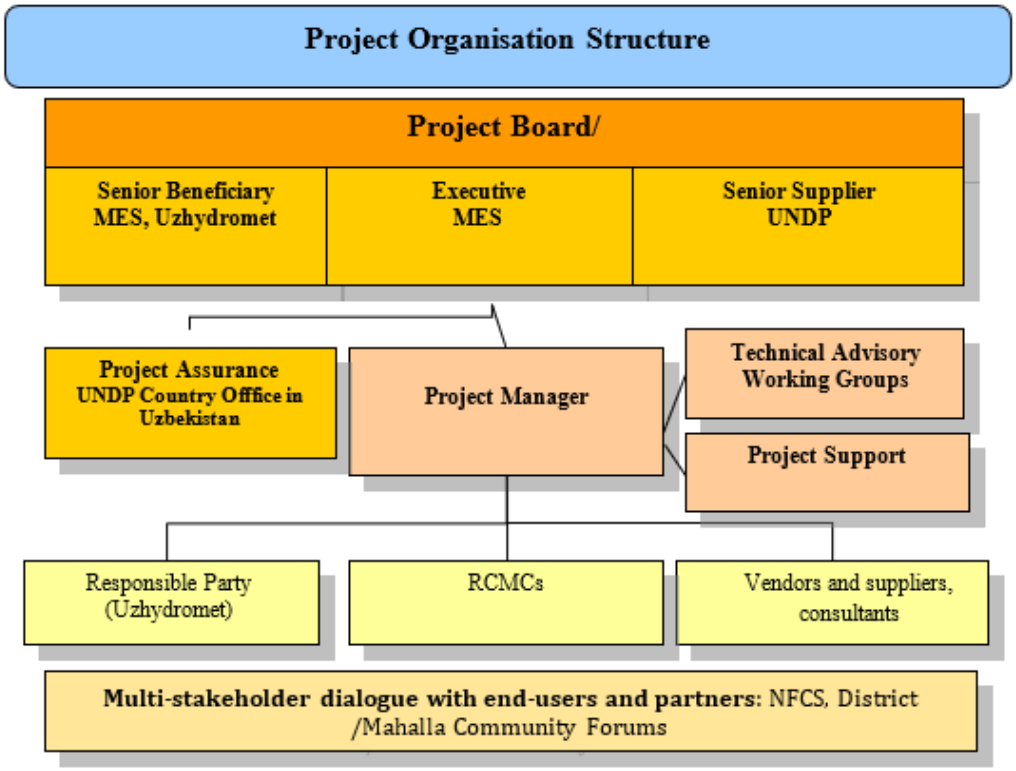
69. In addition, the Government of Uzbekistan may request UNDP to provide direct project services for this project. The UNDP and Government of Uzbekistan acknowledge and agree that those services are not mandatory, and will be provided only upon Government request and specified in the Letter of Agreement on support services. If requested, the direct project services would follow UNDP policies on the recovery of direct project costs relating to GCF funded projects. These services (in the amount of US $0.140 mln under PMC covered by GCF funds) will be specified in the Letter of Agreement. Eligible Direct Project Costs should be charged to the direct project costs account codes: "64397- Direct Project Costs – Staff" and "74596-Direct Project Costs – General Operating Expenses (GOE)".

70. MES will enter into or put in place legal agreements and/or arrangements with Uzhydromet which will serve as a Responsible Party (in UNDP terminology) for the implementation of certain activities under Output 1. Uzhydromet will assist in successfully delivering project outcomes and will be accountable to MES for the execution of activities within their co-financing under Output 1. Relationships/responsibilities between MES and Uzhydromet related to the implementation of the EWS are fully covered in the national legislation governing the State Emergency Prevention and Response System, where MES has the overall management and coordination role and Uzhydromet has the mandate to provide climate information inputs. The project implementation framework is aligned with this national regulation. Specifically for the GCF project implementation, MES (EE) and Uzhydromet (RP) would have an arrangement in writing.

71. The Project Board (PB), chared by MES, will be composed of representatives of UNDP, MES, Uzhydromet, Ministry of Economy, Ministry of finance, Ministry of Agriculture and Water resources, State Committee for Ecology and Environment Protection, State Service of the Republic of Uzbekistan on Monitoring of Hazard Geologic Processes. The Project Board is responsible for taking, by consensus, management decisions in accordance with standards that shall ensure management for development results, best value for money, fairness, integrity, transparency and effective international competition. In case a consensus cannot be reached within the Board, final decision shall rest with the UNDP Resident representative in Uzbekistan. The Project Board will meet at least once a year, ad-hock meetings could be arrange at the request of the PB members.

72. The National Project Director (NPD) will be appointed by the Executing Entity to execute the project on a day-to-day basis on behalf of MES and will be accountable to PB. The NPD's prime responsibility is to ensure that the project produces results specified in the project document, meet required standard of quality, timeliness and cost criteria. In addition, the NPD will be a liaison between UNDP and the executing/implementing agency as well as will other key Ministries engaged in various components and activities as responsible parties/strategic partners.

The management arrangements for this project are summarized in the chart below.



73. The International Chief Technical Advisor (CTA) will provide regular technical guidance to the project management and technical teams in managerial and technical issues. He/she will be hired for a long-term during the entire project implementation period by UNDP based on UNDP recruitment procedures.

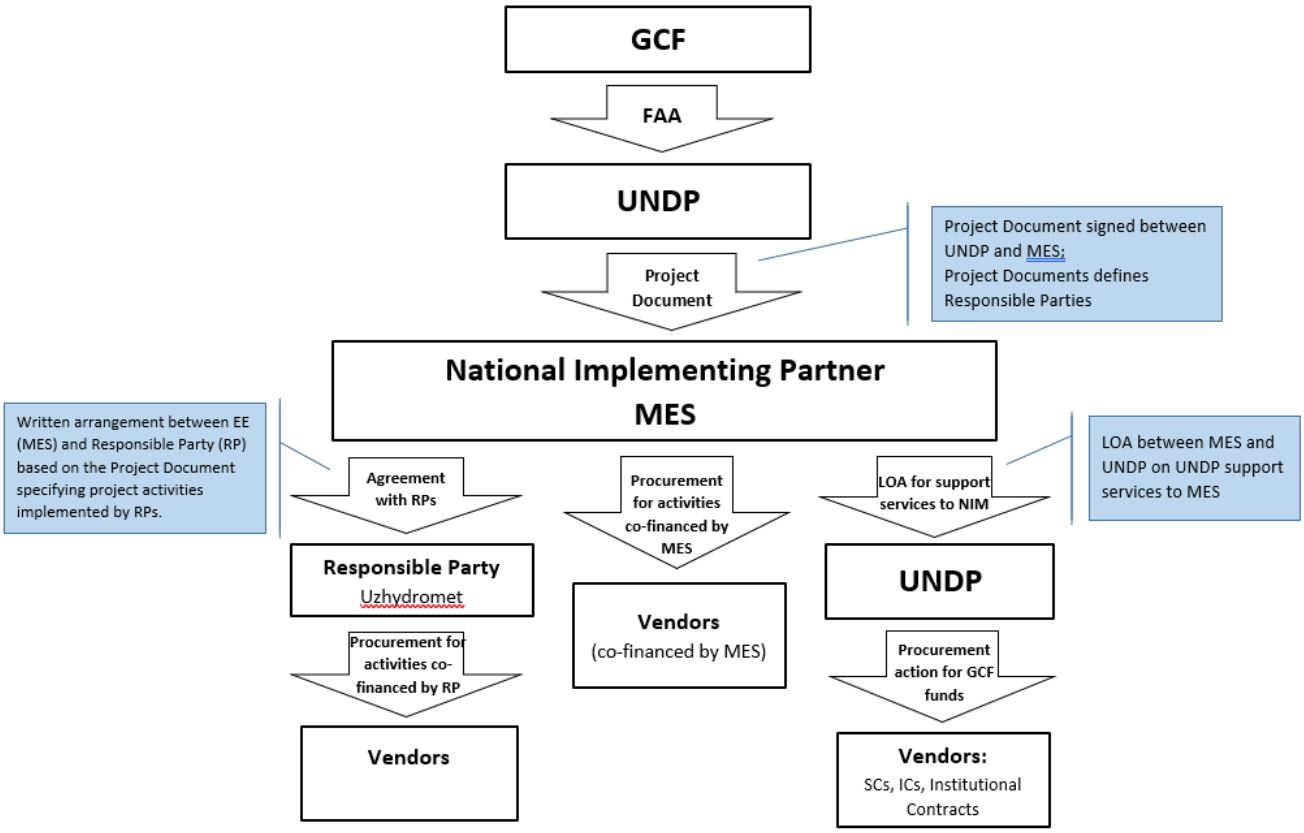
74. The Project Manager (PM), recruited by UNDP Country Office in Uzbekistan, will run the project on a day-to-day basis on behalf of MES within the constraints laid down by the Project Board. The Project Manager function will end when the final project terminal evaluation report and other documentation required by the GCF and UNDP, has been completed and submitted to UNDP. The Project Manager is responsible for day-to-day management and decision-making for the project. The Project Manager's prime responsibility is to ensure that the project produces the results specified in the project document, to the required standard of quality and within the specified constraints of time and cost.

