

Project Design Matrix (PDM)

Project Title: Project for Capacity Development of GLOF and Rainstorm Flood Forecasting and Early Warning in the Kingdom of Bhutan

Project Duration: (3 years)

Project Site: Mangdechhu and Chamkharchhu River Basins in Kingdom of Bhutan

Target Group: DHMS, DDM, DGM, DoES, NLCS, Local Governments and communities in the Project Site

Narrative Summary	Objectively Verifiable Indicators	Means of Verification	Important Assumption
<p>[Overall Goal]</p> <p>Nationwide disaster resilient society against natural disasters such as GLOF and rainstorm flood for Climate Change Adaptation is realized in Bhutan.</p>	<p>a. GLOF/rainstorm flood forecasting and early warning is properly disseminated based on accumulation of hydro-met data to relevant agencies at central and local level as well as outside of pilot river basin.</p> <p>b. Evacuation drills are conducted at least one community outside of pilot river basin with EWS.</p>	<p>a. 12th FYP</p> <p>b. DHMS/DDM report</p>	
<p>[Project Purpose]</p> <p>Capacity of DHMS and relevant stakeholders on emergency response against GLOF/rainstorm flood is enhanced.</p>	<p>a. GLOF/rainstorm flood forecasting and early warning is in place in accordance with developed Standard Operation Procedure (SOP).</p> <p>b. Early warning and evacuation drills in the pilot basins are regularly conducted by use of developed EWS (at least once in a year).</p>	<p>a. 11th FYP Mid-term review</p> <p>b. Project documents</p>	<ul style="list-style-type: none"> - Necessary budget of DHMS and DDM for maintaining IGEWS is secured. - Government policy of Bhutan on disaster management does not change significantly.
<p>[Outputs]</p> <p>1: Capacity of related agencies on GLOF/rainstorm flood risk assessment, development planning, disaster prevention, flood forecasting and warning as well as emergency information sharing among relevant agencies is enhanced.</p>	<p>a. Plan of institutional strengthening for mainstreaming disaster risk assessment information into development plans is formulated.</p> <p>b. Equipment and facilities for NWFFWC are installed as scheduled and utilized as planned.</p> <p>c. GLOF/rainstorm flood risk zonation maps are developed.</p> <p>d. Flood and weather forecasting is delivered daily by utilizing improved forecasting system.</p> <p>e. SOP on emergency information sharing is developed.</p>	<p>a. Plan of Institutional strengthening</p> <p>b. Project documents</p> <p>c. The zonation maps</p> <p>d. DHMS weather forecasting and warning report</p> <p>e. SOP at central level</p>	<ul style="list-style-type: none"> - Staff of DHMS, DGM, DoES , NLCS and DDM who participated in trainings of the Project will continuously work in their offices.
<p>2: Early Warning System (EWS) for GLOF/rainstorm is developed and maintained in the pilot basins of Mangdechhu and the Chamkharchhu.</p>	<p>a. Equipment and facilities for EWS are installed as scheduled and utilized as planned.</p> <p>b. EWS operation and maintenance manual is developed.</p> <p>c. Trainings for the operation and maintenance of EWS are conducted by use of the manual. (All DHMS staff in charge will join the trainings).</p>	<p>a. Project documents</p> <p>b. The manual</p> <p>c. Training report</p>	
<p>3: Emergency response capacity against GLOF/rainstorm flood at central and local level is enhanced in the pilot basins.</p>	<p>a. Workshops for flood emergency response on warning and evacuation are held with the stakeholders in the target sub-districts.</p> <p>b. Evacuation drill by use of developed EWS is planned and conducted in the pilot basins.</p> <p>c. SOP for GLOF/rainstorm flood in the pilot basins is developed.</p>	<p>a. Workshop report</p> <p>b. Drill evaluation report</p> <p>c. SOP at local level</p>	

