



ANNUAL REPORT 2025-2026

NATIONAL CENTRE FOR HYDROLOGY AND METEOROLOGY
ROYAL GOVERNMENT OF BHUTAN
THIMPHU, BHUTAN
July 2026



ANNUAL REPORT

2025-2026

National Centre for Hydrology and Meteorology
Royal Government of Bhutan
Thimphu, Bhutan
July 2026

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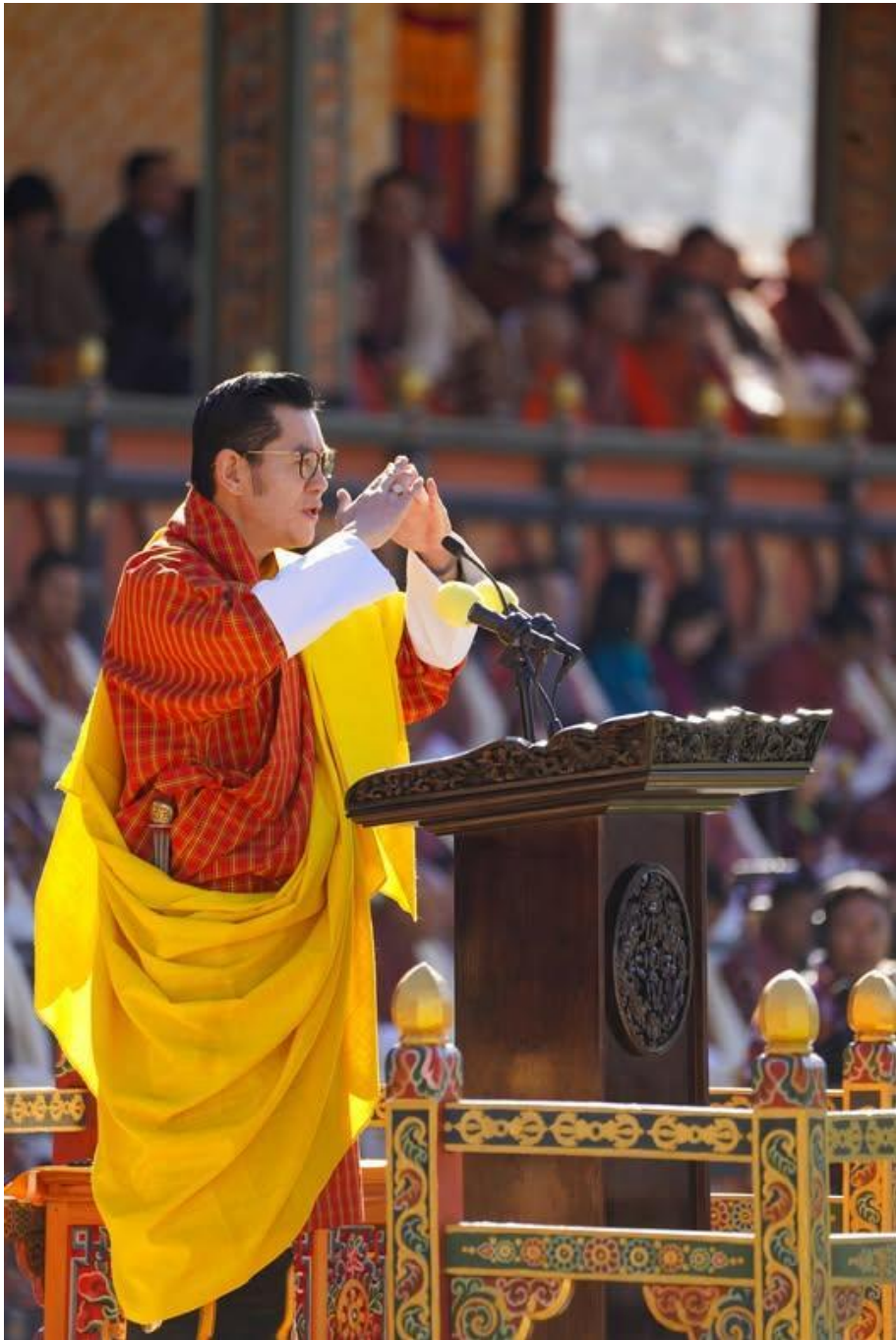
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His Majesty's Address to the Nation on National Day
17 December 2024

Acronyms:

13 FYP	Thirteen Five-Year Plan
AMS	Aviation Meteorology Section
AWLS	Automatic Water Level Station
AWS	Automatic Weather Station
BFL	Bhutan for Life
CDMS	Centralised Database Management System
CSD	Cryosphere Services Division
CDCL	Construction Development Corporation Limited
DGPC	Druk Green Power Corporation
EWS	Early Warning System
GB	Governing Board
GCF	Green Climate Fund
GFCS	Global Framework for Climate Services
GLOF	Glacier Lake Outburst Flood
GoI	Government of India
GTS	Global Telecommunication
HWRSD	Hydrology and Water Resources Services Division
ICT	Information Communication Technology
JET	Joint Expert Team
JICA	Japan International Cooperation Agency
JTT	Joint Technical Team
MSD	Meteorological Services Division
MoENR	Ministry of Energy and Natural Resources
NCHM	National Center for Hydrology and Meteorology
NWFWC	National Weather Flood and Warning Centre
PHPA	Punatsangchhu Hydropower Project Authority
PSC	Project Steering Committee
R&D	Research and Development
RCSC	Royal Civil Service Commission
RGoB	Royal Government of Bhutan
RIMES	Regional Integrated Multi-Hazard Early Warning System
SOP	Standard Operating Procedure
SOFF	Systematic Observations Financing Facilities
STAC	Scientific Technical Advisory Council
TSRD	Technical Standard Research Division
UNDP	United Nation Development Programmed
UNEP	United Nations Environment Programme
WIS	Weather Information System
WWIS	World Meteorological Organisation Weather Information System
WMO	World Meteorological Organization
WRF	Weather Research and Forecast

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Figure 1: Salang Tendril ceremony of the construction of the National Weather and Flood Warning Centre (NWFWC) and its associated scientific facilities at Yusipang, Chang Gewog, Thimphu Dzongkhag on 15 April 2026

1 ORGANIZATION

The National Centre for Hydrology and Meteorology (NCHM) is a scientific and technical autonomous agency of the Royal Government of Bhutan, established in 2016. During the Civil Service transformation exercise in 2022, the Centre was placed under the Ministry of Energy and Natural Resources (MoENR). The Centre is responsible for understanding the behaviour of the atmosphere, its interaction with the cryosphere and water bodies, weather and climate, and the distribution of the country's water resources. It serves as the nodal agency for generating information and delivering products and services related to weather, climate, cryosphere, and water resources in Bhutan.

The Centre was established to enhance efficiency and effectiveness in providing hydrology, meteorology, cryosphere, and climate science information and services required by various sectors and the public.

2 NCHM REPORTING

In accordance with the Civil Service Reform Act of Bhutan 2022, the RCSC, vide letter no. RCSC/HRMD/7/2023/2830 dated February 13, 2023, conveyed that the 7th CSR meeting held on February 10, 2023, approved that NCHM shall have functional autonomy. The Head of the Centre shall report to the Secretary of the Ministry of Energy and Natural Resources for strategic policy direction and governance of the Centre.

3 SCIENTIFIC AND TECHNICAL ADVISORY COUNCIL (STAC)

To advise and provide directives to the Centre in implementing its technical mandates in weather, climate, water, and cryosphere sciences, as well as their applications for the generation of information and services, the Scientific and Technical Advisory Council (STAC) of NCHM was established in October 2023. The establishment and composition of members of the Commission/Authorities/Council were approved during the 156th Session of the *Third Lhengye Zhungtsho*, held in October 2023, along with the Guiding Principles.

3.1 Composition of Scientific and Technical Advisory Council (STAC)

The following are the approved Council members by the Cabinet;

- a. Chairperson : To be appointed from amongst the members
- b. Member : Director/Specialist, Department of Energy, MoENR
- c. Member : Director/Specialist, Department of Public Health, MoH
- d. Member : Director/Specialist, Department of Human Settlement, MoIT
- e. Member : Director/Specialist, Department of Local Governance and Disaster Management, MoHA
- f. Member : One eminent specialist/Expert member from outside the Civil

- Service agency
- g. Member : Director General/Head, NCHM

The following are the current council members confirmed by the agencies and endorsed by the Ministry.

- a. Chairperson : Mr. Karma P Dorji, Director General
Department of Energy, MoENR
- b. Member : Mr. Karma Galay, Director General
Department of Local Governance and Disaster
Management, MoHA.
- c. Member : Mr. Karma Jamtsho, Director
Department of Public Health, MoH
- d. Member : Mr. Wangda Dorji, Director
Department of Human Settlements, MoIT
- e. Member : Dr. Cheki Dorji, President
College of Science and Technology (CST)
Royal University of Bhutan [Eminent specialist/Expert
Member from outside the Civil Service approved by
Minister, MoENR based on nomination by RUB]
- f. Member : Karma Dupchu, Director General, NCHM

Additional experts from relevant sectors may be invited to participate as observers. Their inclusion shall be determined by the Chairperson of STAC, based on the agenda and issues under discussion.

4 VISION, MISSION AND CORE VALUES

4.1 VISION

Centre of Excellence in Hydrology, Meteorology and Cryosphere Science and Services

4.2 MISSION

Monitoring and understanding of hydrology, weather, climate and cryosphere, for timely provision of information and services to protect lives and property and support national needs for ecologically balanced sustainable development.

4.3 CORE VALUES

- a. Commitment and loyalty in delivery of products and services
- b. Integrity
- c. Professionalism in support of science, research, objectivity, impartiality, and excellence
- d. Mutual respect, cultural sensitivity and non-discrimination

4.4 GOALS

- a. Improve result-based decision support service for weather incidents and events that threaten lives and livelihoods
- b. Enhance climate services to understand and adapt to climate-related risks;
- c. Develop capacity to provide integrated and coupled monitoring, detection and forecast services to support assessment and management of water resources and hydro-meteorological hazards;
- d. Build competence to provide sector-relevant information for socio-economic development, and support the development of integrated environmental services to foster healthy communities and ecosystems;
- e. Sustain a highly skilled professional workforce equipped with training, tools and infrastructure to fulfil the mission.

