UNITED NATIONS DEVELOPMENT PROGRAMME

Terms of Reference

Conducting a study for identification of required optimum number of Hydrological and Meteorological Stations for proposed GCF funded project "Protecting Livelihoods and Assets at Risk from Climate Change Induced Flooding in Glaciated River Basins of Nepal"

Project: Protecting Livelihoods and Assets at Risk from Climate Change Induced Flooding in Glaciated River Basins of Nepal	
Geographic Coverage	Koshi, Gandaki and Karnali Basins particularly focusing on glaciated basins- a) Lower Barun, b) Hongu 2, c) Thulagi and d) Lumding Tsho Glacial Lakes
Organizational Unit:	Resilience and Environment, UNDP CO Nepal
Reporting to:	UNDP: Assistant Resident Representative, UNDP Nepal, through Portfolio Manager and Senior Project Officer – ICRMP, UNDP CO Nepal
Type of Contract and number of positions:	Individual Contract Hydrologist- 1
Contract Period(s) and duration	25 days (spread over 2 months)
Duration:	Spread over 15 May 2020 to 15 July 2020
Duty Station:	Kathmandu (DHM Office)

Background:

United Nations Development Programme (UNDP) is collaborating with the Ministry of Finance – the National Designated Authority (NDA) for the Green Climate Fund (GCF), the Department of Hydrology and Meteorology (DHM), the Ministry of Energy , Water Resoueces and Irrigation (MoEWRI) to formulate a five-year project proposal on "**Protecting Livelihoods and Assets at Risk from Climate Change Induced Flooding in Glaciated River Basins of Nepal**". The Department of Forests and Soil Conservation (DOFSC), The Ministry of Forests and Environment (MOFE), the Department of National Park and Wildlife Conservation (DNPWC), and other relevant ministries and departments are some of the key partners that will support in the formulation and implementation of the project.

A Concept Note was submitted to the Green Climate Fund Secretariat on 13th February 2018 (available in GCF Website). A detailed funding proposal is currently under development for submission to the GCF.

The UNDP is seeking a qualified and experienced experts (Hydrologist and Meteorologist) with expertise on requirement of hydro-met stations network to cover Koshi, Gandaki and Karnali basins for the

proposed project in selected glaciated watersheds of Koshi, Gandaki and Karnali river basins. This study will constitue an important input on identification of required number of hydrological and meteorological stations and their costs (detail budgets) for the funding proposal and the feasibility study.

Context:

Nepal is home to 8 of the 10 highest mountain peaks in the world, including Mount Everest (8,848 m), whose snowpack and glaciers maintain the perennial flow of major domestic rivers and the Ganges in India. As glaciers retreat, they leave behind weak moraine and ice dams, behind which glacial lakes are formed.

All the major rivers of Nepal are snow and glacier melt-fed and accommodate significant volumes of water flow throughout the year. However, 75% of the annual volume of water is discharged during the monsoon season (June–September) resulting in significant annual flooding.

The observed maximum temperature increases in the high Himalayas in Nepal (0.86 °C per decade) is higher than in the lower parts of Nepal (0.2°C per decade) and above the global average of 0.15-0.20°C per decade. Consequently, the melt rate of Himalayan glaciers is intensifying, the number of glacial lakes is increasing, and existing glacial lakes are expanding. The Glaciated area decreased by 24% and the volume of ice reserve decreased by 29 % from 1977 to 2010 in Nepal[1], forcing some mountain communities to migrate due to scarcity of water for their livelihood.

Due to climate change-induced accelerated melting of the Himalayan glaciers, the instance of highly destructive GLOFs that decimate communities and assets downstream is increasing. These outburst floods are likely to trigger cumulative disaster events such as flash floods, mudflows and landslides downstream. As climate change continues to accelerate the rate of glacial melt, the livelihoods of millions of people, as well as the growing hydropower industry and other critical assets, are increasingly at risk of devastation from GLOFs and other climate related hazards in Nepal.

Nepal has experienced at least 26 GLOF events in the past. Impacts from GLOFs include loss to lives, agriculture, hydropower, transportation and tourism, among other sectors. Impacts extend to 100 km and more downstream. Nepal is also highly susceptible to floods during the monsoon rains, patterns of which are impacted by climate change. Floods and landslides have caused approximately 8,400 deaths in Nepal from 1983 to 2013, with an average of 269 deaths per year (DWIDP 2013).

With GCF funding, this project aims to safeguard the lives and livelihoods of tentatively above 300,000 people in the Gandaki and Koshi River Basins and their physical and economic assets from the climate-induced threat of glacial lake outburst floods (GLOFs) and related hazards through the two following outputs:

Output 1 - Institutions strengthened to deliver climate risk information, monitoring and early warning services to local populations and productive sectors of economy

[1] International Centre for Integrated Mountain Development (ICIMOD) 2014 (Bajracharya et al., 2014)

Output 2 - Investment in GLOF and Flood risk reduction strategies at the watershed level scaled-up.