75. Technical Advisory Working Groups (TAWG) will support the CTA and PM and will provide inputs to and endorsement of the design and quality of the project outputs. TAWGs members will be drawn from government, private sector, academia and civil society to provide guidance and technical advice on the project. A balanced representation of women and men in the TAWGs will be ensured. Local stakeholders and community members have a key role in the implementation and monitoring of the project. Local community consultations have been conducted during the project preparation phase (see Stakeholder Assessment and Engagement Plan). During the inception phase of the project, the project will additionally consult with all stakeholders, including vulnerable community members and local government, etc. and facilitate an understanding of the roles, functions, and responsibilities within the Project's decision-making structures, including reporting and communication lines, and conflict resolution mechanisms. Local community consultation forums will be established at community levels to maintain dialogue with the local beneficiaries and stakeholders throughout the project implementation. The

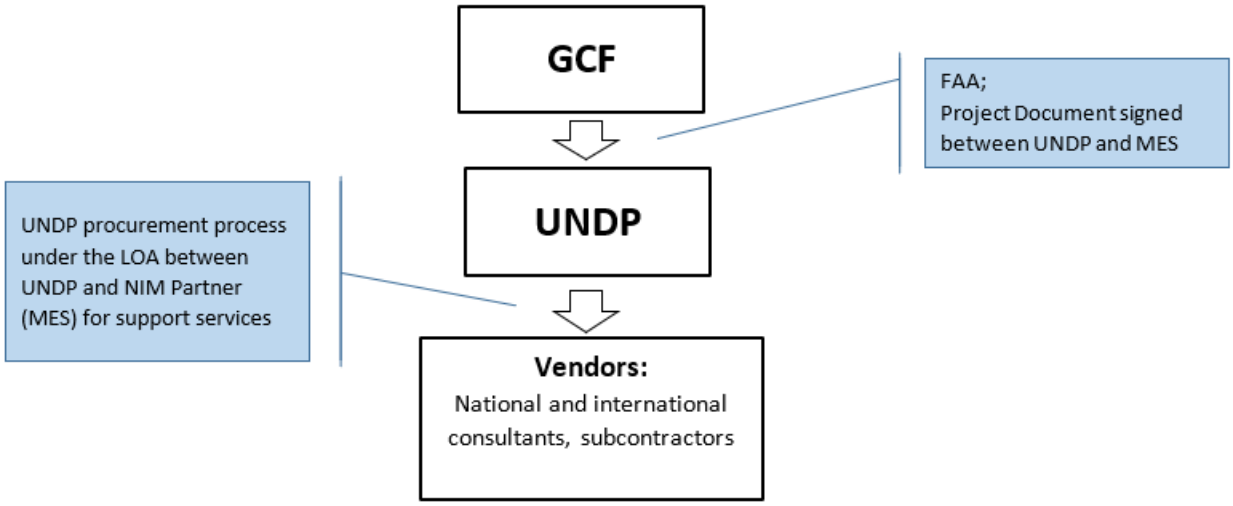
stakeholders will also be engaged during the mid-term and final evaluations to assess the progress of the project and enable adaptive project management in response to the needs and priorities of the communities.

76. A Gender Advisor will be engaged by the project and will be a member of all TAWGs to ensure that gender is adequately mainstreamed in all technical discussions and in the project implementation and that gender outputs are monitored and reported.

Project implementation diagram:



GCF Funding flow diagram:



C. FINANCING INFORMATION

C.1. Total financing

(a) Requested GCF funding (i + ii + iii + iv + v + vi)	9.999455	million USD ($)

GCF Financial Instrument		Amount	Currency	Tenor	Pricing
(i)	Senior loans	Enter amount	Options	Enter years	Enter %
(ii)	Subordinated loans	Enter amount	Options	Enter years	Enter %
(iii)	Equity	Enter amount	Options		Enter % equity return
(iv)	Guarantees	Enter amount	Options	Enter years	Enter %
(v)	Reimbursable grants	Enter amount	Options		
(vi)	Grants	9.999455	million USD ($)		

(b) Co-financing information[24]	**Total amount**	**Currency**
	30.639880	million USD ($)

Name of institution	Financial instrument	Amount	Currency	Tenor	Pricing	Seniority
Uzhydromet	Grant	1.215789	million USD ($)	Enter years	Enter%	Options
Uzhydromet	In-kind	2.979716	Million USD ($)			
MES	Grant	25.126875	Million USD ($)			
MES	In kind	1.317500	million USD ($)	Enter years	Enter%	Options
	Options	Enter amount	Options	Enter years	Enter%	Options
Click here to enter text.	Options	Enter amount	Options	Enter years	Enter%	Options

(c) Total investment (c) = (a)+(b)	**Amount**	**Currency**
	40.639335	million USD ($)

(d) Co-financing ratio (d) = (b)/(a)	*3.06*
(e) Other financing arrangements for the project/programme (max ½ page)	Co-financing is provided from the Government of Uzbekistan (GoU) as part of the budgetary allocations to MES and Uzhhydromet, specifically to finance the Operation and Maintainance (O&M) cost for the new equipment and software purchased under Output 1 and 2 by GCF funding. Additionally, Uzhydromet and MES have agreed to provide the capital (in-kind) to house and support the equipment purchased by this project (e.g. AWS, radars and upper air station installations), as well as the support infrastructure needed for the expansion of RCMCs. The infrastructure will be located at existing facilities and/or on existing structures thereby reducing costs and importantly, mitigating environmental and social impacts. The co-financing amount is calculated for the project implementation period of 6 years. However, Uzhydromet and MES have committed to support O&M operational cost and personnel for all equipment invested in this project for up to 20 years. The additional O&M and personnel cost for year 7-20 is estimated by Uzhydromet to be USD 7,408,184 and USD 5,981,500 from MES, making the total public co-financing leveraged by this project to be USD 44,029,565. Co-financing by MES and Uzhydromet is provided in local currency Uzbekistani Som (UZS). All costs and expenses are defined in current prices as of 01/01/2021. (USD exchange rate is 10,500 UZS for 1 USD). The Accredited Entity's fee of 8.5% of the total GCF budget is not included in the total GCF funding (a) and will be payable by GCF to UNDP according to the FAA to cover UNDP's services as the Acredited Enntity, including its role of Project assurance and Seniour Supplier.

C.2. Financing by component

[24] If the co-financing is provided in different currency other than the GCF requested, please provide detailed financing information and a converted figure in the GCF requested currency in the comment box. Please refer to the date when the currency conversion was performed and the reference source.

Component	Output	Indicative cost (USD)	GCF financing		Co-financing			
			Amount (USD)	Financial Instrument	Type	Amount (USD)	Financial Instrument	Name of Institutions
Output 1	Upgraded hydro-meteorological observation network, modelling and forecasting capacities	8,495,125	4,509,395	Grants	Public Source	3,985,730	Grants	Uzhydromet
Output 2	Establish a functional Multi-Hazard Early Warning System based on innovative impact modelling, risk analyses, effective regional communication and community awareness	24,428,056	3,098,400	Grants	Public Source	21,329,656	Grants	MES
Output 3	Strengthened climate services and disaster communication to end users	5,708,380	1,915,880	Grants	Public Source	3,792,500	Grants	MES
Project Management	Click here to enter text.	2,007,774	475,780	Grants	Public Source	1,531,994	Grants	MES, Uzhydromet
Indicative total cost (USD)		40,639,335	9,999,455		30,639,880			

C.2.1 Financing structure (if applicable, mandatory for private sector proposal (max.300 words)

N/A

C.3 Capacity Building and Technology development/transfer

If the project/programme is envisaged to support capacity building and technology development/transfer, please specify the total requested GCF amount for these activities respectively in this section.

C.3.1 Capacity building	Amount: 323,000 USD
C.3.2. Technology development	Amount: 7,018,400 (combined investment under activity 1.1, 1.2, 2.1 and 2.3) USD

C.4. Justification for GCF funding request (max. 500 words)

If applicable, inform if other donors at national and/or international level (including private sector) have been previously consulted to support this project/programme.

77. GCF financing of this proposal is requested to provide the critical public good of climate information and disaster-related forecasting and warning services, including their dissemination and use, which will ultimately reduce the climate risks and directly enhance the resilience of up to 34% of the vulnerable rural population of Uzbekistan. The multi-harzard early warning system that will be developed and rolled-out under this project will enable the communities at disaster-prone areas to safeguard their lives, livelihoods and assets from climate-related hazards and risks. This is fully in line with GCF's mandate and strategic guildline on EWS, as well as other international framework and agreements:

- The **Paris Agreement Sub-paragraph 7(c)** calls for "Strengthening scientific knowledge on climate, including research, systematic observation of the climate system and early warning systems, in a manner that informs climate services and supports decision-making".
- The NDC submitted to the UNFCCC under the Paris Agreement **shows a high demand for EWS**

78. Furthermore, this project proposal, if approved, will serve as a timely response to the recently launched Global Alliance for Hydromet Development[25] at the COP 25 of UNFCCC in Madrid, where twelve international organizations including GEF, GCF, AF, ADB, EBRD, UNDP, UNEP collectively committed to scale up action that strengthens the capacity of developing countries to deliver high-quality weather forecast, early warning systems, water, hydrological and climate sevices and support the most vulnerable communities.

79. The GoU has been prioritizing disaster prevention work over the past decade through the gradual enhancement of the hydro-meteorological monitoring capacities and resettlement of populations in high risk areas. Consequently the overall losses of life from natural disasters has been falling. However, this work has been constrained due to the lack of capacities and access to modern risk assessment, monitoring and forecasting technologies. Continuous population growth and expansion of infrastructure increases risks due to climate-driven extreme events (which climate change is increasing). This requires a more efficient and timely approach to: i) the generation of warnings (most hazards are fast onset events which require real time monitoring and forecasting in order to act ex-ante); ii) climate risk management (monitoring and forecasting new areas which are either not currently observed through ground-based technologies or the impacts are not modelled); iii) risk knowledge (which needs to quickly identify people, assets and infrastructure at risk in light of immediate information on impacts/hazards); iv) application of modern information and communication technologies; v) co-development and understanding of warnings and information with communities.