4.5 MANDATES

To provide scientific and technological services in hydrology, water resources, meteorology, climatology, and cryosphere to ensure the safety and socio-economic well-being of society and to support national and international needs.

4.6 FUNCTIONS

- a. Establish and operate a National Observation network and telemetry system for weather, climate, cryosphere, hydrology and water resources;
- b. Maintain a national database (repository) of hydrology, meteorology, cryosphere and related environmental data and information;
- c. Provide Public Weather Services (PWS), climate services, agro-meteorology, and

- climate projection;
- d. Aviation meteorological observation and provide aviation meteorological services.
- e. Provide hydrological forecasting (flow and flood), water resource availability assessment.
- f. Assessment and mapping of hydro-meteorological and GLOF hazards and provide Early Warning Services.
- g. Study and monitoring snow, glaciers and glacial lakes in the country.
- h. Conduct scientific studies on the cryosphere to make an inventory and assess its potential in terms of water resources. Carry out a hazard assessment and recommend suitable measures to address the risks and hazards associated with this field.
- i. Promote and conduct research on cryosphere, meteorology (weather and climate), hydrology and water resources;
- j. Enhance human resources development and professional capacity in the field of hydro-meteorology and cryosphere services;
- k. Promote and facilitate standardization of hydro-met instruments, methods of observation and recording.
- l. Establish collaboration and linkage with national, regional and international organizations.

5 ORGANOGRAM AND STAFFING

5.1 Organogram

The Centre is organized into Common Secretarial Services with four Technical Services Divisions headed by the Director;

- a. Office of the Director/Head
- b. Secretariat Services (Planning and Program, HR Services, Administration, Finance, Procurement/Store, ICT)
- c. Technical Standard and Research Division (TSRD)
- d. Cryosphere Services Division (CSD)
- e. Meteorology Services Division (MSD)
- f. Hydrology and Water Resources Services Division (HWRSD)

The updated organogram of NCHM with the reporting structure is given in Figure 2.

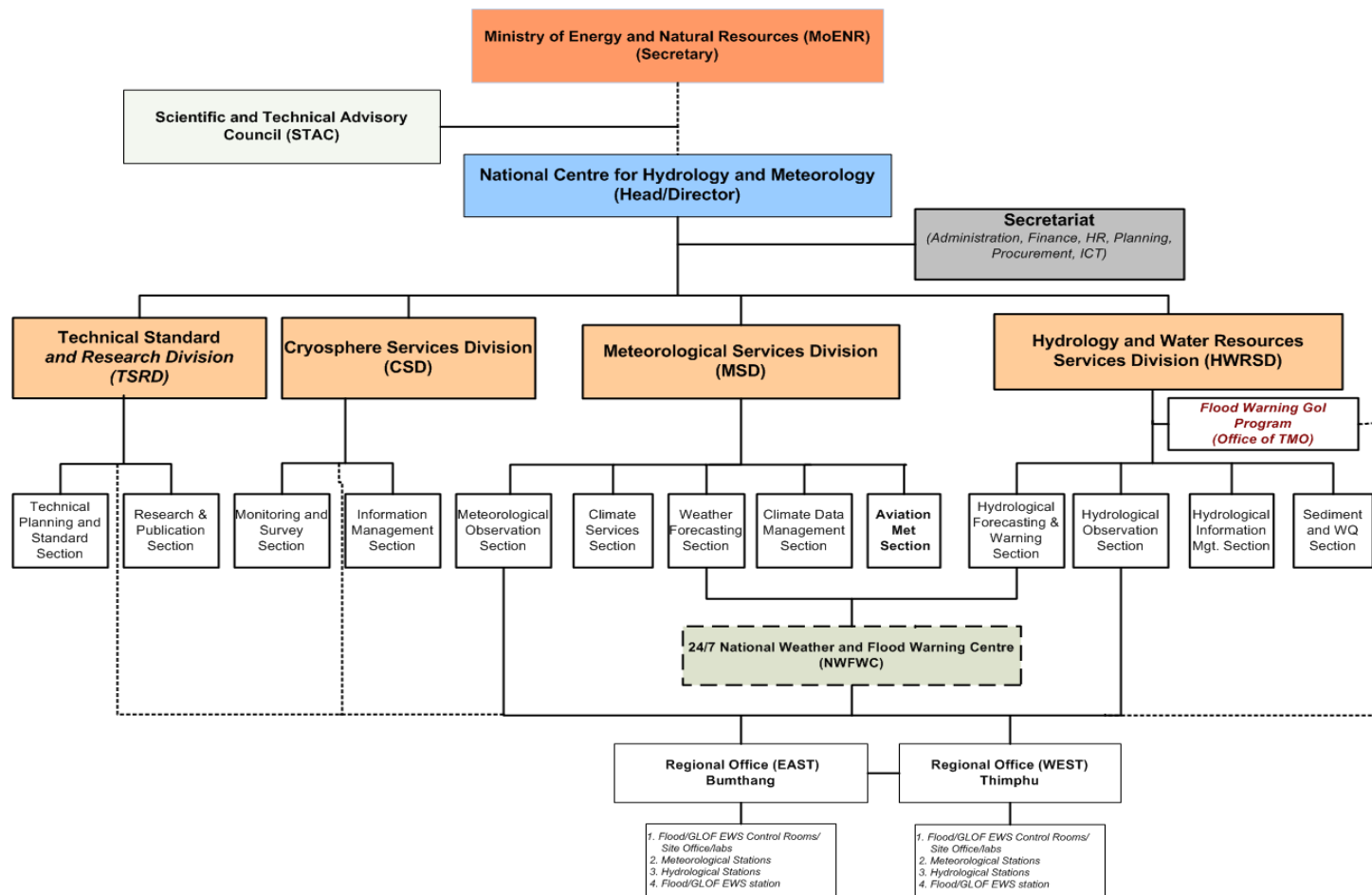


Figure 2: Approved Organogram of NCHM

5.2 Staffing

5.2.1 Staff by Division

Under the 13th Five-Year Plan, the NCHM has an approved strength of 215 positions. As of now, the Centre is staffed with 192 employees, including standard staff and ESP/GSP personnel under the Secretariat and the HWRSD. The detailed manpower distribution across divisions is presented in the table below.

Table 1: Approved and Existing Staff by Division

Sl. No.	Division	Approved	Existing	Gap/ Excess
1	Secretariat	18	18	0
2	Technical Standard and Research Division	7	4	-3
3	Cryosphere Service Division	8	6	-2
4	Meteorological Service Division	65	59	-6
5	Hydrology and Water Resource Service Division	117	105	-21
Total		215	192	-23
% of Staff Strength (Existing)		89.30%		

The Centre experienced a slight decline in staff strength from 91% in FY 2024–2025 to 89.30% in FY 2025–2026. Despite this marginal decrease, the current workforce remains largely adequate to support the Centre’s mandates, operational requirements, and the delivery of key hydrometeorological services and targets under the 13th FYP.

The manpower distribution indicates that the technical divisions continue to operate below the approved staffing levels. The most significant shortage is observed in the HWRSD, followed by the MSD. Although the Centre has maintained a relatively stable workforce, these gaps underscore the need for continued recruitment and workforce strengthening to ensure sustained operational efficiency and effective service delivery in the long term.

5.2.2 Staff distribution by Gender

Male employees constitute 66.67% of the workforce, while female employees account for 33.33%. The higher proportion of male staff is largely due to the technical and field-intensive nature of services in the respective divisions. These roles involve continuous monitoring, river gauging, flood and landslide assessments, installation and maintenance of observation stations, and data collection in remote and challenging terrains, requiring frequent field deployment and extended travel—conditions that have

traditionally resulted in greater male participation.

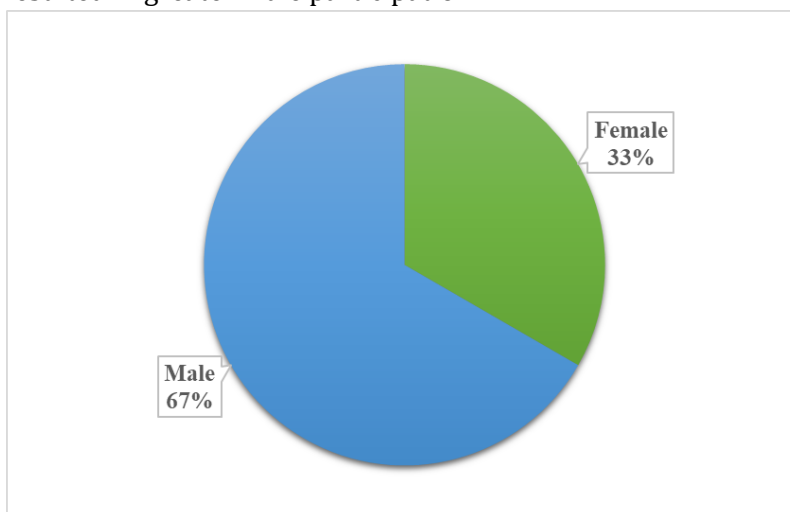


Figure 3: Staff Distribution by Gender

In comparison, the Secretariat services demonstrate a higher concentration of female staff, indicating stronger female representation in administrative, coordination, and support functions. Overall, the staffing pattern reflects a gender distribution shaped by the operational and functional requirements of respective divisions.

5.2.3 Staff distribution by Position level

The staff distribution reflects a pyramid structure, with the majority of employees in the Supervisory and Support Category (140), followed by the Professional and Management Category (32), Operational and Elementary staff (19), and only 2 at the EX/ES level. This indicates that NCHM functions primarily as a technical and implementation-oriented agency, with a strong mid-level workforce supporting field and operational activities.