Objective of the Assignment:

The main objective of this assignment is to identify the optimum number of Hydrological and meteorlological stations (agriculture, climate etc) considering the following points;

- Required number of stations (hydrological, meteorological, climate, agro-met etc) that DHM wants to operate/manage during GCF Project and beyond in three basins;
- Locations (GIS map based) to install / operate such stations – particularly Mountain/ High Hill/ Hills and some in downstream of the proposed glacial lakes (watershed coverage areas);
- No. of parameters to be measured in each station;
- Technical specifications of each station that meets WMO or other standards compatible with existing DHM system;
- Tentative costs of the procurement, delivery and installations of those stations;
- Cost of establishment of EWS for last mile connectivity (Gandaki and Koshi basin- in the specific watersheds- in three glaciated river basins;
- Investment plan for Institutional settings and requirement of capacity building at all levels for smooth function of the system sustainably- during and post project scenarios;
- DHM's plan for annual maintainance, repairment and monitoring costs during the project (co-financing) and after the project as a regular national budgeting.

The study will also identify the possibility of establishment of Early Warning System for last mile connectivity for the most vulnerable communities in the downsteam of Hongu 2, Lumding tsho, Lower Barun and Thulagi Glacial Lakes. It is to be ensured that there is equal, meaningful and logical participation of local government, and NGOs/CSOs, private sectors and their organizations/networks during the implementation of the proposed system.

The findings of the study will be presented for review and discussion in DHM.

Scope of Work:

After a systematic study of glacier and glacial lakes, a new inventory of glacial lakes has been prepared. In addition, the lakes which are at critical situation have also been identified. The scope of study will be limited to high hill and mountain regions (east to west) of three basins but special attention will be given in the following glaciated basins of Koshi, Gandaki and Karnali (Map attached as Annex);

a) Lower Barun,
b) Hongu 2,
c) Thulagi and,
d) Lumding Tsho

The project will have the following proposed interventions in each basin and the underlined scope will be covered by this study:

<u>Koshi Basin:</u>

- GLOF Risk Reductions with appropriate structural measures
- Installation of Monitoring Stations for Hydro-met/ climate data/ information
- Installation of Early Warning Systems
- Community Based Climate Risk Management Initiatives

Gandaki Basin:

- GLOF Risk Reductions with appropriate structural measures
- Installation of Monitoring Stations for Hydro-met/ climate data/ information
- Establishment of Early Warning Systems

Karnali Basin:

- Installation of Monitoring Stations for Hydro-met/ climate data/ information

The consultant should design the optimum station network for hydrological (water level, flow, sediment and water quality) and meteorological (rainfall, climate and agro-met) monitoring by DHM as guided by but not limited to the following scope of works:

a) Hydrological monitoring:

The hydrological monitoring network design shall be guided mainly by the following fundamental principles:

- real-time data delivery;
- the ability to withstand the impact of a 200-year flood and still be operational;
- provide accurate data for the full range of anticipated flows.

Additionally, the following include the major guidelines to design an optimum hydrological monitoring network:

i) **Interstate and international transfers** - The network should be able to provide accepted, neutral data to the federal government to use in allocation of water transferred across interstate and international borders.

ii) **Water budgets** - The network should take into account the contribution of water from each river basin to water resources for national policies and planning.

iii) **Flooding** - The network should generate real-time information to provide current streamflow conditions for accurate and timely flood forecasts and flood zoning maps. In order to account for the physiographic variations and therefore the nature of flooding, following major networks should be considered: a) Glacial Lake Outburst Flood (GLOF) monitoring b) Rainfall induced flood monitoring in major river basins c) Flash flood monitoring mainly in rivers originating from the Churiya range d) Urban flood monitoring in major cities.

iv) **Water quality** - The network should generate information on water quality for water resources distribution planning as well as ecological management. Network design should mainly consider physiographic variations and human disturbances in each watershed.

v) **Sediment monitoring** - The network should generate information on suspended as well as bed-load for the full range of anticipated flows to produce a national database for design of infrastructure as well as sediment management plans for both federal and provincial governments.

Detail Tasks

The details tasks will include;

i) Review the existing hydro-meteorological parameters (climate, agro-met, civil aviation, water level, and sediment, water quality etc.) measured by DHM and define a ranking scheme for the parameters to prioritize network design;
ii) For each of the identified hydro-meteorological parameters, design criteria for optimum network covering Nepal;
iii) Consultants should identify the technical specifications of the instruments for each parameter that is compatible with the existing DHM system and that meets WMO standard;
iv) Stock taking/ mapping of existing Early Warning System in Nepal and their status;
v) Consultants should workout the tentative cost for the overall procurement, delivery and installation of hydrological and meteorological stations as well as the cost of installation of early warning systems in each of the major river basins in consultation with DHM;
vi) The geospatial distribution of the network should provide information regarding the homogeneity in observation series;
i) Locations (GIS map based) of the proposed stations – particularly Mountain/ High Hill/ Hills and some in downstream
ii) Investment plan for Institutional settings and requirement of capacity building at all levels for smooth function of the system sustainably along with annual maintainance, repairment and monitoring costs during the project (co-financing) and after the project as a regular budgeting.