80. The GoU requests the GCF funds in the form of grant, given the public good nature of the proposed climate risk reduction investments targeting enhanced resilience of 32 million people, including the most vulnerable and poor rural communities living in remote desert and mountainous areas. The project will develop climate risk information products which will benefit populations at risk, in line with the statutory obligations of the GoU to provide the necessary information to enable them to safeguard their lives, livelihoods and assets from climate induced extreme hydrometeorological risks. This is a public good and therefore does not lend itself to cost-recovery. MES does not have any income generating activities and all costs are covered by the GoU. Uzhydromet, whilst not having the funds to expand and upgrade it's existing system, has however demonstrated it's ability to use the funds it has to operate and maintain the existing network in it's current state for many years since the breakup of the Soviet Union.

81. Under the Decree No. 601 by the cabinet ministers on Aug 8, 2017, the Government of Uzbekistan (GoU) outlines the structure of the national early warning system for natural hazards, including an automated system for disseminating alerts and warnings. The GCF grant is required to fill the critical technical and financial gaps in upgrading the existing multi-hazard information and MHEWS system in Uzbekistan so it can effectively deal with the additional pressure brought about through increases in climate variability and change. This requires investments in both new technologies, training of technical staff, demonstration of modern approaches to hazard modelling and prediction, as well as development of awareness and educational materials and communications with communities. Together these activities will demonstrate the potential benefits of the upgraded system.

C.5. Exit strategy and sustainability (max. 300 words)

82. By end of the GCF project, Uzhydromet and MES, will be technically, and technologically equipped and trained to maintain the modelling, forecasting and effective dissemination of impact-based climate-induced hazards and early warning services countrywide. In addition, the improved capacity of RCMCs and local communities to use and intepreate climate risk information into practical early responses will enhance the community resilience as a whole with sustained impacts. The project puts a strong focus on community engagement, training and "last-mile" communication solutions, which will contribute to improved user interaction and ownership by local communities and key stakeholders and further promote the sustainability of this project into the long-term.

83. Operational wise, the establishment of a seris of guidance and protocols - including a national to regional EWS protocol, and communication protocols will increase the institutional coordination capability among MES, Uzhhydromet and other relevant government agencies, and support an integrated approach to long-term climate, socio-economic risk planning and decision-making.

84. Financial sustainability of this project is supported by the strong commitment of GoU. Since 2011, multiple cabinet resolutions and decrees have been issued to support the modernization of a more efficient and wide-ranging multi-hazard EWS. In particular, decree No. 601 by the cabinet ministers on Aug 8, 2017 states the responsibilities of MES to operate and maintain IT equipment and communications, and set out how funds/revenue should be

[25] https://public.wmo.int/en/media/press-release/alliance-hydromet-development-launched

dedicated in order to undertake this responsibility. As noted above in C.1 section, co-financing to this project will be provided by MES and Uzhhydromet as part of the budgetary allocations, specifically to finance the Operation and Maintainance (O&M) and personnel costs for the new equipment and software over a period of 20 years. The total public co-financing by GoU (including 20-year O&M, personel cost, infrastructure and capital investment) leveraged by this project is estimated to be USD 44,029,565.

85. Uzhydromet and MES have agreed to provide the capital (in-kind) to house and support the equipment purchased by this project, as well as the support infrastructure needed for the expansion of RCMCs:

- Internet connections and communications for field equipment (both satellite and GSM/GPRS based) and centres hosting databases, modelling capacity and risk mapping/remote sensing facilities;
- Infrastructure at the national Crisis Management Center (CMC) and regional Crisis Management Centres (RCMC) to house and support new risk analysis and communication systems.

86. Lastly, the project will seek to develop a sustainable business model to explore ways, including through Public-Private Partnerships (PPP) to attract private sector engagement in the delivery and use of climate and disaster-realated information products and services. Notably, several public institutions including Uzbekistan Railway have expressed interest in the climate harzard warnings and advisories.

C.6. Financial management/procurement (max. 300 words)

87. The financial management and procurement of this project will follow UNDP financial rules and regulations available here: https://info.undp.org/global/documents/frm/Financial-Rules-and-Regulations_E.pdf

88. All projects will be audited following the UNDP financial rules and regulations noted above and applicable audit guidelines and policies.

89. Further guidance is outlined in the financial resources management section of the UNDP Programme and Operations Policies and Procedures available at https://info.undp.org/global/popp/frm/Pages/introduction.aspx.

90. UNDP has comprehensive procurement policies in place as outlined in the 'Contracts and Procurement' section of UNDP's Programme and Operations Policies and Procedures (POPP). The policies outline formal procurement standards and guidelines across each phase of the procurement process, and they apply to all procurements in UNDP. See here: https://info.undp.org/global/popp/cap/Pages/Introduction.aspx. Procurement of services and goods will be done in a cost effective and reliable way and by applying following principles: **Best Value for Money**, which consists of the selection of the offer that best meets the end-users' needs and that presents the best return on investment; **Fairness, Integrity and Transparency,** which ensures that competitive processes are fair, open, and rules-based. All potential vendors will be treated equally, and the process will feature clear evaluation criteria, unambiguous solicitation instructions, realistic requirements, and rules and procedures that are easy to understand; **Effective International Competition,** understood as giving all potential vendors timely and adequate information on UNDP requirements, as well as equal opportunity to participate in procurement actions; and **In the best interest of UNDP**, which means that any business transactions must conform to the mandates and principles of UNDP and the United Nations. As outlined in the Procurement Plan, procurement of goods and services will be mainly carried out by UNDP and the UNDP procurement procedures will be applied (POPP). Additional detailes on the UNDP procurement threthholds and methods are provided in the Annex 8 Procurement Plan.

91. The project will be implemented following the National Implementation Modality (NIM) following NIM guidelines available here: https://info.undp.org/global/documents/_layouts/WopiFrame.aspx?sourcedoc=/global/documents/frm/National%20Implementation%20by%20the%20Government%20of%20UNDP%20Projects.docx&action=default&DefaultItemOpen=1

92. UNDP will ascertain the national capacities of the implementing partner by undertaking an evaluation of capacity following the Framework for Cash Transfers to Implementing Partners (part of the Harmonized Approach to Cash Transfers - HACT).

D. LOGIC FRAMEWORK AND MONITORING, REPORTING AND EVALUATION

This section refers to the project/programme's logic framework in accordance with the GCF's Performance Measurement Framework under the Results Management Framework to which the project/programme contributes as a whole, including in respect of any co-financing. This is different from the project/programme-level log frame(as there may be other impact measures for example that go beyond those defined by the GCF).

A project-level logical framework, with specific indicators, baselines and targets, means of verification and assumptions should be provided as part of Annex 2.

D.1. Paradigm shift objectives (max.200 words)

Increased climate-resilient sustainable development	The project will facilitate a significant shift in the provision of climate and disaster information and forecasting services through an enhanced multi-hazard early warning system in Uzbekistan. The GCF project will promote the transformation of climate hazard forecasting and warning from a reactive (ex-post) hazard-based system to one that is proactive (ex-ante), user-oriented and impact-based. Moreover, this project will be the driver of significant institutional change within Uzbekistan's hydrometeology and disaster response services, as well as a potential catalyst for increased investment in the sector. Uzhydromet currently serves as a Regional Specialized Meteorological Centre (RSMC) within the WMO Network for Central Asian region. This project will strengthen Uzhydromet's capacity to potentially scale up the enhanced climate information management system to other Central Asian countries through experience sharing and peer learning. By the end of the project the number of its direct beneficiaries will come to 11.296 million people (34.9% of the total population), including 5.63 million men and 5.666 million women. Direct beneficiary of this project is the population currently living in high risk areas of Uzbekistan (people exposed to one or more climate hazards), estimated to be 34.9% of the population.

D.2. Impacts measured by GCF indicators

Select the appropriate impact for the project/programme. Note that more than one indicator may be selected per expected impact result. Add results as appropriate.

Expected Result	Indicator	Means of Verification (MoV)	Baseline	Target		Assumptions
				Mid-term (if applicable)	Final	
A1.0 Increased resilience and enhanced livelihoods of the most vulnerable people, communities and regions	1.1 Change in expected losses of lives and economic assets (US$) due to the impact of extreme climate-related disasters in the geographic area of the GCF intervention	National Emergency Situation Report issued by MES national and local government statistics; PDNA (where available) Focused group survey, national and local government statistics, National Emergency Situation PDNA (where available)	Loss of life: Average of 8 lives lost annually (1996-2016) for the entire country Economic losses for the entire country: US$ 312.3 million average annual loss due to various hazards (floods, droughts and mudslides)[26].	0/No change (the new system will not be fully operational at scale by mid-term)	50% lives (average of 4) saved from climate-induced hazards per annum 3% or 9.37 million USD expected reduction in economic damages from various hazards[27]	The occurrence of major extreme events (e.g.seismic) do not deviate historic trajectory

D.3. Outcomes measured by GCF indicators

Expected Outcomes	Indicator	Means of Verification (MoV)	Baseline	Target		Assumptions
				Mid-term (if applicable)	Final	

[26] FS section 5.2 provides the national estimate of direct economic cost of disasters that is used to calculate baseline: annual economic impact is estimated to be US$ 236 million for floods, US$ 67.2 million for droughts, US$ 9.1 million for mudslides (including the valuation of loss of life: 8 people with a VSL of US$ 871,798).