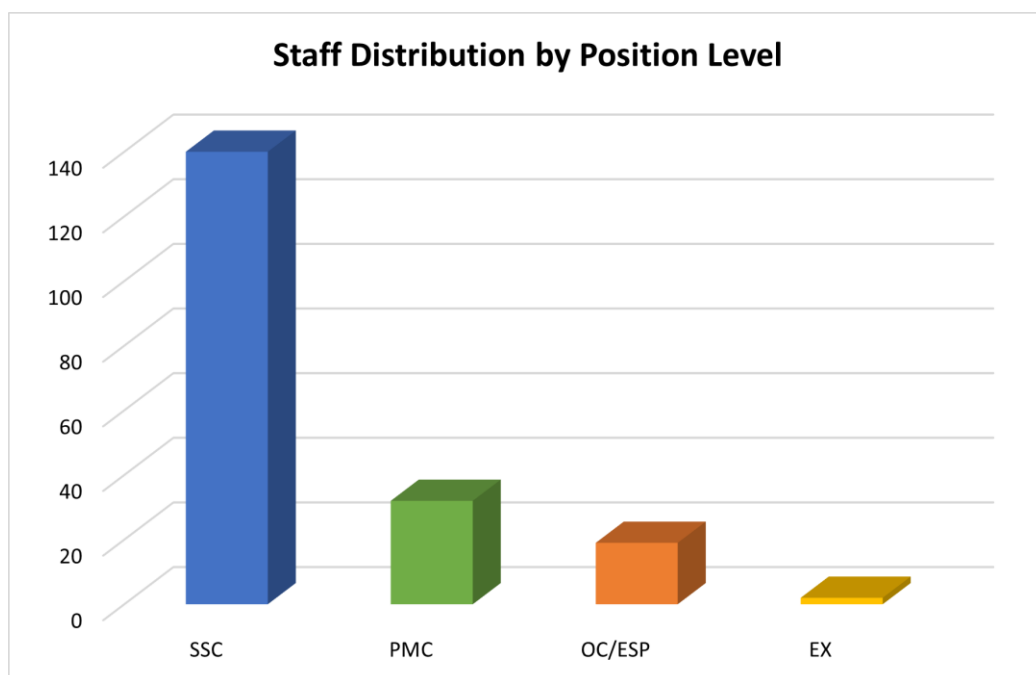


Figure 4: Staff distribution by Position level

(Ex: Executive, PMC: Professional and Management Category, SSC: Supervisory and Support Category, OC: Operational Category, ESP: Elementary Service Personnel)

5.3 Superannuation

During the financial year 2025–2026, the NCHM bid farewell to two Meteorology/Hydrology Technicians and one Principal Meteorology/Hydrology Officer. On behalf of the Royal Civil Service Commission (RCSC), the Centre conferred the Lifetime Civil Service Award Medal along with certificates of appreciation in recognition of their dedicated service to the Tsa-Wa-Sum. The list of superannuated staff is provided below:

Table 2: List of Superannuated Officials for FY 2025-2026

Sl. No.	Name	Position	Duration of Service
1	Mr. Pashupati Sharma	Principal Meteorology/Hydrology Officer	37 years 8 months 11 days
2	Mr. Khemraj Sanyasi	Meteorology/Hydrology Technician II	35 years 8 months
3	Mr. Purna Kumar Poudel	Meteorology/Hydrology Technician I	38 years, 6 months, and 4 days



Figure 5: Photos of Superannuated Staff, Mr. Khemraj Sanyasi (Right) and Mr. Pashupati Sharma (Left)

5.4 Recruitment, Appointments and Transfer

5.4.1 Recruitment

During FY 2025-2026, the Centre recruited and appointed two officials under the PMC category and five under the SSC category, most of whom were replacements for staff separations or long-term leave. In addition, the Assistant Planning Officer joined NCHM through reassignment from the Policy and Planning Division (PPD), Ministry of Infrastructure and Transport (MoIT), Thimphu Thromde. Ms. Karma DeeJay Tshomo joined NCMM on 9 December 2025 as an ICT Technical Associate II. The details of these appointments and transfers are provided in Table 3. The Centre conducted onboarding programmes for all recruits and transferees to familiarise them with its vision, mission, organizational structure, mandates, and shared responsibilities in delivering hydro-meteorological services. New employees were also introduced to the Bhutan Civil Service Rules and Regulations and related systems, including eDATs.

Table 3: Recruitment of new employees in PMC and SSC in FY 2025-2026

Sl.No	Category	Position Title	Employment Type	Total
1	Recruitment	Met/Hyd Officer	Regular	1
2	Recruitment	Met/Hyd Technicians	Regular	5
3	Recruitment	Asst. Planning Officer	Regular	1
4	Recruitment (GovTec)	ICTAA	Regular	1



Figure 6: Photos of New Recruits for FY 2025-2026

5.4.2 Appointment

Mr. Trashi Namgyal was appointed as the Chief of the Hydrology and Water Resources Services Division (HWRSD) upon selection through an open competitive process, effective from 1 July 2025. With over 13 years of service and extensive technical expertise, he is expected to strengthen the Division's leadership and advance the Centre's mandate of delivering timely and reliable hydrometeorological services.



Figure 7: Mr. Trashi Namgyel appointed Chief of Division (HWRSD)

5.4.3 Separation of Staff

During FY 2025–2026, nine employees separated from the Centre through voluntary resignation—five at the PMC level and the rest in SSC and below categories—while three staff members superannuated. The attrition rate stands at 4.8%, down from 6.63% in FY 2024–2025, reflecting improved staff retention and greater workforce stability.

6 NCHM 13 FYP (2024-2029)

6.1 Core Activities and Strategic Alignment

Observation, data management, modelling, research, and prediction are core functions of the Centre for effective delivery service. Hydro-met data and services are essential across all four clusters and support national programs both directly and indirectly. All NCHM activities are implemented under the project *Enhancement of National Hydrological and Meteorological Services*, aligned with two national programs and the outcomes of the 13th Five-Year Plan (13 FYP).

Global Goal	  
National Goal	HIGH INCOME GNH ECONOMY
Strategic Objectives	BHUTAN IS A HIGH-INCOME COUNTRY DRIVEN BY INNOVATION AND SUSTAINABILITY
Outcome	Economy Outcome: By 2029, Bhutan has enhanced productivity and diversified products and markets driving sustainable economic growth Security Outcome: Safety and security threats and disaster risks to the country, its economy, infrastructure, institutions, and people are mitigated and managed.
National Program	a. Climate Resilient and Ecological Diversity (Economic Cluster) b. Transformational Governance (Governance Cluster)
Project	Enhancement of National Hydrological and Meteorological Services
Activity	1. Construction of 24/7 National Weather and Flood Warning Centre (NWFWC) and Scientific and Communication Facilities 2. Enhancement of National Hydro-met Observation Network and Infrastructure 3. Enhancing Weather and Climate Service 4. Strengthening Aviation Meteorological Services 5. Enhancing Hydrological and GLOF Early Warning Services 6. Enhancing Cryosphere Monitoring and Research in Bhutan Himalayan 7. Strengthening Technical Standards and Research Capacity

Figure 8: Summary and linkage of NCHM 13 FY Plan to national and international goals

Nu. 1704.26 million is allocated for the “Enhancement of National Hydrological and Meteorological Services” in the 13th FYP.

6.2 Key Performance Indicators

The Centre has identified 13 Key Performance Indicators (KPI) for monitoring the achievements of the Centre’s 13 FYP planned activities.

7 SUMMARY OF FINANCIAL STATEMENT FOR THE FY 2025-2026

7.1 Executive Summary

For FY 2025-2026, the NCHM was allocated a total revised budget of Nu. 416.918 million, against which Nu. 379.577 million, including advance, was utilized, resulting in a utilization rate of 91%.

7.2 Budget Performance

The budget performance, categorized into Capital and Current Expenditure, is presented in Table 5.

Table 4: Budget Performance by Capital and Current Expenditure (Nu. in Millions)

Program Title	Budget	Expenditure	Utilization
Capital	304.153	271.283	89.2 %
Current	112.765	108.294	96 %
Total	416.918	379.577	91 %

7.3 Source of Funding and Utilization

Based on the Revised Expenditure Report for FY 2025-2026, Table 6 summarizes the approved budget and utilization at the end of June 2026, including the funding source.

Table 5: Budget utilization by Source of Funding (Nu. in Millions)

Funding source	Budget	Expenditure	Utilization %
RGoB	153.137	144.01	94 %
Donor/Gol	263.781	235.567	89%
Total	416.918	379.578	91 %

Table 6: Key Performance Indicators NCHM for 13 FYP and Status as of June 2026

Sl. No.	Output	Key Performance Indicators	Baseline	Target 2029	13 FYP Status as of 30 June 2026
1	Hydromet Infrastructure and Early Warning Facilities Enhanced	National Hydro-met Network enhanced	278	300	Achieved
		Number of Infrastructure and scientific facilities established	0	3	On track
		Flood/GLOF EWS System install/upgrade for all the river basins/sub-basins.	3 Basins	8 Basins	On track
2	Hydro-met data and Services delivery for Climate Resilient Development and Disaster Preparedness Enhanced.	Weather forecasting accuracy improved	60%	65%	Achieved
		Climate Projection of Bhutan Report updated	2018	2024/25	Achieved
		Flood/GLOF hazard assessment and maps of the river basin developed/updated	3	8	Achieved
		Number of benchmark glaciers and annual monitoring completed	2	3	Achieved
		Glaciers and glacier lake inventory of Bhutan updated every five years	2018/2019	Update 2025/2026	Achieved
		Fresh Water Lake inventory of Bhutan completed	NA	2025	Achieved
		Increased lead time for river flow forecasting	1 day	3 days	On track
3	Innovation, Research, Standards and Application of Hydro-met Science Promoted.	Number of Hydro-met Operational Manual and Guidelines developed	0	5	On track
		Number of hydro-met research paper/technical study report completed/published/year	10	20	On track
		Calibration Lab facilities expanded	0	1	On track

Highlights of Accomplishments for the FY 2025-2026



Figure 9: Bhutan's First Black Carbon Monitoring Station on Shodug Glacier (Headwater of Thimchu) installed under NCHM-ICIMOD Partnership

8 NATIONAL HYDRO-MET OBSERVATION NETWORK

The National Hydro-met Observation Network consists of 368 stations, comprising the following sub-networks:

- a. National Hydrological Observation and Flood/GLOF Early Warning Network
- b. National Meteorological Observation Network

These networks are interconnected through mobile networks and satellite (Iridium, Himawari, Starlink), in addition to HF wireless communication systems for data transmission

8.1 Meteorological Observation Network

As of June 2026, the national meteorological observation network consists of **188** stations.

