



**Report on
Awareness on GLOF Rainstorm Flood EWS conducted
for Punatsangchhu and Chamkhar-Mangde chhu Basin
From June 17 to June 21, 2021**

**National Center for Hydrology and Meteorology
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1. Background

The first GLOF early warning system in Bhutan was established in the Punatsangchu basin particularly covering Punakha and Wangdue Phodrang dzongkhags. Since most of the potentially dangerous glacial lakes are located in the upstream of Punatsangchu, the settlement downstream and along the basin are exposed to a great threat from GLOFs. Similar Early Warning Systems were also established in Chamkharchu and Mangdechu basins later but with additional features to detect rainstorm floods also.

Just because the early warning system is set up doesn't make it truly beneficial to the societies at risk until they are made aware that such a system exists to assist them in minimizing impact from GLOF/Rainstorm Flood. To do that, sensitization of standard operating procedure is so important firstly to make people aware and secondly to let them know how to interact with each other in times of events like GLOF/Rainstorm flood.

With the onset of monsoon in Bhutan from 7th June 2021, it was a perfect time to remind the stakeholders about the potential dangers from the GLOF and rainstorm. Due to the current pandemic situation, we could only involve the relevant stakeholders and some officials from the dzongkhags for this awareness program. A group from Hydrology and Water Resources Services Division, NCHM started the awareness program of GLOF/Rainstorm Flood Early Warning Systems in Punakha-Wangdue and Chamkhar-Mangde Valley from 17th June, 2021.

During the program, stakeholders were informed about the potentialities of GLOFs and Rainstorm Floods in the Punakha-Wangdue Valley in future due to growing glacier lakes and melting glacier moraines causing the breach of natural dams. The distinct differences between characteristics of GLOF and Rainstorm Flood were pointed out to enlighten the focal persons for better reaction in times of floods. To improve and facilitate communication amongst the stakeholders and the site staff of NCHM, site staff of Wangdue control room were led together to the meeting and introduced.

2. Awareness Program

2.1. Basochu Hydropower project

The awareness program was attended by the focal person for the disaster response and some of the staff of Basochu Hydropower Plant. Technical team made the presentation on the GLOF EWS to the participants. The presentation was followed by the discussion. There were inquiries from Basochu participants whether NCHM had done the flow forecast system setup for Basochu (Tributaries of Punatsangchu). They said that if there is a flow forecast, it will help them to forecast the power generation. The staff was interested in the rainstorm flash flood forecast and even shared their past flood experience which occurred in 2019. Since the past flood event which occurred in 2019 was due to a localised rainfall, the team informed them that such events are difficult to forecast since we do not have the required expertise as of now. And they were introduced with some of the models like FFGS and SERVIR which are being used by the center for flood forecasting.



Figure 1: Staff from Basochu Hydropower Project

2.2. Wangdue Phrodang Dzongkhag

Disaster focal and staff from the engineering section attended the awareness program. During the discussion time, they asked about the procedure for data request. In response to this question, they were brief about the availability of data form in the NCHM website and to whom they should mail it. The NCHM team were informed about the usage of the climate data for the planning purpose. Suggestion regarding the location of weather stations was given by the participants since the current available climate data was not able to suffice their intended purpose.



Figure 2: Wangdue Phodrang Dzongkhag staff

2.3. Punakha Dzongkhag

The awareness program was attended by the Disaster focal person and the staff from planning and engineering sections. The staff were all new and they were not aware about the early warning systems. The planning section made an inquiry regarding the availability of flood hazard zonation maps for Punakha Dzongkhag. They said that the hazard map can be used as a supporting document for the rule against the construction along the rivers bank. But as of now without the hazard map, they don't have any supporting document for that rule. With past

disasters due to windstorms and rainstorms in the dzongkhag, they emphasized the importance of forecasting such events. They said that the mock drill for the communities needs to be conducted.