[27] According to the Economic Analysis, the US$ 9.37 mln estimated reduction in economic damages, equal to 3% of US$ 312.3 mln baseline cost of climate-related disasters, is based on the assumed economic impact from increased lead time of planning for hazards and on the avoidance of loss of lives due to the them

	Number of technologies and innovative solutions transferred or licensed to promote climate resilience as a result of Fund support	Project reports Site visits Central database owned by Uzhydromet for hydrometrological montiroing data, and an integrated impact-based risk information and knowledge database operated by MES, hazard forecasting, monitoring and risk assessment products	The majority of meteorological observation stations (75 out of 85) operate in manual mode, with limited use of remote-sensing and satellite data. The existing multi-hazard EWS system lacks of vulnerability data of population and infrastructure, as well as systematic risk assessment and hazard mapping tools. Baseline: 0 technologies/ solutions; Status: initiated/installed	9 technologies/ solutions; status: initiated/installed Including: 4 Hydrometeorological observation technologies upgraded and installed: AWS; automatic streamflow measurements; upper-air stations; radar 4 technologies for multi-hazard risk analysis, forecasting and impact-based MHEWS: socio-economic risk and vulnerability model; mudflow modeling; landslide risk modeling; Drought EWS for the Syr Darya and Zeravshan rivers 1 communication technology: visualization systems at 3 RCMCs	11 technologies / solutions; status: introduced/in use Including: 5 Hydrometeorological observation technologies upgraded and operational: AWS; automatic streamflow measurements; upper-air stations; radars; centralised database for meteorological measurements 4 technologies for multi-hazard risk analysis, forecasting and impact-based MHEWS: socio-economic risk and vulnerability model; operational mudflow modeling; operational landslide risk modeling; Drought EWS for the Syr Darya and Zeravshan rivers 2 communication technologies: visualization systems at 7 RCMCs, public notice	Relevant government agencies cooperate on the implementation of the MHEWS and data management Inter-agency data available and accessible as inputs to the knowledge management platform Continued government support and commitments to secure adequate O/M of monitoring equipment, relevant software and databases during the project implementation and afterwards

					boards in 20 communities	
A5.0 Strengthened institutional and regulatory systems for climate-responsive planning and development	5.2 Number and level of effective coordination mechanisms	NFCS meeting reports, action plan National EWS protocol and various SOP/coordination protocol products Focus groups, user satisfaction analysis based on surveys	Uzbekistan has not yet established a National Framework of Climate Services (NFCS), a framework that can promote more efficient adaptation to climate variability through continuous improvement in the quality, delivery and use of climate-related information in planning, policy and practice. Currently, MES under the State Emergency Prevention and Response System (SEPRS) has limited capacity to coordinate the dissemination and inter-agency responses of multi-hazard forecasting and early warning, using various communication channels at national and regional levels. Specifically, national baseline on the level of effective coordination mechanisms are defined by	A national to regional EWS protocol: Level 2 A National Framework for Climate Services (NFCS): Level 2 (baseline assessment conducted and Action plan endorsed by stakeholders) Number of institutional and coordination frameworks and technical guidance in use by Uzhydromet and MES on: i) data collection and archiving; ii) hazard mapping; iii) risk assessment; and iv) dissemination of information to RCMCs: 2 coordination protocols in place	A national to regional EWS protocol: Level 4 A National Framework for Climate Services (NFCS): Level 4, this includes the operationalization of a national climate outlook forum that brings end-users and co-producers of climate and hydrometeorological information in the design and production processes. Number of institutional and coordination frameworks and technical guidance in use by Uzhydromet and MES on: i) data collection and archiving; ii) hazard mapping; iii) risk assessment; and iv) dissemination of information to RCMCs: 4 coordination protocols in place	Continued and government support and cross-agency commitment the project;

			a metric of Level 1-4:28 A national to regional EWS protocol: Level 1 A National Framework for Climate Services (NFCS): None (Level 1) Number of institutional and coordination framework and technical guidance in use by Uzhydromet and MES: 0			
A6.0 Increased generation and use of climate information in decision-making	*6.2 Use of climate information products/services in decisionmaking in climate sensitive sectors*	National climate change and DRM/DRR policies, plans and reporting at the national, district, and community levels Reports on the performance of the MHEWS Project reports User /focus group surveys	Weather and climate related information is not generally used for preparedness and risk management purposes among government institutions in Uzbekistan, with a few exceptions of: · Hydrological drought forecasting for the Amu Darya · Identification of avalanche GLOF risks through monitoring of snowpack and lake levels at key sites and through remote sensing; · General monitoring of high intensity rainfall in	At least 2 government agency members under SEPRS use the forecasts and risk assessment for climate hazards in decision-making and prioritization; 30% of surveyed government beneficiaries (agencies) report improved emergency response due to improved disaster warning	At least 4 government agency members under SEPRS use the forecasts and risk assessment for climate hazards in decision-making and prioritization Inter-agency data-sharing agreement between agencies institutionalized, and data-sharing protocols established 50% of surveyed government beneficiaries (agencies) report improved emergency response	Uzhydromet and MES has continued national and local political support for the development of a state emergency prevention and response system (SEPRS).

[28] Level 1 = no coordination mechanism; Level 2= coordination mechanism in place; Level 3 = coordination mechanism in place, meeting regularly with appropriate representation (gender and decision-making authorities); Level 4 = coordination mechanism in place, meeting regularly, with appropriate representation, with appropriate information flows and monitoring of action items/issues raised.

			known areas of potential landslide and mudflow formation.		due to improved disaster warning	
A7.0 Strengthened adaptive capacity and reduced exposure to climate risks	*7.2 Number of males and females reached by (or total geographic coversage of) climate-related early warning systems and other risk reduction measures established/strengthened* [29]	Operational databases for observational equipment Gender-dissagregated MHEWS coverage data, including RCMC/target community demographic profile, mobile subscriber coverage Gender-sensitive field surveys/focus groups	Integrated climate-resilient MHEWS doesn't exist 0 males and 0 females in the project implementation regions[30] have access to up-to-date and area-specific climate hazards and early warning information.	At least 1,133,215 females, 1,125,985 males have access to climate hazards and early warning information.	All population (5,666,075 females, 5,629,925 males) in the project implementation region have access to climate hazards and early warning information.	Continued commitment and uptake of the information by targeted communities in the project Target communities understand shorter- to longer-term benefits of MHEWSs and risk reduction interventions Government has a political will, institutional capacity and necessary resources to support proper O/M of MHEWS. No staff and budget cuts occur at MES and Uzhydromet
A8.0 Strengthened awareness of climate threats and risk-reduction processes	*8.1: Number of males and females made aware of climate threats and related appropriate responses*	Project reports Gender-dissagregated MHEWS coverage data, including RCMC/target community demographic profile Site visits and reports Project reporting and gender-sensitive field surveys/focus groups	0 males and 0 females in the project implementation regions have strong awareness of climate threats and risk reduction processes, and capacities to use such climate information for disaster preparedness	40% out of 500 surveyed EWS beneficiaries (100 males and 100 females) report enhanced risk awareness 30% out of 500 surveyed beneficiaries (100 males and 100 females) report that the warnings	80% out of 500 surveyed EWS beneficiaries (200 males and 200 females) report enhanced risk awareness 70% out of 500 surveyed beneficiaries (175 males and 175 females) report that the	Continued commitment and uptake of the information by targeted communities in the project Target communities understand shorter- to longer-term benefits of MHEWSs and risk reduction interventions Government has a political will, institutional capacity and necessary

[29] Number of males and females reached by the early warning system will be estimated based on the coverage data of mobile network (and other communication channels, e.g TV, radio broadcast).

[30] The project has identified 15 districts located in seven provinces in eastern Uzbekistan as hazard-prone target regions. They are: Qoichirchik, Bostanlik, Sirdarya, Saihunabad, S. Rashidov, Gallaaral, Bulungur, Jambai, Koshrabad, Kitab, Yakkabag, Dehkanabad, Chust, Turakurgan, and Dangarin.

				are clear and being used by their households for enhanced disaster preparedness	warnings are clear and being used by their households for enhanced disaster preparedness	resources to support proper O/M of MHEWS. No staff and budget cuts occur at MES and Uzhydromet * The methodology to measure change in awareness and the survey sample size will be established through activity 3.3 during the implementation phase (Year 1) as part of the survey design, tentatively it will include at least 500 project beneficiaries from 10 different communities.

D.4. Arrangements for Monitoring, Reporting and Evaluation (max. 300 words)

93. Project-level monitoring and evaluation will be undertaken in compliance with the UNDP POPP and the UNDP Evaluation Policy.

94. The primary responsibility for day-to-day project monitoring and implementation rests with the Project Manager. The Project Manager will inform the Project Board and the UNDP Country Office of any delays or difficulties during implementation, so that the appropriate support and corrective measures can be adopted. The Project Manager will also ensure that all project staff maintain a high level of transparency, responsibility and accountability in monitoring and reporting project results. The Monitoring and Evaluation (M&E) officer, under the Project Management Team, will be responsible for the overall coordination of the M&E of the project. The M&E Officer is responsible for designing a performance monitoring framework to track the project's progress towards achieving its targets.

95. The UNDP Country Office will support the Project Manager as needed, including through annual supervision missions. The UNDP Country Office is responsible for complying with UNDP project-level M&E requirements as outlined in the UNDP POPP. Additional M&E and implementation quality assurance and troubleshooting support will be provided by the UNDP Regional Technical Advisor as needed. The project target groups and stakeholders including the NDA Focal Point will be involved as much as possible in project-level M&E.

96. A project inception workshop will be held after the UNDP project document has been signed by all relevant parties to: a) re-orient project stakeholders to the project strategy and discuss any changes in the overall context that influence project implementation; b) discuss the roles and responsibilities of the project team, including reporting and communication lines and conflict resolution mechanisms; c) review the results framework and discuss reporting, monitoring and evaluation roles and responsibilities and finalize the M&E plan; d) review financial reporting procedures and mandatory requirements, and agree on the arrangements for the annual audit; e) plan and schedule Project Board meetings and finalize the first year annual work plan. The Project Manager will prepare the inception report no later than one month after the inception workshop. The final inception report will be cleared by the UNDP Country Office and the UNDP Regional Technical Adviser, and will be approved by the Project Board.