Table 4: Status of Meteorological Network as of June 2026

Sl. No.	Types of Station	Number
1	Class A (Agro-Meteorological) Station (which 5 are Synoptic reporting station: Gasa, Babesa, Dekling, Chamkhar Kanglung)	20
2	Class C (Climatological) Station	64
3	Automatic Weather Station (AWS)	87
4	Snow Station (Manual Station)	17
Total station		188

8.1.1 Relocation and upgradation of Meteorological Station

To enhance network coverage and improve data quality, the NCHM expanded and strengthened its observation network during FY 2025–2026. New Class C meteorological stations installed at Gasa and Begana (Thimphu) upgraded.

Two existing Class A meteorological stations at Gasa and Tsirang upgraded to World Meteorological Organization (WMO) standards, ensuring improved reliability and data quality. Two AWS stations were established at Royal Manas National Park and Phibsoo Wildlife Sanctuary to support long-term climate monitoring and research for GMC.

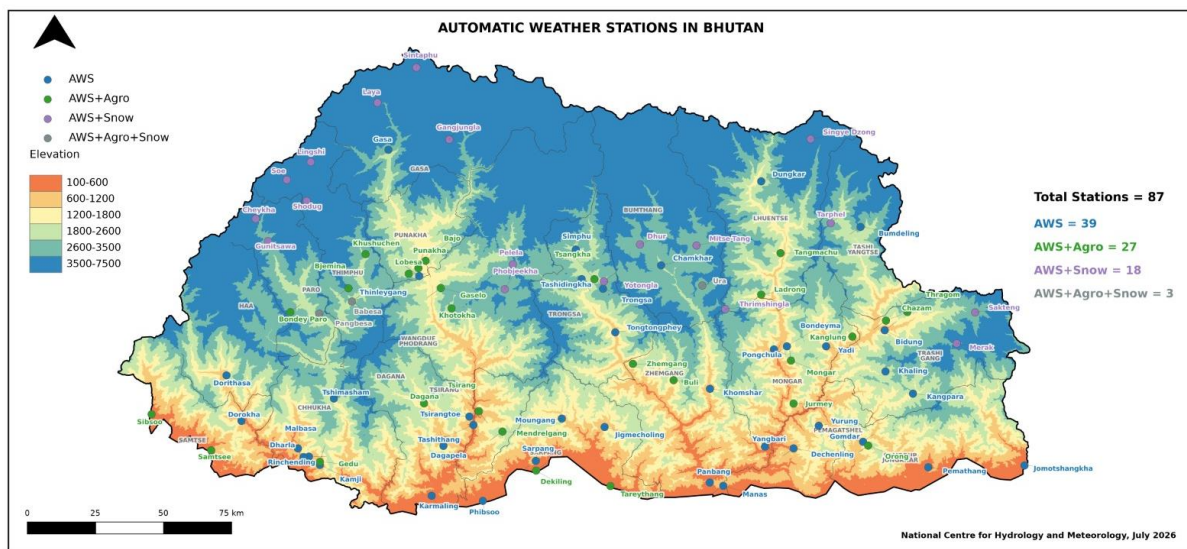
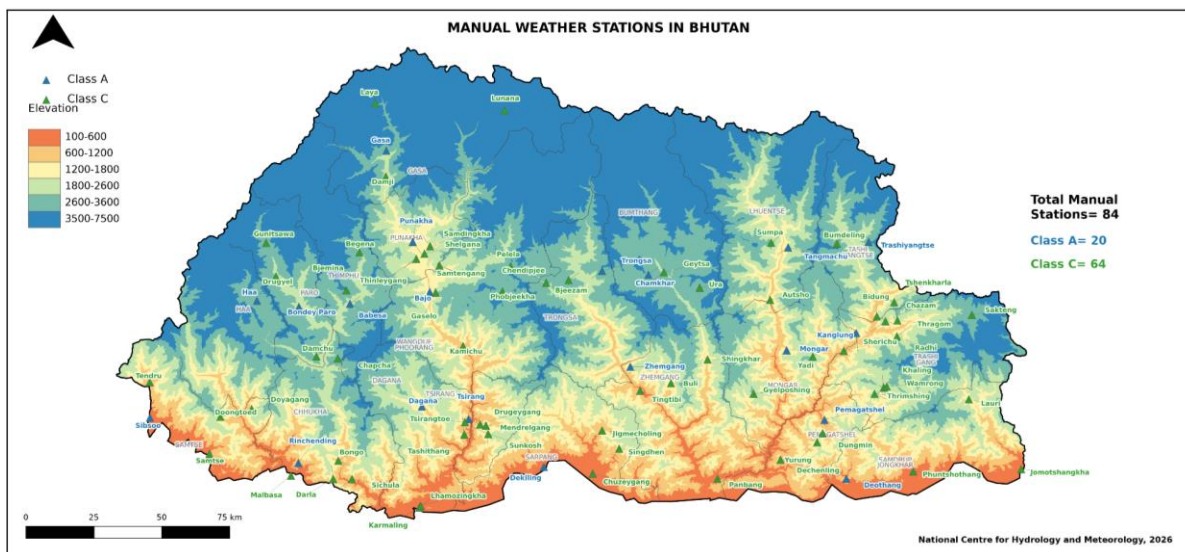


Figure 10: Maps showing the National Meteorological Observation Network in Bhutan.



Figure 11: Class A Meteorological Stations upgraded to WMO Standard

Table 5: List of New and Upgraded Meteorological Stations in FY 2025–2026

Sl. No.	Station	Remarks
A	New	
1	Automatic Weather Stations (AWS) installed in the Royal Manas National Park (RMNP), Zhemgang	Funded by BFL
2	Automatic Weather Stations (AWS) installed in Phibsoo Wildlife Sanctuary (PWS), Sarpang	Funded by BFL
3	Installation of Class C station at Damchu, Thimphu	WMO SOFF
B	Upgradation	
4	Upgradation of Class A Meteorological Station/GTS, Gasa	RGoB
5	Upgradation of Class A Meteorological Station/GTS, Damphu, Tsirang.	WMO SOFF
6	Upgradation of Class C station at Begana, Thimphu	WMO SOFF



Figure 12: Photos of two new AWSs in Protected Areas

8.1.2 Annual Maintenance of Meteorological Network

The annual maintenance of meteorological stations for FY 2025–2026 was carried out in two phases to ensure the accuracy, reliability, and continuous operation of weather monitoring systems across Bhutan.

- The first phase was conducted before the onset of the winter season and focused on the maintenance of high-altitude snow monitoring stations. Zero setting is a critical calibration procedure that establishes a baseline measurement by accounting for residual snow, debris, and sensor drift, thereby ensuring accurate snowfall and snow-depth measurements throughout the winter season.
- The second phase focused on the routine maintenance and operational upkeep of

meteorological stations nationwide. During this phase, all post-paid SIM cards were replaced with IoT SIM cards to ensure uninterrupted transmission of data from the stations to the central server. As of 10 June 2026, more than 85% of the stations were successfully transmitting data to the server despite ongoing network connectivity and sensor-related issues at some locations.

Many meteorological stations have been in operation for nearly a decade, and aging infrastructure has led to an increasing frequency of equipment failures. Several stations experienced sensor malfunctions and failures of critical components, necessitating extensive repairs and, in some cases, the replacement of equipment to maintain operational reliability. The table below outlines the maintenance activities conducted for FY 2025-2026.

Table 6 : List of annual maintenance carried out in FY 2025-2026

Sl. No	Maintenance Travel	Duration	Places Visited
1	Troubleshooting of the Phobjikha AWS (Forecasting Points), Khotokha and Bajo AWS station	01-04 August, 2025	Phobjikha, Khotokha, Bajo
2	Troubleshooting of the Tsimalakha, Darla and Rinchendhing AWS station and Replacement of the Class C screen box	25-29 August, 2025	Tsimalakha, Chapcha, Darla, Bongo, Sinchula, Rinchendhing, Gedu
3	Annual maintenance of high-altitude AWS and snow stations, including zero setting for the snow station	10 September-07 October, 2025	Cheykha, Soe, Gunitsawa, Lingzhi, Pangbisa, Bongdey, Bjeemina
4	Zero setting of snow stations, data downloading and annual maintenance in the eastern region.	22 October - 17 November, 2025	Pelela, Tsangkha, Simphu, Trongsa, Yotongla, Chamkhar, Tang, Dhur, Ura, Thrimshingla, Jurmey, Bongdeyma, Ladrong, Tangmachu, Dungkhar, Mongar, Pongchula, Yadi, Bumdeling, Trashiyangtse, Pamadung, Tarphe, Thragom, Bidung, Sakteng, Merak, Khaling, Kangpara, Kanglung, Chazam

5	Annual maintenance of AWS stations and updating of firmware to the latest version in the Southeastern region	14 January - 04 February, 2026	Pemagatshel, Yurung, Yangbarey, Dechenling, Deothang, Orong, Gomdhar, Pemathang, Jomotsangkha, Lauri, Pangbang, Khomshar, Buli, Zhemgang, Tongtophay, Jigmecholing, Dekiling, Sarpang, Mendrelgang, Tsirangtoe, Tashidingkha
6	Annual maintenance of the AWS and snow station at Singye Dzong.	20 March - 01 April, 2026	SingyeDzong
7	Zero setting and annual maintenance in the Northern region.	28 October - 5 November, 2025	Gasa, Laya, Punakha, Baji, Gaselo, Lobesa, Gaselo, Thinleygang
8	Annual Maintenance in the Southern region.	17 June - 20 June, 2026	Karmaling, Malbase, Dorokha, Kanji, Gedu
9	Installation of SRRG at 20 Dzongkhag and thermo-hydrograph in 5 SYNOP stations	12 May - 29 May, 2026	20 Dzongkhag



