



## Outcome 3 Fact sheet



### Outcome 3: Reduced human and material losses in vulnerable communities in the Punakha-Wangdue Valley through GLOF early warnings



#### Background

Bhutan's northern mountain ranges are speckled with numerous glacier/snow-fed lakes. With a majority of Bhutan's population and infrastructure concentrated in large river valleys, climate-induced glacial lake outburst floods (GLOFs) can cause significant human and economic devastation. Rising mean temperature, attributed by the scientific community to climate change, is the main cause of glacial retreat, correlated with a faster rate of glacier melt of almost 30-60 meters per decade. The melting ice from these receding glaciers is increasing the volume of water in glacial lakes, and the melting of ice-cored dams is destabilizing them, pushing the hazard risk for GLOFs to critical levels.

A significant portion of the country's revenue, projected to 60%, is derived from hydropower, which has involved huge investments in infrastructure and requires sustainable water resources. Other sectors are also highly vulnerable to the adverse effects of climate change. Agriculture in Bhutan provides livelihoods and employment to 79% of the population. The majority of the people practice subsistence farming on small marginal land holdings which are extremely vulnerable to flood impacts. All these investments, infrastructure, agricultural lands and communities require an early warning system (EWS) for GLOF risks.

#### Objective

As a follow up to the UNDP-supported National Adaptation Programme of Action (NAPA, 2006), Bhutan is currently implementing the first project funded by the Least Developed Countries Fund on Climate Change Adaptation titled "*Reducing climate change induced risks and vulnerabilities from glacial lake outburst floods*".

Outcome 3: "*Reduced human and material losses in vulnerable communities through GLOF early warnings*" of the project is addressing the vulnerabilities of communities lying along the Punakha-Wangdue valley. Villages located in high risk zones along the Puna Tshang Chhu River, the country's longest river, include emerging townships, important historical structures, major hydropower projects, farmland, and public infrastructural projects. All of these face human and material losses if the river floods due to GLOFs.

The **goal** of the overall project is to enhance adaptive capacity to prevent climate change-induced GLOF disasters in Bhutan.

The **development objective** of the project outcome 3 is to reduce human and material losses in vulnerable communities in the Punakha-Wangdue and Chamkhar Valleys.

#### Implementation

Project implementation started in 2008 and will continue until 2012.

Project outcome 3 is implemented by the Department of Disaster Management (DDM) and the Department of Energy (DOE) of the Royal Government of Bhutan. The UNDP Country Office in Bhutan is ensuring oversight, monitoring, evaluation and technical guidance, along with the Project Board (PB) and the Technical Support Advisory Team (TSAT) comprised of key stakeholders from the Royal Government of Bhutan and funding agencies.

#### Source of funding

• GEF-LDCF	3,445,050
• UNDP	396,224
• Government (in-kind)	2,680,000
• Austrian Development Agency	800,000
• WWF Bhutan	30,000

## Achievements

The DOE started installation of the automatic EWS in 2010 with completion in 2011. The automatic EWS replaced an interim manual EWS based on appointed community focal points in the 21 most vulnerable communities in the Punakha-Wangdue valley. The automatic EWS is comprised of 17 sirens, 4 automatic water level stations and 3 automatic weather stations that have been successfully installed and are fully functional. A Flood Warning Control Station has been set up and will be manned by 2 (and at a later 3) technicians 24 hours a day. The design of the new EWS has been linked with the Flood Warning system of Bhutan that shares water level data with the Indian states of Assam and West Bengal, thereby, enhancing sub-regional cooperation.

Implementation of awareness activities by the DDM started in 2008. Based on a survey conducted in June, 2011, 90% of households in the vulnerable communities are aware of the GLOF automatic EWS. Communities are better prepared to respond to GLOF disasters with 57% of members having participated in awareness activities since the inception of the project.

GLOF red zone areas and safe evacuation sites have been demarcated in all vulnerable communities based on GLOF hazard zonation maps. Disaster Management focal points have been identified and awareness activities have educated all 21 vulnerable communities, which includes over 875 households, 4 schools, 2 Vocational Training Institutes, a Basic Health Unit and employees at the Basochhu and Punatsangchhu Hydroelectric Power Authority.

The combination of the automatic EWS and awareness activities will provide long-term impacts on the lives of all vulnerable communities lying along the Punakha-Wangdue valley. Community members will be able to identify high risk areas and move to safer sites if the sirens are activated. In addition to communities in Punakha-Wangdue valley, the EWS will benefit communities that are located further down the river, such as the northern states of India.

## Key challenges and lessons

One of the challenges during implementation has been the transportation of hardware components for the automatic EWS to remote areas lacking road access, which are up to 9 day's trek away. No heavy machinery, vehicles, or helicopters could be used due to the mountainous terrain and high altitude. This challenge was overcome by investing in manual labor by hiring donkeys, horses and yaks for transporting the heavy structural columns and employing more men to carry the sensitive, technical hardware components. The projects use of these modes of transportation contributes to the economy of local yak- and horsemen.

## Best practices

The involvement, ongoing cooperation and consistent support of stakeholders from different government departments to create appropriate adaptation measures have been crucial in the successful implementation of the project. In particular, a joint venture between the Sutron Corporation based in the United States and the Bhutanese company USD Enterprises was formed to execute and complete the installation of the automatic EWS. This collaboration combined outside telecommunications, engineering and technical skills with local area knowledge, engineering and labor skills, creating installation teams to successfully complete the project objective. Further, cooperation and additional funding from the Punatsangchhu Hydroelectric Power Authority allowed expansion of the EWS from an initial 14 sirens to the current 17 sirens, which will contribute to the sustainability of project activities.

In addition, early considerations during project design, involving district authorities and local communities, have benefitted project implementation. Consultation with potential partners has led to the formulation of proposals for installation of EWS's in other high-risk valleys, such as Mangdichu basin, in Bhutan and for regional cooperation.

## Resources

<http://www.bhutanglofproject.gov.bt>  
<http://www.undp-adaptation.org/project/glof/>



Austrian  
Development Cooperation