97. An Annual Progress Seport (APR) will be prepared for each year of project implementation. The Project Manager, the UNDP Country Office, and the UNDP Regional Technical Advisor will provide objective input to the APR. The

Project Manager will ensure that the indicators included in the project results framework are monitored annually well in advance of the APR submission deadline. The final APR, along with the terminal evaluation report and corresponding management response, will serve as the final project report package.

98. An independent mid-term review process will be undertaken and the findings and responses outlined in the management response will be incorporated as recommendations for enhanced implementation during the final half of the project's duration. The terms of reference, the review process and the final MTR report will follow the standard templates and guidance available on the UNDP Evaluation Resource Center.

99. An independent terminal evaluation (TE) will take place no later than three months prior to operational closure of the project. The terms of reference, the review process and the final TE report will follow the standard templates and guidance available on the UNDP Evaluation Resource Center. The final TE report will be cleared by the UNDP Country Office and the UNDP Regional Technical Adviser, and will be approved by the Project Board. The TE report will be available in English. The UNDP Country Office will include the planned project terminal evaluation in the UNDP Country Office evaluation plan, and will upload the final terminal evaluation report in English and the management response to the public UNDP Evaluation Resource Centre (ERC) (www.erc.undp.org).

100. A detailed M&E budget, monitoring plan and evaluation plan will be included in the UNDP project document. Monitoring, reporting and evaluation arrangements will comply with the relevant GCF policies and Accreditation Master Agreement signed between GCF and UNDP.

101. Beyond the standard project monitoring, evaluation and learning frameworks, the core indicators/metrics for tracking progress will also focus on long-term performance targets of climate-related disaster risk and risk management (with the active participation of non-state actors). This will include:

- Disaster deficit index: Measure the economic loss that a country could suffer when a climate-related catastrophic event takes place, and the implications in terms of resources needed to address the situation;
- Monitoring of the O&M commitments of Uzhydromet and MES. This will include ensuring that O&M for new infrastructure is included in the current O&M management plan for both Uzhydromet and MES;
- Prevalent vulnerability index: Characterize predominating vulnerability conditions reflected in exposure in prone areas, socioeconomic fragility and lack of social resilience - direct impact, indirect and intangible impact in case of the occurrence of a climate-related hazard event; and
- Risk management index: Measure qualitative performance of risk management based on risk identification, risk reduction, disaster risk management, governability and financial protection, existing indicators of sectoral and national performance already utilized at the national level (e.g. in the context of increased effort towards monitoring the Paris Agreement).

102. Besides these indices, a project M&E system will be set up to collect feedback through a website and mobile phones, on the effectiveness and usefulness of warnings and advisories. Together with feeback through community meetings this information will be used to change and develop the issued warnings. Additional targets will be monitorer at the end of project cycle including:

- Establishment of the NFCS;
- Establishment of Quality management system and certification;
- WMO categorisation of Uzhydromet.

E. EXPECTED PERFORMANCE AGAINST INVESTMENT CRITERIA

E.1. Impact potential (max. 300 words)

E.1.1. Expected tons of carbon dioxide equivalent (t CO_2 eq) to be reduced or avoided (Mitigation and cross-cutting)	Annual	Click here to enter text. tCO_2 eq
	Lifetime	Click here to enter text. tCO_2 eq
E.1.2. Expected total number of direct and indirect beneficiaries, disaggregated by gender (Adaptation and Cross-cutting)	Direct	11,296,000 people 50.16% of female
	Indirect	32.39 million people (100% of population) 50.16% of female
	**For both, Specify the % of female against the total number.*	
	Direct	11,296,000 people at risk of climate-induced hazards (Expressed as 34 %) of the country

E.1.3. Percentage of beneficiaries relative to total population	Indirect	32.39 million people who will gain improved access to critical weather information and services (Expressed as 100 %) of the country population

E.1.4. **Impact potential for adaptation**

103. The project will directly benefit over 11 million people living in high risk areas of Uzbekistan (34% of the population). Several climate induced hazards (such as floods) have caused significant economic damages and led to the loss of lives. For example, it is estimated that 7.6 million people are vulnerable to flooding in Uzbekistan. The economic impact of flooding due to climate change is estimated to be about 236 million USD. These hazards related to heavy rainfall and temperature extremes are either already increasing in frequency and/or intensity or are expected to do so under climate change, particularly over the eastern mountainous regions of Uzbekistan. The following chart shows the number of population of Uzbekistan exposed to one or more hazard in current climate and by 2030.

Province	Current	2030	Difference
Karakalpakstan	781.8	664.5	-117.3
Khorezm	37.4	1.3	-36.1
Bukhara	5.5	620.7	615.2
Navoi	142.1	160.3	18.2
Kashkadarya	1599.1	2433.2	834.1
Surkhandarya	1945.1	2422.5	477.4
Samarkand	644.5	718.6	74.1
Jizak	213.6	198.9	-14.7
Sirdarya	429.4	23.2	-406.2
Tashkent	420.9	391.4	-29.5
Andijan	2122.3	2354.9	232.6
Ferghana	2244.7	2490.2	245.5
Namangan	709.6	788	78.4
Uzbekistan Total:	11296	13267.7	1971.7

(Unit: Thousand of People)

104. Responding to the needs stated by the Government of Uzbekistan to modernize its national early warning system, the project will invest into critical technical and human capacity required for effective operation of MHEWS. Comparable efforts (MHEWS, climate information, and community-based DRM) have shown effective impact related to saving of lives, assets, and livelihoods. Advanced MHEWS systems are estimated to be 60% effective in reducing loss of life by floods, and 20% effective in case of drought.[31]

105. Specifically, we assume that the project investment in early warning system in Uzbekistan will lead to at least 3% reduction in damages due to the hazard (3% effectiveness). This is based on an increase in lead time of planning for the hazard and avoidance of loss of lives due to the hazard. Short (5 days to 2 weeks) or long-lead forecast (1-2 months) allows farmers, communities and governments to carry out actions that can help utilize improved flood forecast in the country. According to Economic and financial analysis (Annex 10), the project investment will lead to avoided damage from mudslide (60% lives saved) and drought (3% loss saved) owing to improved methods and capacities for monitoring, modelling and forecasting climate hazards and risks supported with satellite-based remote sensing.

106. As a result, the project will significantly enhance the quality and timeliness of climate and disaster-related information available to decision-makers and the dissemination of such information to the population of 32.39 million people (approx. 50% increase in the warning lead time and 50% reduction in the warnings delivery time), thus contribute to avoided household income loss (1% avoided damage due to climate information) and increased resilience and enhanced livelihoods of the most vulnerable people, communities in these regions, and to the increased resilience of health and well-being, food and water security in Uzbekistan.

E.2. Paradigm shift potential (max. 300 words)

107. The project will enable a paradigm shift in MES's approach to climate and disaster risk management, focussing on prevention of rather than reaction to disasters and high impact events. To enable this the project focusses on parts of the MHEWS value chain which can be speeded up (automatic data collection and processing, development of key SOPs, dissemination via mobile phones etc) and developing missing components (translation of weather

[31] Teisberg, T. and Weiher, R. (2009) Benefits and Costs of Early Warning Systems for Major Natural Hazards

information into hazard/impacts, risk analyses based on vulnerable populations and infrastructure). By contributing to a culture of managing climate risk on an ongoing basis and ahead of time, the project will lead to a paradigm shift in the attitudes of the government and communities to identifying low-risk areas for future expansion/development.

108. In addition, the Impact-based forecast and warning services has also been identified as a high priority by the World Meteorological Organization (WMO) to increase the relevance and utility of forecasts and warnings. The GCF project will implement impact-based forecasting and MHEWS in Uzbekistan and will explore and facilitate enabling environment for forecast-base action and forecast-based financing.

109. The proposed GCF investment will transform the current risk management and EWS in Uzbekistan by introducing new innovative technologies, increasing the efficiency and cost-effectiveness of the EWS. The proposed technologies and multi-hazard risk and EWS will lead to a paradigm shift through a number of advances:

- Reduced losses of lives and economic losses in the face of climate change;
- A better understanding of risks and their economic costs (losses and damages);
- Reduced costs for climate monitoring infrastructure (increased reliance on remote sensing) that would otherwise increase significantly to be able to monitor increased climate-induced risks if manual systems are maintained;
- The increased use of satellite data/imagery for monitoring areas inaccessible to ground-based observations (including the use of radar technology to observe land movement), the data from which can be made available to adjacent countries, will promote regional coordination and data sharing. It will also stimulate its use and replacement of more costly ground observations where appropriate;
- Increases in the timeliness of monitoring observations and forecasts (increased warning lead time) will increase the efficiency of warnings and the likelihood that they will be received in time to act;
- The establishment of a central repository for hydrometeorological hazard and risk information that integrates automatically transmitted data from different providers/manufacturers with quality control/assurance and allows further interrogation via geo-visualization software;
- The development of improved hazard modelling and risk mapping capabilities will lead to clearly identified areas at risk (more targeted warnings);
- Introduction of a socio-economic risk and vulnerability modelling as an integral element of the impact-based multi-hazard EWS;
- The establishment of a series of guidance and protocols - including a national to regional EWS protocol, and communication protocols will increase the institutional coordination capability among MES, Uzhhydromet and other relevant government agencies, and support an integrated approach to long-term climate, socio-economic risk planning and decision-making;
- Development of information and communication systems at RCMCs will enable them to undertake pro-active planning and response measures;
- Development of a sustainable business model for hydromet information services;
- Effective dissemination of warnings, alerts and “last-mile” communication to targeted areas and populations (50% reduction in warning delivery time), and empowering sectoral stakeholders to engage on climate risk management and climate change adaptation;
- Enhanced preparedness building upon high quality and timely climate-related risk information; and
- Improved WMO categorisation of Uzbekistan in climate forecast and climate services.