Figure 13: Photos from Annual Maintenance field works

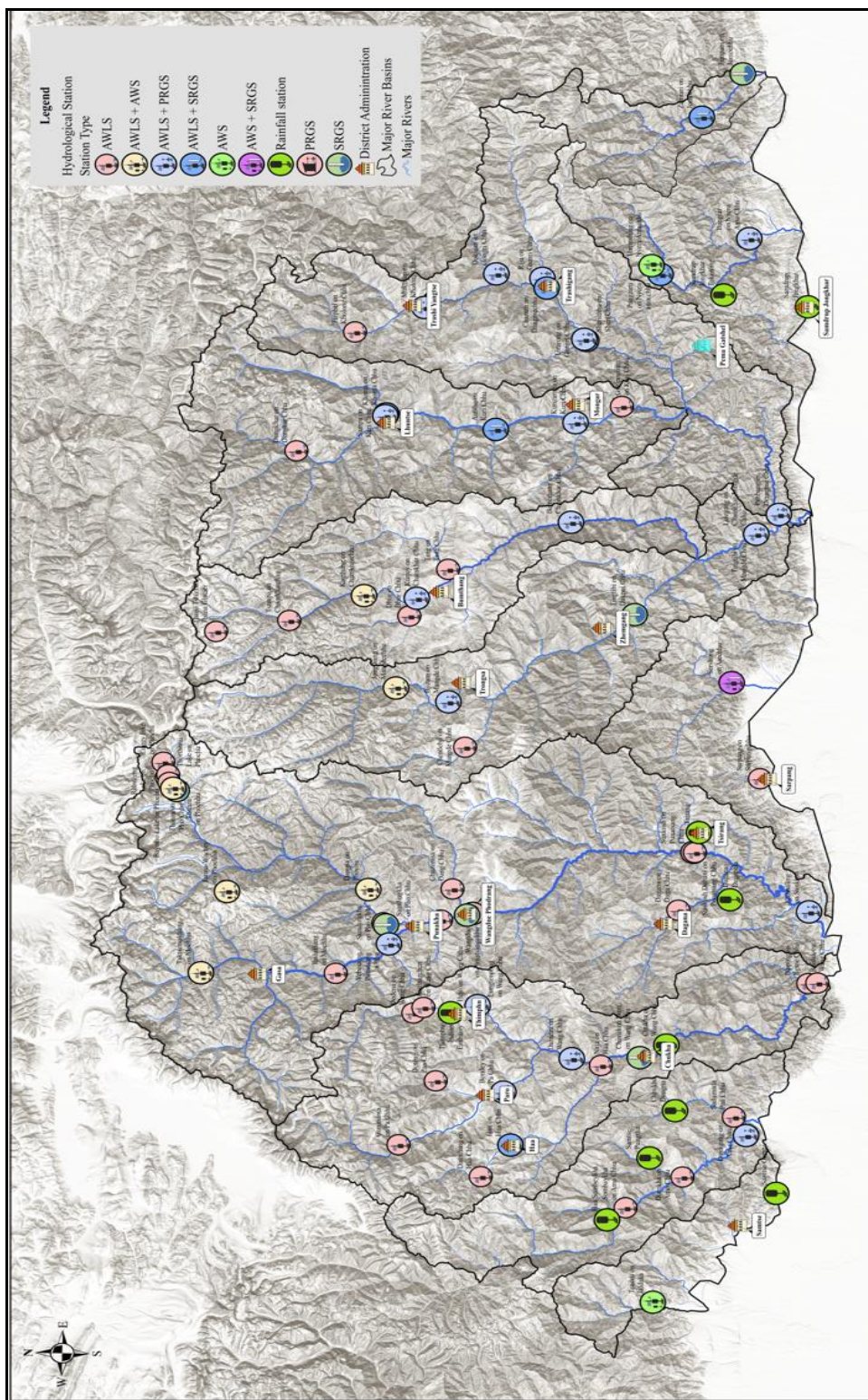


Figure 14: Map showing the National hydrological monitoring/observation network in Bhutan.

8.2 Hydrological and Flood/GLOF EWS Monitoring/Observation Network

As of June 2026, NCHM operates nationwide hydrological and flood early warning monitoring network comprising 180 stations and system components. The inventory includes principal and secondary hydrological stations, Automatic Water Level Stations (AWLS), GLOF early warning monitoring stations, sediment sampling stations, ambient water quality monitoring stations, and warning sirens as of June 2026.

Table 7: Status of National Hydrology and Flood/GLOF EWS network as of June 2026

Sl. No.	Type of Station /System component	Number
1	Principal Hydrological Station	19
2	Secondary Hydrological Station	32
3	Automatic Water Level Stations (AWLS)	51
4	GLOF EWS monitoring stations	15
5	Sediment sampling stations	17
6	Ambient water quality stations	4
7	GLOF EWS monitoring stations (Punatsangchhu/Mangdechhu/Chamkharchhu)	15
8	Warning sirens	27
	Total stations/components	180

8.2.1 Annual Maintenance of Hydrological and Flood EWS Station

The annual maintenance works of hydrological and flood EWS stations include troubleshooting, replacement of sensors/equipment, calibration of sensors, and installation and upgradation of selected hydro-met stations. Annual maintenance works for the national hydro-met observation network were completed, and the status is shown in Table 12.

Table 8 List of total stations maintained from 2021-2026

Sl No.	Station Category	Station Type	Total Maint. 2021-22	Total Maint. in 2022-23	Total Maint. in 2023-24	Total Maint.in 2025-2026
1	GLOF-EWS	Automatic	15	15	15	15
2	Hydrological Stations	Manual	14	15	37	48
		Automatic	21	19	28	55

8.2.2 Annual Maintenance of National Hydrological Network

Annual Maintenance of National Hydrological Stations, FY 2025–2026 includes;

- a. Automatic Hydrological Stations: Maintained from January to March 2026, including lean flow measurements.
- b. Manual Hydrological Stations: Routine maintenance carried out during FY 2025–2026.
- c. GLOF Early Warning Stations:
 - Punakha–Wangdue basin: September–October 2025
 - Chamkhar–Mangdechhu basin: August–September 2025

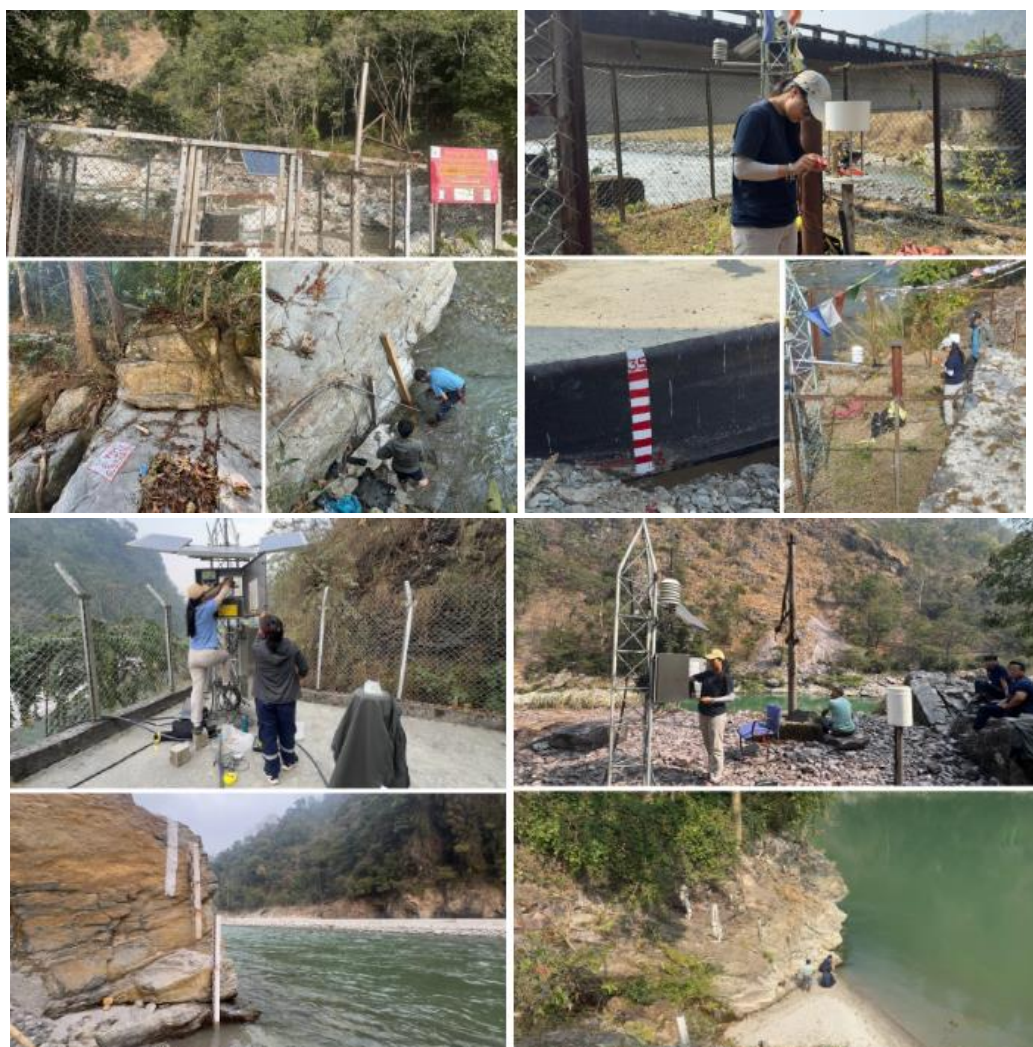


Figure 15: Photos from Annual Maintenance of Hydrological Stations

8.2.3 Annual Lean Flow Measurements

Mountain springs and tributaries remain Bhutan's primary sources of drinking water and irrigation. To assess firm flow in ungauged catchments, lean flow measurements—initiated in 1998—were continued during January–March 2026, covering 70 small rivers and tributaries alongside the annual maintenance of hydrological stations.



Figure 16: Photos from Annual Lean Flow Measurements of streams

8.2.4 Upgradation of Automatic Station under FWS

Under the GoI Flood Warning Program, one AWLS was installed at Bangtar (Phuntshothang) and one AWS at Sershong (Gelephu) during FY 2025–2026. Both stations were successfully integrated into NCHM's central system, with data stored on the server. The upgradation work, awarded to M/s Shangrila Traders, Thimphu, was completed in March 2026 at a total cost of Nu. 54,51,442.00.