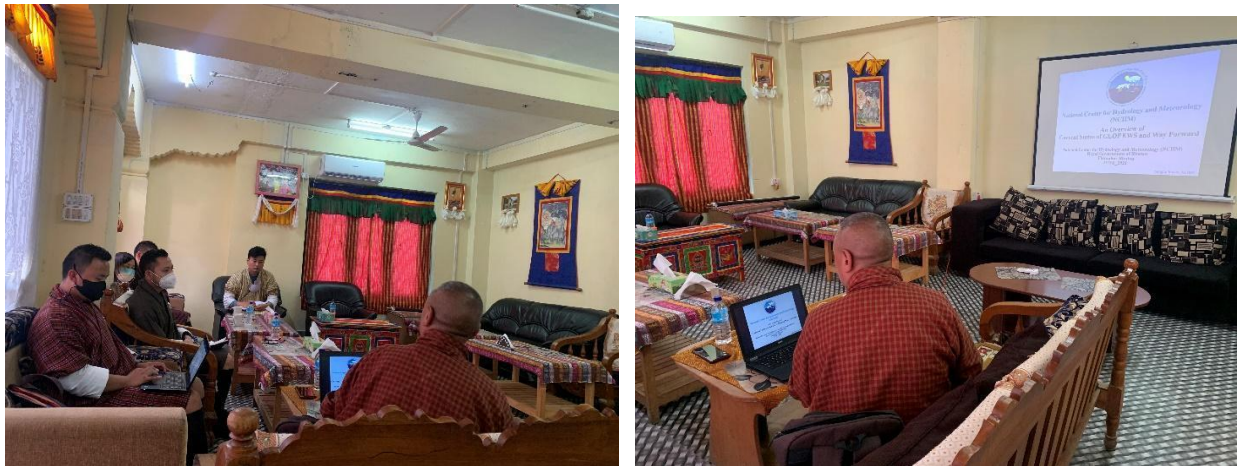


Figure 3: Punakha Dzongkhag Staff

2.4. Punatsangchu Hydro Power Authority (PHPA I and II)

Some on the discussion held with the PHPA I and II security division were:

- Mock drill to be conducted during the lean season and the need to test the equipment like siren for the early warning since it has been more than 10 years after the installation of the system.
- They suggested the use of sirens even during the flash flood as an information to the community. Difficulties faced during the flash flood in 2020 for the evacuation were shared by them to the NCHM team.
- They informed us that they conduct mock drills every 3 months for the work. The NCHM team informed them that if they want to use the siren for the mock drill, we can assist them by turning on the siren.
- Color coded marking of alert and alarm level on the Wangdue bridge. The threshold value to be set up with consultation with the PHPA staff. The materials like paint required for the marking will be provided by the PHPA.
- They requested for 3-hourly data even during night.
- The need for the flow forecast in order to forecast the power generation.
- Sharing of username and password of the GLOF webpage to the PHPA-I
- They recommended the involvement of the persons who are actually responsible for the response for the disaster during the seminar and meeting conducted by the center for GLOF.



Figure 4: Staffs of PHPA

2.5. Wolathang Primary School

Due to the current pandemic, the NCHM team did not interact with the students. The meeting with the teachers was also held only after school hours. Wolathang school being the first place in Punakha dzongkhag to be impacted in the event of GLOF, the contact details of the teacher were collected to be updated in the SOP for the information dissemination. They were also given the contact details of the Wangdue control room office number. The school management informed about their plan to conduct a mock drill for the student on 21st June. For the mock drill, refreshment for the student from the center was handed over to the school management.



Figure 5: Teachers of Wolathang Primary School

2.6. Bjeezam Primary School

For the information dissemination during the flood events, the contact details of the teachers were gathered. With the recent experience of flood, they shared the need to conduct mock drills for the flood. They said that some of the students are traumatized due to the recent flood event which occurred in October 2020.



Figure 6: Teachers of Bjeezam Primary School

2.7. Trongsa Dzongkhag

Dasho Dzongdag of Trongsa dzongkhag graced the meeting. The police official who was responsible for the response during the disaster attended the meeting. Following are the feedbacks received after the meeting:

- Need of flood forecast system for the preparedness
- Monitoring of small streams
- Need to conduct detailed study for the flood events not just at the place where the damage has occurred but from the source itself.
- Dasho even recommended a need for the DDM and NCHM to work together in the event of a flood.

2.8. Bathpalathang Airport

Since the current SOP for GLOF/ Rainstorm Chamkhar Basin did not include the contact details of the airport officials, there is a need to include their contact details during the revision of the SOP. For their reference, a flood hazard map was provided to them. The need to identify evacuation places during the flood events was shared by the participants.