110. This project addresses one of the main objectives of SAP projects, which is to create an enabling environment for future scaled-up investment. By demonstrating the benefits of improved warnings and communications with regional centres and communities, it will provide the evidence and impetus for further funding to expand to the whole of Uzbekistan. Furthermore, by directly linking hydrometeorological data with hazard warnings, the utility of different data sources can be evaluated for better directing future investments.

111. The impact, scalability and paradigm shift potential of this GCF investment will be further elevated due to Uzhydromet’s role as the Regional Specialized Meteorological Centre (RSMC) for Central Asia. As the project will improve technological and institutional capacities of Uzhydromet, this will allow them to further improve on service/information delivery to other Central Asian countries, as well as any training, technology and knowledge transfer activities they undertake as an RSMC. The project will further facilitate such knowledge transfer across Central Asia by allowing sub-regional stakeholders attending the National and Regional Climate Outlook Fora, as well as observing and sharing collected data according to international standards and guidance (e.g. GCOS and GBON) and through standardised mechanisms (e.g. through the GTS).

E.3. Sustainable development (max. 300 words)

112. The project directly contributes to the UN 2030 Sustainable Development Goal 13: Take urgent action to combat climate change and its impacts, specifically target 13.1: Strengthen resilience and adaptive capacity to climate-related hazards and natural disasters; target 13.2: Integrate climate change measures into national policies, strategies and planning and target 13.3: Improve education, awareness-raising and human and institutional capacity on climate change mitigation, adaptation, impact reduction and early warning. Furthermore, the project supports Goal 11: Make cities and human settlements inclusive, safe, resilient and sustainable, specifically target 11.5 which states that by 2030, number of deaths and number of people affected should be significantly reduced and direct economic losses relative to GDP be substantially decreased.

Socio-economic co-benefits

113. By improving knowledge on losses and damages which are associated with different climate-related hazards, the project will help the GoU to reduce and optimize budget spending, improving the use of public funds for disaster preparedness and recovery. Risk knowledge will inform land use and investment decisions to avoid maladaptation/poor development practises. Based on focus group discussion with communities in 7 disaster-prone regions of Uzbekistan, social impacts associated with climate hazards in those communities include: damage of schools and healthcare centers due to mudflows, power outrage due to strong winds. An estimation of household loss in face of climate-related hazards are summarized in the following table. Through improved risk knowledge and hazard forecasting capacity, as well as strengthened “last-mile” delivery and community outreach efforts, a functional impact-based MHEWS will contribute to increased resilience and enhanced livelihoods of the most vulnerable people, communities and region in Uzbekistan. The detailed estimation method of savings, avoided losses and economic co-benefits can be found in section 4.4 and 5 of the FS.

Hazards	Estimated loss of household property/ possessions	Estimated loss of household daily income	Estimated loss of household farm produce (crops)	Estimated loss of household livestock	Estimated loss of household fish stock
Flooding	350,000 - 25 million som	20,000 - 1 million som	1 - 15 million som	2 - 60 million som	500,000 - 2 million som
Drought	-	-	-	-	-
Strong wind	200,000 - 1.5 million som	-	-	-	-
Landslide	350,000 - 25 million som	-	-	300,000 - 6 million som	100,000 - 1 million som
Mudflow	350,000 - 4 million som	20,000 - 1 million som	1 -15 million som	2 - 60 million som	500,000 -2 million som

Environmental co-benefits

114. Uzbekistan has numerous acute environmental challenges including inter alia: degradation of water resources, salinization of soil and water resources, loss of forests, desertification, land degradation, reduction in productive potential of arable land and pastures, biodiversity loss and the Aral Sea crisis. These are all exacerbated by climate change. Often a number of these environmental challenges are found in highly populated geographical areas and can combine to create compound problems. For example, in the Ferghana Valley, which contains industrial and radioactive waste, landslides can lead to radioactive waste spill over. This poses significant challenges to communities living in such areas. Enabling the identification of landslide risk areas under heavy rainfall through this project will provide much needed information ahead of such events. Additionally the development of hydrological drought forecasting for the Syr Darya and Zeravshon rivers will enable better water and irrigation management, especially during low flows, which will reduce the risks of salinization in agricultural areas. Mudflow and avalanche risk maps and forecasts will also provide prior warning, mitigating the need for prior blasting where there is a build up of landslips and snow.

Gender-sensitive development impact

115. The Sendai Framework for Disaster Risk Reduction 2015-2030 (Sendai Framework) of which Uzbekistan is signatory and shares the commitments underpinning the framework, recognizes that gender equality and women’s empowerment is a catalyst for effective disaster risk reduction in attaining the overall sustainable development goals.

116. Women suffer disproportionally from disasters due to uneven income distribution and lesser access to information, planning and decision making. Women and girls tend to have less access to or control over assets, including the resources necessary to cope with hazardous events, such as information, education, health and wealth, their vulnerability is in general relatively greater than men's.[32]

117. The project follows a gender responsive approach that will ensure the particular priorities, needs, barriers, status and roles of men and women are recognized and addressed. There will be a particular focus on inclusion and empowerment of women as a critical element of sustainable development in the context of disaster risk reduction and climate change. A gender analysis undertaken at the onset and during the design phase of this project, acts as an entry point for gender mainstreaming throughout implementation. The stakeholder consultation process involved holding seminars with representatives of various Ministries (MES, Uzhydromet, Ministry of Health, State Committee for Ecology and Ecology, etc.) and representatives of Parliament, Civil Communities and Women's Committee. As a result, the gender analysis enabled the multi-stakholder engagement and incorporated the gender-senstive approach into the project design moving forward. For instance, gender aspects and specific needs will be integrated during development of the multi-hazard early warning regulations, mechanisms and protocols (Output 2). A Gender Action Plan has been developed in this process, which sets out gender-disaggregated target data and indicators to establish a baseline in which to measure improvements and identify areas of focus (Annex 4). The project will present a number of opportunities to promote gender equality in Uzbekistan. Specifically, gender-sensitive socio-economic vulnerability assessments and development of socio-economic risk models for decision making and prioritization of resilience building investments will bring transformative impact by providing evidence-based information on gender situation that further be considered at level of project implementation ensuring targeted support and access to the risk informed solutions. With regard to the gender-responsive technical design of the MHEWS, the project will ensure that warnings are tailored to the gender-differentiated needs and capabilities of specific population groups, such as children, senior citizens, and persons with disabilities. Multiple methods for targeting messages will be used for reaching broadest group of people, including TV, radio, Internet, sirens, flashing lights, registration-based alert systems sending messages to cell phones with information clearly stated orally and graphically. Pregnant women and the elderly and disabled will be included in emergency planning. The important element in mainstreaming gender is community awareness and capacity, and understanding of impacts of disasters on community resilience, when the project builds the capacity of communities and demonstrate the impact of hazards to various groups of people. Inclusiveness and consideration of needs of all groups including those are with special needs also make the project actions transformative. As a result, the project will ensure at least 30 percent representation of women and their active participation in project stakeholder consultations, capacity building and trainings, local and national decision-making bodies set up and/or facilitated by the project. This 30% target is based on the lessons from and experience of the earlier UNDP community based projects in the country, community consultations and DRR stakeholder consultations. The gender related targets proposed in the project are both ambitious and achievable, and will positively promote gender equality in Uzbekistan.

E.4. Needs of recipient (max. 300 words)

118. Although a lower middle-income country, poverty is nonetheless a persistent and significant problem in Uzbekistan with 12.3% of the population living below the national poverty line in 2016. Uzbekistan has a large population (in comparison to other CA countries) of 32.4 million, of which 63% live in densely populated rural communities, most of whom are dependent on agriculture for livelihoods. Poorly developed and distorted market relationships and an absence of properly established land tenure rights have resulted in heavy dependence of the rural population on natural resources.

119. Climate change induced hazards cause both economic damages and lead to the loss of lives. Approximately 8 million people (26% of the population) are affected by mudflows, 80% of which occur in the foothills and high mountainous areas and are caused by heavy rainfall. In the period of 1977-2015 1,335 mudflows were recorded, 33 of which led to loss of life. A single drought event in 2000 affected 600,000 people and caused an economic loss of $50 million. In 1998, flooding from the Shakhimardan River originating in Kyrgyzstan killed 100 Uzbeks and caused damage estimated at $700 million. A flood event in February 2005 in the Boymurod region affected 1,500 people. Landslide hazards are significant in the country's mountain and foothill areas, while there have been over 2,600 extreme mud flows in the past 80 years. A landslide in the Angren region on 4 May 1991 killed 50 people, while a landslide in January 1992 killed 1 person and affected 400 others. The 20-year return period

[32] https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/236656/women-girls-disasters.pdf

loss for all hazards is $623 million (2.8 per cent of GDP), while the 200-year return period loss is $2.13 billion (9.5 per cent of GDP), though this is based mostly on damages due to earthquakes.[33][34]

120. Uzbekistan lacks financial resources, knowledge and capacities at system, institutional and individual levels to conduct multi-hazard, vulnerability and risk assessments, establish real-time monitoring, forecasting and early warning systems in order to make climate-informed decisions and implement climate-induced disaster risk management measures. There is significant financial gap between actual and required DRR and climate change adaptation investments. Both rural and urban populations and the government have low response and preparedness capacities. Uzhydromet conducted a survey among stakeholder ministries and departments in January-March 2017, with the purpose of determining the requirements for hydrometeorological information in the main sectors of the economy. The results demonstrated stakeholder's awareness of serious gaps in technical capacities of Uzhydromet. The results of the survey confirmed that the modernization of Uzhydromet is a critical and urgent task. These needs are articulated in SNCs, TNCs and NDC as well as in various DRR related policy documents and assessments. Specific needs include the following:

(i) Key needs in risk knowledge largely associated with being able to map and monitor hazards over wider areas and use international best practices. For example, mudflow risk assessment and forecasting is based on outdated methods and relationships set up in the 1980's. Mudflow modelling needs to be updated using rainfall and flow models in a GIS environment. To be able to calculate risks, vulnerability information needs to be intersected with hazards, as does information on expected economic damages and impacts. In order to do this there are several noteworthy needs such as damage and loss data for most hazards which is not systematically collected and archived in an accessible database. Data is only available for direct damages and not for the indirect consequences.