Figure 17: Photos of upgraded AWLS at Bangtar and AWS at Sershong (Gelephu)

8.2.5 Establishment of Automatic River Discharge Measurement System on Thimchhu Tributaries

Under the ECRUL Project, four automatic river discharge measurement systems (*Discharge Keepers*) were installed on major tributaries of the Thimchhu. These stations strengthen the monitoring network and are critical for developing and operationalizing flood forecasting and early warning systems. Equipped with sensors and optical cameras, they convert water level data into discharge measurements. Installation, testing, and commissioning were completed in May 2026, with a total budget of Nu. 21.1 million, funded by GEF/UNDP through the ECRUL Project.

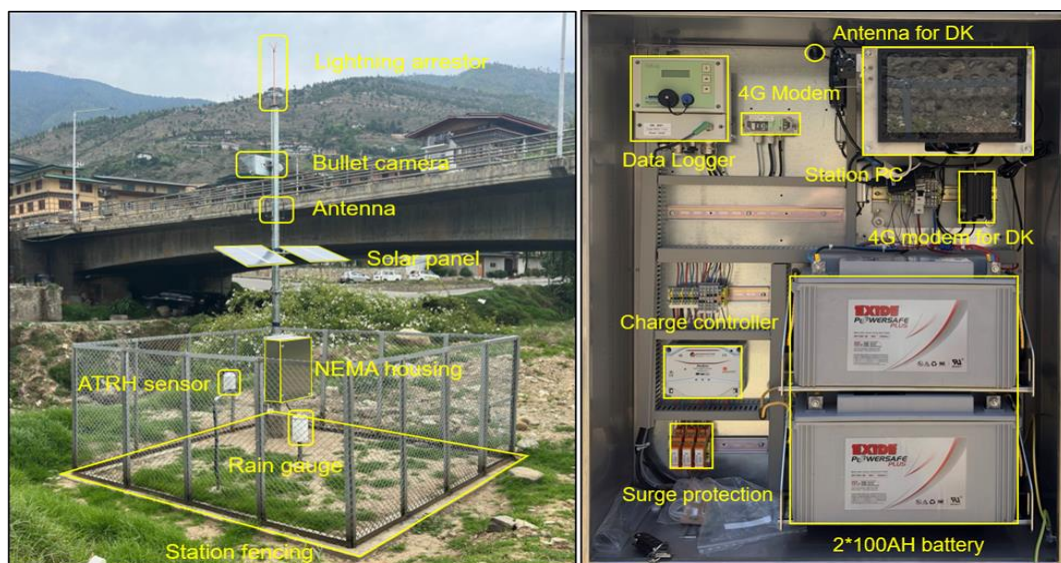


Figure 18: Typical layout of ARDMS with different components (left) and the system set up inside the NEMA housing (right)



Figure 19: Automatic River Discharge Measurement Station established on the tributaries of the Thimchhu

8.2.6 Establishment of Automatic Weather Stations in High-Altitude Regions of Thimphu and Paro

Under the ECRUL Project, three AWS were installed in high-altitude areas of Thimphu and Paro to address meteorological data gaps. Each station is equipped with rain, air temperature, and relative humidity sensors, integrated into the existing network via the central server. Installation, testing, and commissioning were completed in May 2026 at a cost of Nu. 5.1 million, funded by GEF/UNDP through the ECRUL Project.

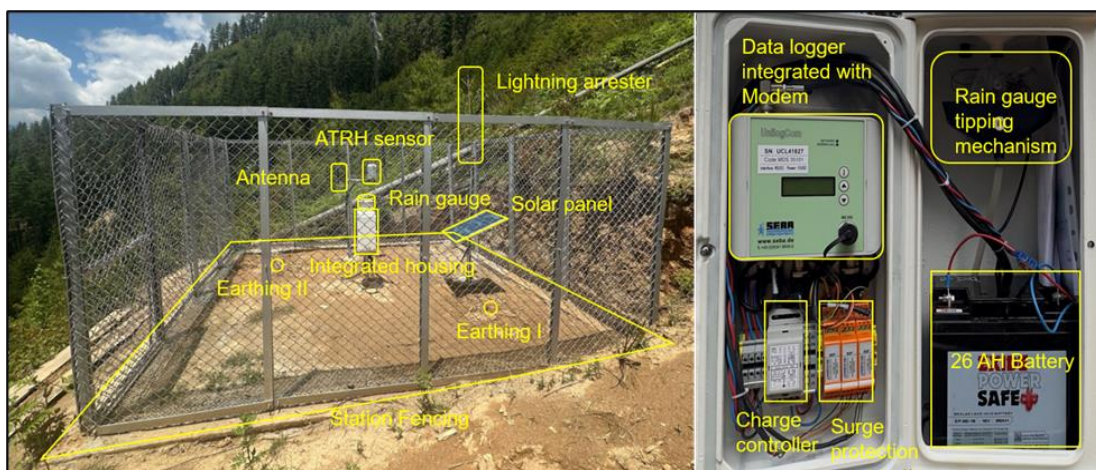


Figure 20: Typical layout of an Automatic Weather Station with different components (left) and the system set up inside the Integrated Housing (right)



Figure 21: Photos of the Automatic Weather Station established in the high-altitude region of Thimphu and Paro

Table 9: List of Hydromet Stations installed under the ECRUL Project FY 2025–2026

Sl. No.	Station
A	New Hydrological Station
1	Automatic River Discharge Measurement Station on Thimchu at Jungshina
2	Automatic River Discharge Measurement Station on Olarongchu at Olakha
3	Automatic River Discharge Measurement Station on Bjimeenachhu at Bjimeena
4	Automatic River Discharge Measurement Station on Gaynechhu at Charkilo
B	Met Station
5	Automatic Weather Station (AWS) at Dotey, Paro
6	Automatic Weather Station (AWS) at Tsalungna Paro
7	Automatic Weather Station (AWS) at Thujidrak, Paro

8.2.7 Procurement of Critical Spare Parts for GLOF-EWS System

With approved funding of Nu. 15.00 million from the RGoB, critical spare parts—including bubbler sensors, iridium transceivers, data loggers, 75Ah batteries, and other essential components—were procured for the Puna–Wangdi GLOF-EWS. Some items have already been deployed to restore functionality of previously non-operational stations, while the remainder are securely stored for future maintenance and emergency use.

With GLOF EWS more than 13 years old, a comprehensive assessment of GLOF-EWS was undertaken with two experts from M/s *OTT Hydromet Corporation*, who installed the system. The evaluation covered hardware and software components, identified technical issues, and resolved existing bugs. Assessment activities were conducted at the Wangdi Control Center, siren stations, and upstream Automatic Water Level Stations (AWLS). Experts also provided hands-on training on the operation and maintenance of the GLOF EWS system.



Figure 22: Assessment of Puna-Wangdi GLOF-EWS and Training of NCHM Staff at GLOF EWS Control Room and NCHM HQ

9 HYDRO-MET INFRASTRUCTURE AND FACILITIES

9.1 Establishment of the National Weather and Flood Warning Centre (NWFWC) and the scientific facilities Campus at Yusipang

The establishment of the NCHM Headquarters, National Weather and Flood Warning Centre (NWFWC), and scientific facilities on 5 acres at Yusipang, Thimphu Dzongkhag was approved under the 13 FYP with support from the Government of India through Project Tied Assistance (PTA). In March 2026, the main building construction contract was awarded to *M/S STRC Builders Pvt. Ltd.* through competitive bidding at Nu. 229,777,777.00 (Ngultrum Two Hundred Twenty-nine million, Seven Hundred Seventy-seven Thousand, Seven Hundred Seventy-Seven), with a completion period of 36 months.

The NWFWC marks a strategic milestone in strengthening Bhutan's climate resilience and disaster preparedness. The campus will include:

- A 24/7 National Weather and Flood Warning Centre as the national hub.
- Advanced ICT infrastructure for weather, climate, and flood modelling.
- A scientific library and hydromet data archive.
- Satellite reception and data processing systems.
- Laboratories for calibration, equipment maintenance, and sediment analysis.
- An education and learning centre to inspire future generations in weather, climate, and cryosphere sciences.



Figure 23: Photo from Contract Agreement signing for Awarding of Contract to M/s STRC Builders Pvt Ltd and NCHM

9.1.1 Groundbreaking Ceremony

The Groundbreaking Ceremony for the construction of the NFWWC and scientific facilities at Yusipang, Thimphu Dzongkhag was held on 15 April 2026. The event was graced by Lyonpo Gem Tshering, Hon'ble Minister for Energy and Natural Resources; His Eminence the Gaytshog Lopen of the Zhung Dratsang; and representatives from the Embassy of India, Thimphu, including Mr. Aniket Mandavgane, Deputy Chief of Mission, and Dr. J. Aravind, First Secretary. Senior officials from the Ministry of Finance, MoENR, and local leaders of Chang Gewog, Thimphu Dzongkhag also attended.



Figure 24: Photos from Salang Tendrel Ceremony at Yusipang on 15 April 2026



Figure 25: 3D Model of NFWWC and Scientific facilities at Yusipang, Chang Gewog, Thimphu



Figure 26: 3D Model of Upper Air Observation Facilities at Tsirang and Salary Tendrel Ceremony and handing over of construction work awarded to M/s Larjab

9.2 Construction of Upper Air Observation Facilities at Damphu, Tsirang

Bhutan's first Upper-Air Observation Sounding Facility will be constructed at Damphu, Tsirang, under the Bhutan SOFF project. The construction work was awarded to M/s Larjab Construction on February 27, 2026, at a contract price of Nu. 30,538,304.60/- (Ngultrum Thirty Million Five Hundred Thirty-Eight Thousand Three Hundred Four and Cheltrum Six Zero Only). The project site was officially handed over on March 4, 2026. The groundbreaking ceremony (*Salang Tendrel*) was held on March 13, 2026.