Previous Studies

The study team will take a reference of previous studies carried out by DHM and other agencies in the related subject matter.

Documentation and Reporting

Document, analyse and summarise the key findings and this will be further discussed with DHM and UNDP for using for the full Green Climate Fund proposal;

Methodology:

The selected experts will consult the GoN authorities, particularly Ministry of Energy, Water Resources and Irrigation, DHM and UNDP to finalize the methodology for the study. The consultation will be carried out with experts, academia, research institutions as required. However, the tentative methodology includes the following but not limited to;

- Literature Review
- Consultations (relevant stakeholders)
- Bilateral meeting

- Experts' judgement

Expected Outcomes and Deliverables

i) Inception report - 2 copies
ii) Draft report - 2 copies
iii) Final report - 2 copies
iv) GIS based map and layers of the optimum network for station types.

The final outputs of the assignment include:

- Inception Report with detailed timelines and the methodologies;
- Raw data and Analysis of the data of the survey done during the consultation and field survey;
- Consultation workshop to review and present key findings and recommendations

For timely submission of the above deliverables with the highest quality, the consultants are expected to;

- Consult wth experts involved in preparation of different studies, including, but not limited to, Environment and Social Safeguards (ESS), Lake Lowering Design, Downstream mitigation works, baseline studies etc,
- Liaise with the Team Leader, EES and Financial Appraisal Expert to provide relevant inputs to the main funding proposal, as required
- Consider Gender equality and social inclusion at all levels;
- Validate in the consultations with adequate documents;
- Develop criteria and guidelines for the identification of the required numbers of hydro-met stations and selection of location,
- Document all relevant information related to consultations with communities and submit as annex to the main report with attendees' signature;
- Share the questionnaires/ guiding questions with the Funding Proposal Team Leader and UNDP prior to conducting survey.

Geographical Area Coverage

The detail of the geographical coverage area is given in the annex (Annex 3: Geographical Areas).

Schedule of the Payments

The payments will be delivery-based on progress submitted consultant as follows:

Installments	Milestones	Payment
Ist	Submission and finalization of the Inception Report with detailed work plan and methodology	30%
2nd	Upon submission of the **Draft** Report, including with annexes	50%
3rd	Upon submission of the **final** report incorporating inputs from UNDP and GCF Project Formulation Advisory Committee	20%

Time Frame

The assignment will be started soon after signing the contract after submission of the inception report.

The selected consultant will have to submit the report as follows:

- Inception Report with detailed work plan and methodology by 22 May 2020
- Draft Report (Summary and Actual Field Report) - by 15 June 2020
- Final Report (Incorporating the Comments/Feedback) – by 15 July 2020

The report should be presented in the wider stakeholders for final consultation before finalizing the deliverables. The detailed timeframe will be further defined during the presentation of the inception report. The GCF Project Formulation Advisory Committee will provide its inputs at all stages of the studies until it's finalizations.

Reporting and Coordination Line

- The selected experts (Hired under UNDP's Procurement Guidelines) will report directly to Advisor – Resilience and Environment Pillar in close coordination with the Senior Project Officer – Integrated Climate Risk Management through Portfolio Manager, Resilience and Environment Pillar, UNDP Country Office, Nepal;
- The selected expert will work closely with UNDP CO, relevant government agencies particularly DHM, DoFSC, DNPWC, National and International Consultants (mainly Watershed Management Specialist, Glaciologist), International consultants and other stakeholders towards developing and finalizing the full-size proposal in close coordination.

Required Human Resources for the Baseline Survey

S.N.	Designation	No. of position	No. of days	Main Responsibility	
1.	Hydrologist	1	25	• Cover for hudrological part of the study for identification of the required number of hydrological stations as described in the scope of the work;	
Competencies of the team members: • Ability to communicate effectively to varied audiences; • Ability to work under tight schedule; • Ability to coordinate and collate information obtained from various sources; • Ability to guide the team members to achieve better results in timely manner; • Proven strong analytical abilities; • Ability to work under pressure with several tasks and various deadlines; • Actively generates creative, practical approaches and solutions to overcome challenges situations; • A pro-active approach to problem solving.					

Annexures

Annex 1 Proposed Project Sites

Proposed Project sites and covered municipalities (Maps- a) Lower Barun, b) Hongu 2, c) Thulagi and d) Lumding Tsho