Figure 7: Official from Trongsa Dzongkhag



Figure 8: Staffs of Bathpalathang Airport

2.9. Bumthang Dzongkhag

Dasho Dzongdag of Trongsa dzongkhag graced the meeting. The police official who was responsible for the response during the disaster attended the meeting. Following are the feedbacks received after the meeting:

- The members present there suggested the installation of a water level detection sensor at the source for early detection of GLOF and in order to increase the lead time.
- Use of mobile apps to inform people about flood occurrences since the siren might not be loud enough for everyone.
- They shared the problems related to false alarms.
- Water level gauge mark on the Chamkhar bridge as a reference for the public.

- Dasho recommended the need to conduct flood awareness programs for the school specially Gangrithang and Choekhortoe school since they are located along the Chamkhar Chu.
- Use media as a means to create awareness for the public.



Figure 9: Official from Bumthang Dzongkhag

2.10. Gangrithang Primary School

The principal of the school informed us about the usage of the disaster related tool which was provided to them during the installation project of EWS during the mock drill. But the batteries for some of the equipment were not available in our market. So, they were seeking assistance in purchasing the batteries.



Figure 10: Teachers of Gangrithang Primary School

2.11. Choekhorthoe Primary School

The school informed that mock drills are being frequently conducted for the students. They have already conducted it three times this year. They informed us that the sound from the siren is not being heard by some of the villages located near the school. If it is possible for some training related to disaster response which will help them during the events of flood. The teachers shared their experience and the problems faced during the mock drills. They said that the tent posts were not convenient for the students to carry and there is a need for some mats for the students to rest during the events of the disaster.



Figure 11: Teachers of Choekhorthoe Primary School

2.11. Gasa Dzongkhag

Due to the landslide event on 16th June 2021, the officials of the Gasa dzongkhag were all busy. The team from the NCHM were not able to meet them. Therefore, the team decided to conduct the awareness program virtually for Gasa Dzongkhag and decide on the date for the program after consulting with the dzongkhag disaster focal.

3. Issues and Challenges conducting the Awareness program

Following are the issues and challenges faced while conducting the Awareness program:

- ❖ Due to the current pandemic, the community at risk was not involved in the awareness program.
- ❖ Coordination of the awareness program with the disaster focal.

4. Recommendation

Following are the recommendations from the team:

- ❖ With the installation of early warning systems, there is a need to make the vulnerable community aware about the systems. It has been 3 years since the awareness program and mock drill for the EWS was conducted involving the community at risk. Hence a mock drill for the GLOF needs to be conducted for the community at risk. For the mock drill, we will have to involve the official from the Department of Disaster Management and the disaster focal from the Dzongkhag.
- ❖ While conducting the Awareness program, it was found that there are some changes in the contact detail of the focal person of the stakeholders for the communication purpose during the disaster. So, there is a need for the office to constantly update the contact details of the stakeholder.

5. Annexure with list of participants /attendance

1. Wangdue Phodrang Dzongkhag

Sl.no	Name	Designation
1	Sonam Wangchuk	DT Secretary / DDMO
2	Passang Dorji	Dzongkhag Planning Officer
3	Lhab Tshering	RBP
4	Sangay Lhamo	Engineer
5	Purna Kumar Poudel	Wangdue In-charge

2. Punakha Dzongkhag

Sl.no	Name	Designation
1	Tshewang Phuntsho	Disaster Focal
2	Phub Tshering	Dzongkhag Environmental Officer
3	Rohit Chettri	Dzongkhag Architect
4	Sherab Lhamo	Development Regulatory Officer
5	Sonam Gyeltshen	District Engineer
6	Dawa Singay	Urban Planner
7	Purna Kumar Poudal	Met/Hyd/Tech II

3. Wolathang Primary School

Sl.no	Name	Designation
1	Namgay Thinley	Principal
2	Phurpa Zangmo	ECCDF
3	Tshering Dekar	Teacher
4	Sangay Wangchuk	Teacher

5	Dawa Phuntsho	Teacher
6	Purna Kumar Poudal	Met/Hyd/Tech II

4. Basochhu Hydropower Plant

Sl.no	Name	Designation
1	Yeshey Samdrup	Head Operator
2	Neten Tshering	Head MTU
3	Sonam Yangchen	Head HRO
4	Kunzang Chedup	Head Security
5	Sonam Wangchuk	Dy. EE
6	Duptho Wangmo	Head Incheage
7	Kishor Maya Ghalley	Fleet Incharge
8	Pema Zam	Fleet
9	Pema Zam	Head, Finance unit
10	Pema Norbu	AFO, Finance unit
11	Tenzin Choden	Am, HR
12	Rinzin Choden	TSU/OS
13	Rinchen Pelmo	Accountant
14	Choney Dukpa	Head, Technical Support Unit
15	Dorji Khandum	Am, HR
16	Sangay Dorji	Fireman