9.3 Construction of New and Renovation of Hydromet Site Offices Facilities

During FY 2025–2026, NCHM completed the renovation and construction of site offices and laboratories under GoI-FWS and RGoB support:

- Flood Warning Site Office, Tendu (Samtse): Renovated at Nu. 3.40 million under GoI-FWS support. New Site Office and Sediment Laboratory, Phuntshothang (Bangtar), Samdrupcholing Dungkhag: Constructed under GoI-FWS support (Initial contract Amount: Nu. 4.152 million).
- Hydrological and Sediment Laboratory, Yebesha (Punakha): Renovated under RGoB support (Nu. 16.36 million).
- Hydrological and Sediment Laboratory, Sumpa (Lhuntse): Renovated under RGoB funding (Nu. 1.039 million).
- Meteorological Site Office, Kanglung (Trashigang): Renovated under RGoB funding (Nu. 0.771 million).



Figure 27:: Renovation of Site Offices and Laboratories under GoI-FWS and RGoB support

10 WEATHER AND CLIMATE SERVICES

The MSD under the Centre is responsible for operating the national meteorological observation and aviation meteorology networks for data collection. The division provides public weather services, severe weather warnings, and manages meteorological data. It also delivers aviation meteorology, agro-meteorology, and climate change information and services.

10.1 Daily Weather Forecast

The Weather Forecasting Control Room (WFCR) under the National Weather and Flood Warning Centre (NWFWC), Thimphu, operates 24/7, monitoring weather conditions nationwide. NCHM issues daily forecasts and extreme weather information as remarks, advisories, and warnings through email, websites, BBS TV, radio, and social media.

- A daily 24-hour forecast for all 23 forecast points, including rainfall outlook and temperature extremes, is issued at 16:00 hours.
- A weather forecast in Dzongkha language is issued every Friday at 16:00 hours.
- Forecasts are updated at 04:00, 16:00, and 22:00 hours.
- A three-day forecast with detailed analysis is issued at 10:00 hours.

Table 10: Daily Weather Forecast for the FY 2025-2026

Forecast type	Number of forecasts (1 July 2025- 30 June 2026)
Weather update at 4:00 AM	364
Weather report and analysis at 10:00 AM	364
Daily weather forecast at 4:00 PM	364
Weather update at 10:00 PM	364
Total number of forecasts issued	1456

10.2 Weather Advisory

The WFCR under the NWFWC, Thimphu, issued 17 extreme weather remarks and advisories during FY 2025–2026.

Table 11: table showing No. of Weather Advisories issued 1st July 2025 - 30th June 2026

Sl No.	Title	Issued date
1	Weather Advisory on Heavy Rainfall	02.08.2025
2	Flood remarks	05.10.2025
3	Weather Advisory on Severe Cyclonic Storm	08.10.2025
4	Weather Advisory on Severe Cyclonic Storm	26.10.2025
5	Weather Remarks on Severe Cyclonic Storm update-1	27.10.2025
6	Weather Remarks on Severe Cyclonic Storm update-2	29.10.2025
7	Weather remarks on Cyclonic Storm	5.10.2025
8	Weather Remarks on Snowfall	31.12.2025
9	Weather Remark on Strong Wind Gust	01.12.2025
10	Weather Remark on Heavy Rainfall	20.03.2026
11	Seasonal Public Advisory	06.04.2026
12	Weather Remark on Heavy Rainfall	24.04.2026
13	Weather Remark on Heavy Rainfall	28.04.2026
14	Weather Advisory	22.05.2026
15	Weather Remarks	19.05.2026
16	Weather Remarks on Moderate to Heavy Rainfall	19.05.2026
17	Weather Advisory on Very Heavy Rainfall	19.06.2026

10.3 Special Weather Forecast Services

The WFCR disseminated around 350 forecast requests to various stakeholders during the same period, reflecting the growing demand and dependence on timely, location-specific weather information. This trend highlights the increasing use of weather services in sectors such as disaster management, agriculture, hydropower, and infrastructure planning, and underscores the Centre's expanding role in supporting informed decision-making and climate risk management.

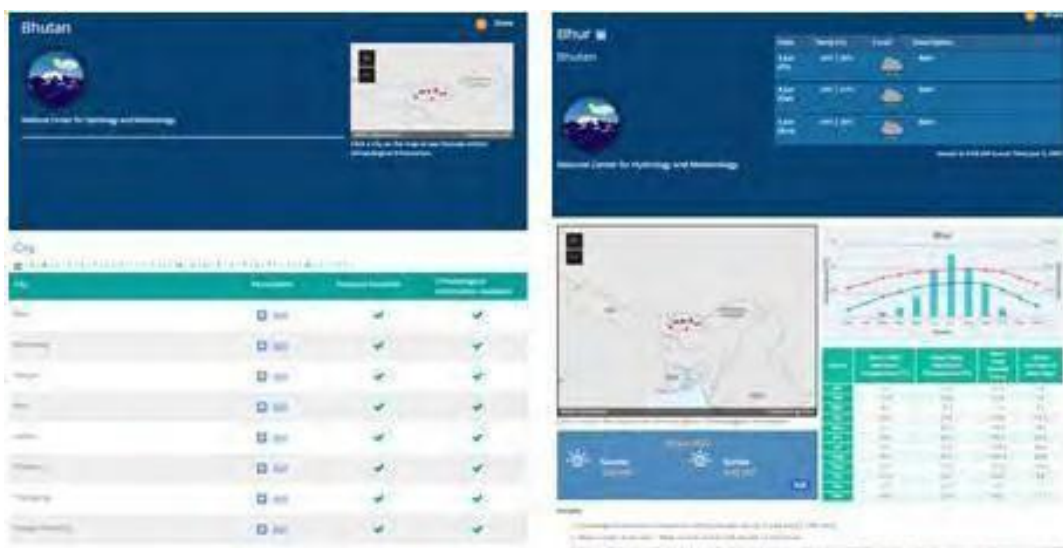


Figure 29: Cities' Weather forecast issued to WMO daily

10.6 Climate Data Services

The Centre is responsible for the observation, collection, processing, and archival of historical climate data, which is provided to user sectors and individuals upon request. As of June 2026, climate data were supplied to 259 users. The Centre also produced annual climate monitoring reports and seasonal forecasts, all of which are regularly updated on the NCHM website (www.nchm.gov.bt) and Facebook page.

10.7 National Climate Outlook Forum (NCOF-12)

NCHM, in partnership with the Pangrizampa College of Astrology and the Central Monastic Body, organized the 12th National Climate Outlook Forum (NCOF-12) on 25 May 2026 in Thimphu. The Centre issued a press release on the summer monsoon outlook (rainfall and temperature) for JJAS 2026, while the College of Astrology presented the monsoon outlook for the Earth Horse Year 2026 from an astrological perspective. The workshop was attended by representatives from climate-sensitive sectors and media houses.



Figure 30: Photos from NCOF - 12 at Thimphu

10.8 Climate Data Services

The NCHM continues to play a vital role in observing, collecting, and disseminating climate data to support research, planning, and decision-making. Data is shared with stakeholders upon request, ensuring accessibility while maintaining quality and relevance. Between 1 June 2025 and 30 June 2026, a total of 304 users availed of climate data services from NCHM. This reflects the growing demand for reliable climate information to guide national development, disaster preparedness, and sectoral planning.

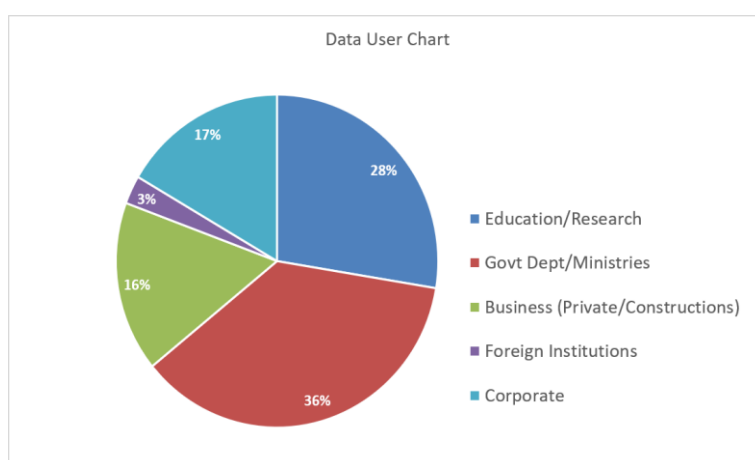


Figure 31: Climate Data Services provided to various stakeholders

11 AVIATION METEOROLOGICAL SERVICES

The NCHM is the designated Aeronautical Meteorological Service Provider of Bhutan, certified by the Bhutan Civil Aviation Authority (BCAA) under the *Civil Aviation Act of Bhutan 2016*. Based on technical competence and service performance, NCHM was certified for the period 29 October 2023 to 26 October 2026, and is mandated to deliver aviation meteorological services in compliance with BCAA and ICAO regulations.

11.1 Aviation Meteorological Services

As per BCAA regulations and ICAO standards, the Aviation Meteorology Section (AMS) under NCHM's Meteorological Services Division operates meteorological observation systems at all aerodromes in Bhutan, including Paro and Gelephu International Airports and the domestic airports at Bumthang and Yonphula. The Section provides essential meteorological information to support international, domestic, and helicopter flight operations.

11.2 Aviation Weather Forecast Services

The AMS Office, located at Paro International Airport (PIA), oversees aviation meteorological services across all airports in Bhutan. AMS provides uninterrupted 24-hour weather forecasts throughout the year to support the operation of international, domestic, and helicopter flights.

Table 12: Daily Aviation Weather forecast

Forecast type	No. of forecasts (1 Jul 2025-30 Jun 2026)
1 hr weather forecast issued to Aviation at 12:00pm	364
48 hrs. weather forecast for Aviation at 6:00 pm	364
48 hrs. weather forecast for Aviation at 4:00 am	364
Total number of forecasts issued	1092

11.3 Installation of UPS for Aviation Meteorological ICT Systems at Paro International Airport

An Uninterruptible Power Supply (UPS) was installed to ensure the smooth and continuous operation of AWOS servers, which provide critical real-time weather information for aviation safety. The UPS safeguards against outages, voltage fluctuations, and power surges, preventing data loss and equipment damage while allowing safe

system shutdown or transition to backup generators during prolonged failures.