(ii) Key needs in observations, monitoring and forecasting arising from a lack of funds for capital investments. This has restricted the ability of Uzhydromet to upgrade and modernise its equipment. The existing observational network do not provide sufficient spatial detail and information, especially for runoff forming zones in mountainous areas or data series gaps due to instrument failures, observer failures, radio communication failures, electricity outages, etc.

(iii) Key needs in communicating and disseminating of warnings, such as relying on the capacity of Uzhydromet to translate hydrometeorological information into hazard-related information e.g. hydrological drought, mudflow and flood occurrence, etc. This leads to an inability to estimate hazards which require specialised knowledge e.g. assessing rainfall-induced landslide risk requires capabilities and expertise beyond that available in Uzhydromet.

(iv) Public dissemination needs arising from the MES's monopoly on the issuing warnings and alerts including:

121. Whilst MES can command telecoms providers (including Ucell and Beeline) to disseminate alerts, these alerts are currently broadly disseminated and not targeted to mobile phones in the location of the predicted/observed hazards. This is possible to do but requires accurate and confident predictions of hazard extent;
122. The ability of MES to work in different regions is dependent on the establishment of regional crisis management centres (rCMCs) as mandated through resolution #242. However, currently these rCMCs are housed in offices which require updated communication facilities. In particular, they lack videoconferencing facilities, access to updated hazard and risk maps based on up to date hazard information; and
123. Public message boards are used successfully in many areas e.g. to disseminate avalanche warnings on the Kamchick pass. However, these boards are only found in a few locations and do not cover all high-risk areas.

E.5. Country ownership (max. 500 words)

Country Ownership

124. The proposed project originates from consultation with the GoU and is based on the national request to support the establishment of an early warning system. The project is fully country-driven.

125. All national strategies related to the climate change adaptation, disaster risk reduction and natural resource management, including the first NDC, clearly prioritize the establishment of the efficient national climate risk

[33] Sutton, William R., Jitendra P. Srivastava, James E. Neumann, Peter Droogers, and Brent B. Boehlert. 2013. Reducing the Vulnerability of Uzbekistan's Agricultural Systems to Climate Change: Impact Assessment and Adaptation Options. World Bank Study. Washington, DC: World Bank. doi:10.1596/978-1-4648-0000-9. License: Creative Commons Attribution CC BY 3.0

[34] http://www.un-gsp.org/sites/default/files/documents/tnc_of_uzbekistan_under_unfccc_english_n.pdf

monitoring and early warning system. Most notably, multiple cabinet resolutions and decrees have been issued to advance the development of a state system for early warning and emergency responses, including:

- "State Program on Prediction and Prevention of Emergency situations" #71 of 03.04.2007, which includes forecasting of possible emergencies, in particular natural disasters, development of coordination mechanisms of emergency risk management, establishment of an early warning and information system;
- Resolution of the Cabinet of Ministers of the Republic of Uzbekistan "On further improvement of state emergency prevention and response system of the Republic of Uzbekistan from 24 August 2011 No. 242;
- Decree No. 5066 on 1 June 2017, sets the agenda for developing a new approach to monitoring and forecasting natural hazards responsible for creating emergency situations; and
- Decree No. 601 by the cabinet ministers on Aug 8, 2017 outlines the structure of the national early warning system for natural hazards, including an automated system for disseminating alerts and warnings. It also provides the legislative basis for the establishment of regional crisis management centres (RCMCs) as well as the mandate of MES to operate, maintain equipment and to set aside funds/revenues for IT system and communications, and requesting the use of privately owned telecommunication facilities in an emergency.

126. In April 2019, a new Cabinet Resolution No. 299 "On measures to implement the Sendai Framework Programme on Disaster Risk Reduction for 2015-2030 in the Republic of Uzbekistan" was approved. The resolution sets out Uzbekistan's national strategy and Action Plan for achieving the goals under the Sendai Framework, including the provision for:
    - Development and implementation of advanced technologies and engineering and technical means for emergency response;
    - Creation and development of systems for forecasting and monitoring of emergencies;
    - organization, development and maintenance of management, notification and communication systems in constant readiness;
    - Improvement of the system of training of managers and the population in emergency situations.

127. In November 2020 the Government of Uzbekistan adopted a new Resolution No. 4896 "On measures to enhance performance of the centre for hydrometeorological service of Uzbekustan" which outlines a strong commitment of the GoU to modernize and strengthen hydromet service delivery and includes above all a roadmap for technological and institutional modernization, improved human capacities, strengthened budget and non-budgetary financing, improved revenue generation opportunities and partnership with sectoral stakeholders. This Resolution reconfirms the strong GoU ownership over and commitment to the GCF project. The country ownership is also confirmed through co-financing commitments provided by MES and Uzhydromet for both project implementation and operations and maintenance costs.

Accredited Entity's comparative advantages

128. The Government of Uzbekistan has requested UNDP to support the development and implementation of this project through consultations. UNDP has extensive experience in the implementation of projects and programmes in Uzbekistan. UNDP has a long history of collaboration with Uzhydromet and has carried out several joint projects, including technical assistance to Uzhydromet for designing and providing training programs for climatologists, as well as support for seminars and the supply of technological equipment to the Uzhydromet. In 2015 UNDP with Uzhydromet assessed climate change vulnerability across different provinces and sectors of economy and developed the first Climate Risk Profile for Uzbekistan. The most relevant UNDP-Uzhydromet project funded by the Adaptation Fund has developed a drought EWS for the Amu Darya basin, incorporating automatic weather stations, use of new remote sensing techniques, improved prediction of river runoff and tools for disseminating information to farmers. This prototype project will serve as a basis for up-scaling under this GCF project.

129. Furthermore, UNDP globally has an excellent track record and experience in implementing climate adaptation and disaster risk reduction programmes and projects. UNDP has an extensive portfolio on disaster risk reduction (US$1.7 billion over 10 years in 163 countries) and on climate change adaptation (US$ 900 million active portfolio in 85 countries). In Europe and Central Asia, UNDP has already supported development of EWSs in Armenia, Azerbaijan, Georgia, BiH and Uzbekistan. Globally, UNDP has an extensive experience in promoting climate information projects in 75 countries with 65 EWS tools developed with project funding through Green Climate Fund, Global Environment Facility, Adaptation Fund, Least Developed Countries Fund, Special Climate Change Fund and Canadian International Development Agency.

Executing Entity's experience and competitive advantages:

130. MES manages Uzbekistan's interagency State Emergency Prevention and Response System (SEPRS). MES is responsible for rapid response, tracking, prevention and mitigation of both natural and manmade disasters and

emergencies, including those occurring in the context of climate change. It coordinates the implementation of state/national programs on natural and manmade disaster forecasting and prevention. MES is responsible for: (i) management and control over the activity of SEPRS; (ii) preparation of proposals to the Cabinet of Ministers of the Republic of Uzbekistan to gather funds and resources for the purpose of preventing and responding to emergency situations; (iii) leveraging resources to provide the population with essential information, means and equipping special detachments to prepare for emergency situations. UNDP and MES have recently collaborated on a joint project "Strengthening Disaster Risk Management Capacities in Uzbekistan", which was implemented during 2010-2016 period. Partner capacity assessment (HACT) has been conducted for the MES that reconfirmed partner's capacities to govern and implement this project (Annex 16).

Stakeholder Engagement in the project

131. Uzhydromet and MES as the project implementing partners have been fully engaged in the development of this proposal. UNDP jointly with BMUB/GIZ/UNEP/WRI is managing a GCF readiness project which has engaged with stakeholders to identify priority projects to be developed for GCF investment. The stakeholder consultation process involved representatives from various Ministries (MES, Uzhydromet, Ministry of Health, State Committee for Ecology and Ecology, etc.), Parliament, Civil Communities and the Women's Committee of Uzbekistan. Based on these extensive consultations and needs assessment, the GoU requested UNDP to develop this GCF funding proposal.

132. During the process, the following stakeholders were also consulted and interviewed: Ministry of Finance, Scientific and Research Institute on Hydrometeorology, World Meteorological Organization, Ministry of Economy, Geohazards, Red Crescent society, Relevant international organisations (World Bank, FAO, USAID), local communities.

133. Various technical missions were undertaken by UNDP in February, August, November, December 2018 and January 2019. During these missions, various roundtable discussions with key national stakeholders resulted in the development of this SAP proposal. Focus group discussions were carried out with more than 180 participants from 15 districts across the country.

Table: General information about Focus Group participants

№	District	Number of interviewed	Gender		Age						Education		
			Male	Female	20-30	31-40	41-50	51-60	61-70	70 and older	Higher	Secondary - special	Secondary
1.	Qoichirchik	15	8	7		2	6	4	3		4		11
2.	Bostanlik	13	8	5	4	1	5	3				4	9
3.	Sirdarya	15	9	6	3	2	4	3	3		7	2	6
4.	Saihunabad	15	15		1	5	4	5			4		11
5.	S. Rashidov	11	5	6		2	2	2	2	3	3		8
6.	Gallaaral	11	10	1	4	2	1	3	1		3	1	7
7.	Bulungur	10	5	5		6	3	1				8	2
8.	Jambai	8	6	2	3	2		2	1			2	6
9.	Koshrabad	16	16		2	4	4	6			9	5	2
10	Kitab	12	12		3	5	1	3			2		10
11	Yakkabag	11	9	2		4	2	3	2		3	2	6
12	Dehkanabad	11	9	2		4	4	3			3		8
13	Chust	13	7	6	4	2	1	6					13
14	Turakurgan	13	8	5		4	2	5	2		3		10
15	Dangarin	9	7	2	1	3	2	2	1		2	1	6
	Total	**183**	**134**	**49**	**25**	**48**	**41**	**51**	**15**	**3**	**43**	**25**	**115**

134. Key beneficiary groups at community level participated in the discussion, and information and feedback provided by the focus groups on climate hazards, in particular on the household loss/damage caused by climate hazards, has informed the project design and selection of target communities, and provided the baseline of project intervention.