5. Punatshangchhu Hydropower Project

Sl.no	Name	Designation
1	Thinley Dorji	Joint Managing Director
2	Wangchuk Hexzo	Chief
3	Sonam Tshewang	Deputy Chief Security Officer
4	Lhatru Dorji	Deputy Chief Fire Officer
5	Tenzin Thinley	Jr. Fire Officer
6	Kelden Dukpa	Chief Security Officer PHPA I
7	Kinley Namgyel	Chief Security Officer PHPA II

6. Trongsa Dzongkhag

Sl.no	Name	Designation
1	Phub Rinzin	Dzongda
2	Tshelthrim Dorji	SP
3	Tharchen	Chief District Engineer
4	Pema Jambho	OC
5	Birddal Rai	Rukha
6	Tshering Gyeltshen	Dzong Incharge
7	Sangay Dendup	Traffic
8	Tshering Dendup	Crime Center
9	Tshewang Norbu	DDMO
10	Jigme Dorji	Drimpon
11	Yeshe Peldon	Met/Hyd/Tech II

7. Bjeezam Primary School

Sl.no	Name	Designation
1	Jamyang Dorjee	Teacher
2	Thinley Tshetan	Teacher
3	Kenchola	Teacher
4	Tshering Pelmo	Teacher
5	Sangay Zangmo	Teacher
6	Yeshe Peldon	Met/Hyd/Tech II

8. Bumthang Dzongkhag

Sl.no	Name	Designation
1	Kezng Choden Dorji	Dzongda
2	Tandin Dorji	Dzongrab
3	Jambay Dorji	Dzongkhag Livestock Officer
4	Rinzin Wangmo	DDMO
5	Jigme Kelzang	DHO
6	Sonam Jamtsho	Chief District Engineer
7	Tashi Tenzin	Assistant Human Resource Officer
8	Som Maya Darjee	Chuma
9	Tshering Namgay	Chuma
10	Kezang Dorji	Chuma
11	Kinley Dorji	Pelpon
12	Sangay Thinley	Drimpon
13	Sonam Dendup	Drimpon

14	Tashi Tenzin	Chuma
15	Pema Wangchuk	Gopa
16	Tshering Gyeltshen	Chuma
17	Sangay Dorji	Peljab
18	Dungchu Wangdi	In-charge

9. Bathpalathang Airport

Sl.no	Name	Designation
1	Ugyen Dorji	Com/Nav Asst I
2	Pema Jamtsho	Security Supervisor
3	Kuenzang Lhadon	Hydro/Met Technician IV
4	Koksel Dema	Hydro/Met Technician V
5	Jamyang Sherab	Officiating APM
6	Dungchu Wangdi	Met/Hydro Tech II

10. Choekhortoe Primary School

Sl.no	Name	Designation
1	Kinzang La	Teacher
2	Mon Bahabur Monger	Teacher
3	Yangchen Wangmo	Teacher
4	Tshering Wangchuk	Teacher
5	Tashi Tshering	Teacher
6	Ugyen Tshewang	Teacher
7	Namgay Dema	Teacher
8	Dungchu Wangdi	Met/Hyd/Tech II

11. Gangrithang Primary School

Sl.no	Name	Designation
1	Dechen Loday	Teacher
2	Rinchen Phuntsho	Teacher
3	Kinga Norbu	Teacher
4	Thukten	Teacher
5	Pema Chophel	Teacher
6	Pema Dakpa	Teacher
7	Pasaang Dorji	Teacher
8	Tshering Wangmo	Teacher
9	Tshering Dema	Teacher
10	Geyden Zangmo	Teacher
11	Kunzang	Teacher
12	Phurpa Dema	Teacher
13	Chewang Choden	Teacher
14	Sonam Yangchen	Teacher
15	Geeta Sherpa	Teacher
16	Karma Choden	Teacher
17	Sherab Dorji	Teacher
18	Minjur Dorji	Teacher
19	Tshering Yangki	Teacher
20	Galley Zangmo	Teacher
21	Karma Wangchuk	Teacher
22	Sonam Dechen	Teacher

23	Kinzang	Teacher
24	Tashi Choden	Teacher
25	Bhumey Ghalley	Teacher
26	Dechen Choden	Teacher
27	Dungchu Wangdi	Met/Hydro Tech II