Activities	Input		
<p><Output 1></p> <p>1-1. Analyze the existing data accumulation and monitoring/alert system in DHMS /NWFFWC to develop feasible and sustainable integrated platform.</p> <p>1-2. Set up necessary system and facilities for the integrated platform and train DHMS/NWFFWC staff to operate and maintain the system.</p> <p>1-3. Review previous study including SATREPS on the potential risk of glacial lakes, and estimate the magnitude of GLOF as well as possible flood considering future climate change in corroboration with DGM and DoES.</p> <p>1-4. <u>Facilitate the discussion in enhancing coordination between GLOF/rainstorm flood risk assessment sector and development sector.</u></p> <p>1-5. Prepare and improve GLOF/rainstorm flood risk zonation to be utilized for activity 3-2 through the training to NWFFWC, DGM, DoES, <u>and NLCS staff.</u></p> <p>1-6. <u>Foster the sense of land use management among related agencies through workshops etc.</u></p> <p>1-7. <u>Identify and propose institutions necessary for mainstreaming disaster risk assessment information into development plans.</u></p> <p>1-8. Improve flood and weather forecasting system by use of accumulated hydro-meteorological data as well as numerical weather prediction data (GPV: Grid Point Value).</p> <p>1-9. Develop SOP on emergency information sharing through discussion and workshops with relevant agencies.</p>	<p>【Japanese side】</p> <p>(1) Dispatch of Experts Experts(7):</p> <ul style="list-style-type: none"> - Watershed Disaster Management (Chief Advisor) - Meteorology / Climate Change Adaptation - Hydrology / Glaciology - Flood Hazard Map / GIS - Weather Forecasting - Information Network / EWS - Community Disaster Management <p>(2) Provision of Equipment</p> <ul style="list-style-type: none"> - Detailed contents will be determined through the implementation of the Project. <p>(3) C/P Training in Japan</p>	<p>【Bhutanese side】</p> <p>(1) Counterpart(C/P) personnel</p> <ul style="list-style-type: none"> - Project Director - Project Manager - Counterparts <p>(2) Office space and facilities for the Project</p> <ul style="list-style-type: none"> - Office space / facilities - Electricity, Water supply and Internet connection <p>(3) Necessary data</p> <ul style="list-style-type: none"> - Geometric data - Hydro-Meteorological data - Socio-economic data etc. 	<ul style="list-style-type: none"> - Necessary budget for the Project is allocated without any significant delay. - Necessary equipment for the Project is procured without significant delay.
<p><Output 2></p> <p>2-1. Review existing hydro-meteorological network and planed hydropower plants from the view point of administrative response on GLOF/rainstorm flood.</p> <p>2-2. Analyze GLOF/rainstorm flood discharge, high-water level, flood arrival time and the other hydrological information to be applied for designing of EWS.</p> <p>2-3. Design the location and specification of EWS composed of detection system, network, data management protocol and information sharing.</p> <p>2-4. Install equipment and facilities for the EWS into the both pilot basins and NWFFWC with necessary provisions of spare parts and maintenance tools.</p> <p>2-5. Prepare EWS operation and maintenance manual to train central and local DHMS staff on its testing, operation and maintenance.</p> <p><Output 3></p> <p>3-1. Review flood emergency response on warning and evacuation in the pilot basins through workshops with participation of DDM, Local Government and Community residents.</p> <p>3-2. List up the target communities and examine flood warning criteria in the pilot basins in the discussion with Local Government considering the findings derived from the activity 1-5, 2-2.</p> <p>3-3. Plan and conduct warning and evacuation drills as well as EWS operation drill in the pilot basins.</p> <p>3-4. Develop SOP for GLOF/rainstorm flood in the pilot basins through evaluation of activity 3-1 to 3-3.</p>	<p>(4) Local cost shared by Japanese side</p> <ul style="list-style-type: none"> - If necessity arises 	<p>(4) Necessary arrangement</p> <ul style="list-style-type: none"> - Land allocation for EWS <p>(5) Local cost shared by Bhutanese side</p>	<p>[Pre-condition]</p> <p>Political situation of Bhutan is stable.</p>