135. Stakeholders from government institutions, financial and technical partners, international and national non-governmental organizations and local civil society will be consulted and engaged at all stages of the project implementation, from the launch of the project to its implementation and review, through sensitization, consultation, and training workshops.

136. Prior to undertaking any intervention, additional stakeholder engagement will be conducted to ensure that target communities in project implementation regions are fully consulted to ensure the project will not impact on them and/or their living environment. During the implementation phases of the project, if any person or group of people are identified as being adversely affected, directly or indirectly due to the project activities, the project will comply with the UNDP Social and Environment Standard, which will include a grivenance mechanism to address any potential environmenta or social issues. For further details refer to Annex 12 - Social and Environmental Screening Procedure and Annex 13 Stakeholder consultations and engagement plan.

E.6. Efficiency and effectiveness

E.6.1. Estimated cost per t CO_2 eq, defined as total investment cost / expected lifetime emission reductions (Mitigation and Cross-cutting)	(a) Total project financing	US$
	(b) Requested GCF amount	US$
	(c) Expected lifetime emission reductions	_____ tCO_2eq
	(d) Estimated cost per tCO_2eq (d = a / c)	US$_____ **/ tCO_2eq**
	(e) Estimated GCF cost per tCO_2eq removed (e = b / c)	US$_____ **/ tCO_2eq**
E.6.2. Expected volume of finance to be leveraged by the proposed project/programme and as a result of the Fund's financing, disaggregated by public and private sources (Mitigation and Cross-cutting)	(f) Total finance leveraged	US$
	(g) Public source finance leveraged	US$
	(h) Private source finance leveraged	US$_____
	(i) Total Leverage ratio (i = f / b)	**_**
	(j) Public source leverage ratio (j = g / b)	**__**
	(k) Private source leverage ratio (k = h / b)	**_____**

Efficiency and Effectiveness

137. The project budget has been developed based on the analysis of existing institutional and technical capacities with the realistic needs assessment for each output and activity. Cost-efficiency is achieved, above all, through narrowing down the priority target areas and hazards, as well as by proposing to apply lower cost technologies (satellite remote sensing) and reducing the reliance on expensive surface observation equipment. A suitable mix of technologies for monitoring and forecasting hazards has been identified which both builds on existing work with Uzhydromet (e.g. the World Bank modernisation programme through the CAHM project) and provides adequate monitoring information in near real time, whilst minimising the reliance on surface observation equipment. For example, installing AWS and hydrological stations at key locations – either replacing existing ageing equipment or at new locations.

138. The complete modernization of the hydrometeorological system requires a larger investment. Even though such large investments may be needed over a long period of time, there are clear advantages to building capacity slowly and for targeted applications: i) larger investments often focus on expensive technologies or expanding capacity too early; ii) without demonstrated applications of technologies and effective coordination mechanisms, projects and investments may focus on limited aspects of the MHEWS value chain. Here it is proposed to make a strategic cost-effective investment to catalyze the required changes in the system/approach to generating and communicating hydrometeorological hazard information, which will inform and facilitate future investments.

139. This project builds upon the projects listed in Section B.1 (many of which are focused on a particular sector or region of Uzbekistan), and complements their modernization of the hydrometeorological observation and forecasting system, by targeting inefficiencies and missing elements needed to complete the MHEWS value chain, in order to increase the capacity of Uzbekistan to monitor, forecast and warn of the likely impacts and locations of climate change related hazards.

140. In particular, the GCF project relies on the lessons of the UNDP/AF project "Developing climate resilience of farming communities in the drought prone parts of Uzbekistan". The UNDP/AF project has upgraded 10 AWS weather stations with modern hydrometeorological equipment and conducted analysis of the economic efficiency of this modernization. The direct and indirect costs for maintenance and servicing of the equipment was assessed, which demonstrated that no significant additional costs would arise, except for a small additional charge for Internet services of 0.7 million UZS annually which was offset by a decrease in the costs of paying for electricity due to reduced consumption associated with the transfer of meteorological information from automatic weather stations to GSM modems. Overall benefits from modernization of Uzhydromet were estimated to range from 11.5 to 109.6 million USD per year, with modernization costs of approximately 3 million USD per year at a CBR ranging from 3.8

to 36.5. Modernization of Uzhydromet's technical base will result in further savings of public funds for operations and maintenance of the observation network and forecasting system. Based on the UNDP/AF project, the estimated benefits of installing 10 AWS include (see section 4.4 of the FS):

- With the installation of 2 Doppler water meters and 8 automated meteorological stations in Karakalpakstan, the drought-prone region is expected to increase its coverage of automated hydro-meteorological observation network to at least 40,000 km2 and effectively improve the early warning capacity of 2 weeks ahead.
- The possibility of issuing target temperature forecasts for Karakalpakstan with 2 weeks lead time, facilitating reduction of losses from adverse weather conditions and increases in farmers' income by at least 10%;
- Annual savings on salaries due to transfer of night-time observations to automatic mode will amount to 261.8 million UZS;
- Annual electricity savings of 0.8 million UZS; and
- The creation of an archive (a database of operational data) will increase the revenue from specialized services provided by Uzhydromet by 10%, which will amount to an additional 130.0 million UZS per year.

141. Through GCF project funding, 25 AWS will be installed in existing target locations in the mountains above key valleys and areas of high precipitation/landslides/mudflow activities and expected to contribute to further savings in Uzhydromet's O&M budget. Critically, the infrastructure will be located at existing facilities and/or on existing structures thereby reducing costs and importantly, mitigating environmental and social impacts.

142. The proposal also builds upon the regional project "Strengthening Early Warning of Mountain Hazards in Central Asia [35] and the recommendations of the Second Development Partners Conference on Strengthening and Sustaining National Meteorological and Hydrological Services[36].

143. Economic cost-benefit analysis was carried out to assess the impact of the project on society's welfare. The analysis of the project was carried out in accordance with the Guidelines for the Economic Analysis of Projects of United Nations Development Program (UNDP 2015). The economic desirability of the investments was determined by computing the economic internal rate of return (EIRR) and economic net present value (NPV) and comparing the EIRR with the assumed 10% discount rate (as recommended in UNDP 2015). Discounted fund flows period is 15 years based on the useful lifespan of the investments. We assume that after the useful life of each intervention, the benefits become zero.

144. The benefit of the project is assumed to be zero in the first three years. This is to allow for the installation of the different climate information systems, modelling and ground truthing of the data. Two sets of benefits are estimated:
    a. Avoided Damages very highly vulnerable: reduced damages from very highly vulnerable households with at least one flooding and mudflow event per annum, avoided damage from drought and avoided income loss to households and
    b. Avoided Damages highly vulnerable: reduced damages from flooding and mudflow events that occur once every three years plus avoided damage from drought and avoided income loss to households.

145. Given the above estimates, the net present value of the project ranges between $22.6 million and $51.8 million using a 10% discount rate, with an internal rate of return of between 24% for only very highly vulnerable households and 38% if we include avoided damages to highly vulnerable households. Additional benefits mentioned above (e.g. cost efficiencies, and ability to generate historical climate data in the country.) are not captured in the IRR analysis.

146. Three sensitivity test cases were examined: (i) total cost decreased by 20%; and (ii) total benefits decreased by 20%; and (iii) total cost increased by 20% and total benefits simultaneously decreased by 20%. In all cases, the project remains economically feasible. The analysis is presented in Annex 10.

[35] See https://www.gfdrr.org/en/strengthening-early-warning-mountain-hazards-central-asia .
[36] See https://www.gfdrr.org/sites/default/files/publication/Second%20Development%20Partners%20Conference%20outcomes.pdf

F. ANNEXES

F.1. Mandatory annexes

☐	Annex 1	NDA No-objection Letter(s) (Template)
☐	Annex 2a	Example project level logframe (Example)
☐	Annex 2b	Example timetable (Example)
☐	Annex 3	Budget plan that provides breakdown by type of expense (Template in excel sheet)
☒	Annex 4	Gender assessment and action plan (Template)
☐	Annex 5	Co-financing commitment letters
☐	Annex 6	Term sheet and evidence of internal approval
☐	Annex 7	Risk assessment and management (Template)
☐	Annex 8	Procurement plan model (Template)
☐	Annex 9a	Legal Due Diligence (regulation, taxation and insurance) (Template)
☒	Annex 9b	Legal Opinion/Certificate of Internal Approvals (Template)

F.2. Other annexes to be submitted when applicable/requested

☐	Annex 10	Economic and/or financial analysis (mandatory for private-sector proposals)
☐	Annex 11	Appraisal, due diligence or evaluation report for proposals based on up-scaling or replicating a pilot project
☒	Annex 12	Social and Environmental Screening Procedure Template (SESP)
☒	Annex 13	Stakeholder Analysis and Stakeholder Engagement Plan
☐	Annex 14	Operations and maintenance plan
☒	Annex 15	Feasibility Study
☒	Annex 16	Responses to GCF comments

** Please note that a funding proposal will be considered complete only upon receipt of all the applicable supporting documents.*