This installation aligns with ICAO guidelines on maintaining data accuracy and integrity, thereby strengthening operational continuity, system reliability, and aviation safety



Figure 32: Photos from Installation of UPS at Paro International Airport (PIA)

11.4 Installation of Obstruction and Flood Lights

The AMS successfully installed obstruction lights and flood lights on wind direction and wind speed instruments at Paro and Gelephu International Airports (GLU) to enhance aerodrome safety. These visual aids are mandatory under ICAO standards and recommended practices and must always remain fully operational to ensure safe aircraft operations, particularly during nighttime and low-visibility conditions.

Failure to maintain these systems may lead to non-compliance with ICAO requirements, compromise flight safety, and expose the aerodrome to regulatory and operational risks.



Figure 33: Flood and Obstruction lights installed at Paro and Gelephu International Airports.

11.5 Annual Maintenance of AWOS and Manual Observatory Stations

The Automatic Weather Observation Systems (AWOS) at Bhutan's international and domestic airports were successfully maintained during FY 2025–2026, ensuring aviation safety, system reliability, and compliance with ICAO and BCAA standards. Maintenance of both AWOS and Manual Observatory Stations was carried out twice annually in accordance with the BCAA-approved Maintenance Procedure Manual.



Figure 34: Photos from Annual Maintenance at international and domestic airports

11.6 Internal Audit Aviation Meteorological Services

Internal audits in Aviation Meteorological Services are conducted to ensure compliance with International Civil Aviation Organization standards and ISO 9001:2015 requirements, to verify the accuracy and reliability of meteorological services, to identify nonconformities and risks, to ensure proper functioning of systems and competency of personnel, and to support continual improvement for aviation safety and efficiency.

Additionally, to strengthen the internal control system, the Aviation Meteorological Services established an international audit mechanism in compliance with BCAA and ICAO regulatory requirements. The audit team comprises members of the Aviation Meteorological Services Division (AMSD) and the Technical Standards and Research Division (MSD).

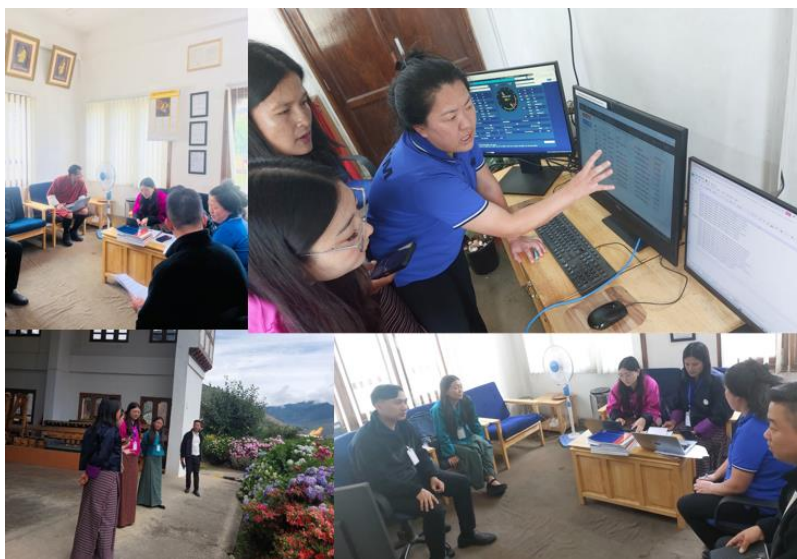


Figure 35: Photos from the internal audit conducted at the Aviation Met Office at Paro International Airport (PIA)

11.7 ICAO Coordinated Validation Mission (ICVM)

NCHM as the Aviation Meteorological Services Provider attended a meeting with the ICAO Coordinated Validation Mission (ICVM) team that conducted audits for Airport facilities and services of Paro International Airport (PIA) from 4 to 7 May 2026. The ICAO Audit team also conducted audits of Aviation Meteorological ICT systems and facilities that generated services at PIA.



Figure 36: The ICAO Audit Team conducted an audit at the Aviation Met Office at Paro International Airport (PIA)

11.8 Coordination and Consultation Meetings with GMC, Gelephu

As Bhutan's designated Aviation Meteorological Services provider, NCHM (via the AMS at PIA) partnered with GMC stakeholders to plan, design, and construct the Gelephu International Airport (GLU). The Aviation Meteorological Section acted as the lead technical counterpart, ensuring all airfield design requirements and meteorological instruments met standard specifications. NCHM Aviation Meteorological team also attended bidder interviews and evaluation sessions for a tender package comprising the construction of the runway, airfield lighting system, and the Integrated Building consisting of Meteorological (MET), Air Traffic Control (ATC), and Aircraft Rescue and Fire Fighting (ARFF) facilities under the Gelephu International Airport Project. organized by GMC at Gelephu from 30 June -5 July 2026.

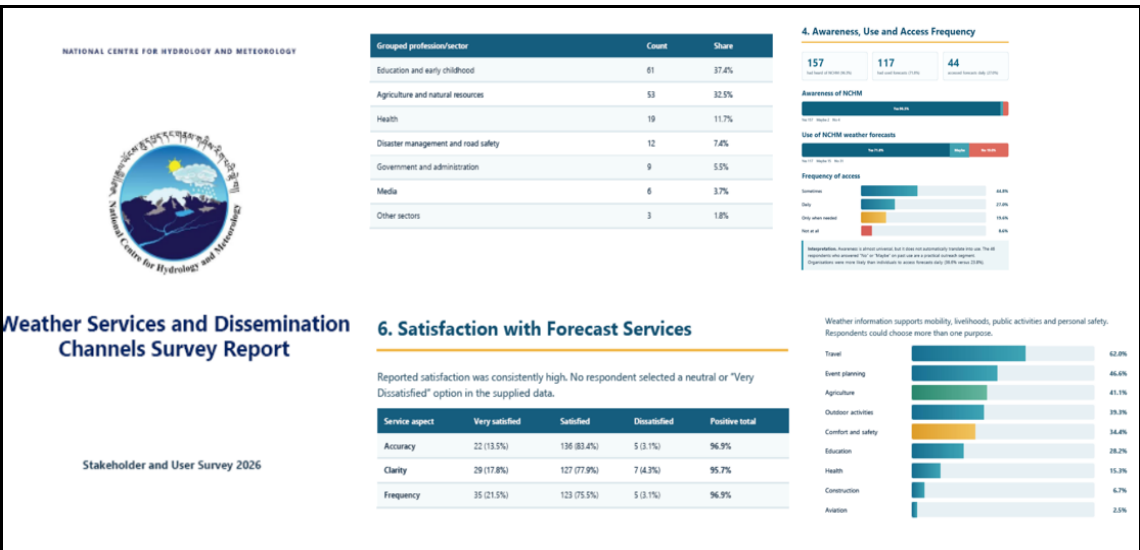


Figure 37: NCHM Aviation Meteorological Team meeting with GMC Consultants and Bidders

11.9 Client User Satisfaction Survey

For FY 2025–2026, the NCHM has conducted three Client Satisfaction Survey among weather data users, forecast product users, and aviation meteorological service users. The survey aimed to assess stakeholder needs, gather feedback, and identify opportunities for enhancing the quality, relevance, and accessibility of services.

The results indicate a high level of stakeholder satisfaction with the weather and climate services provided. Notably, more than 80% of users expressed satisfaction with weather forecast and aviation meteorological services. A detailed breakdown of the survey findings are presented below.



12 HYDROLOGY AND WATER RESOURCES SERVICES

The Hydrology and Water Resources Services Division (HWRSD) manages the national hydrological observation network to provide critical data on water status, trends, and cycles—forming the foundation for Bhutan’s socio-economic development, resource planning, and environmental preservation. The division also operates the national flood and GLOF early warning systems. Promoting a deep understanding of hydrology is essential for driving sustainable development, mitigating water disasters, and strengthening environmental management across all levels, from national river basins to local Dzongkhags and Gewogs.

HWRSD under the Centre is mandated for hydrological observation, forecasting, hydrological data management, water resources availability assessment, dissemination of hydrological data and information and issuing early warning services related to flood and GLOF.

12.1 Hydrological Data Services

The Centre is responsible for collecting, processing, and archiving hydrological data. During 2025–26, it provided data to 250++ users, including government agencies, private sector entities, researchers, students, and corporate offices, as illustrated in the pie chart. All data was shared upon request in strict accordance with the Guidelines on the Exchange and Dissemination of Hydrometeorology Data and Information.

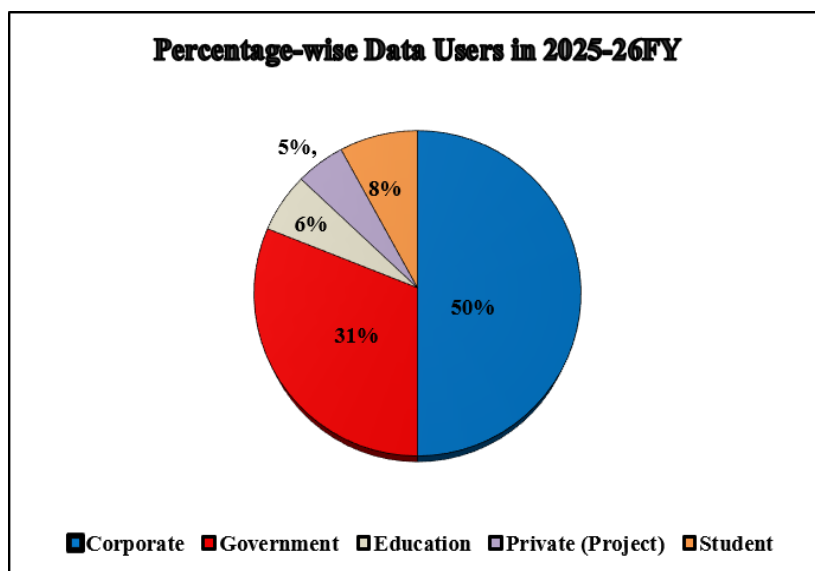


Figure 39: Graph showing hydrological data user

12.2 Flood Monitoring and Warning Services

The Flood Monitoring and Command Room (FMCR) of the National Weather and Flood Warning Centre (NWFWC) operates 24/7 to monitor flood conditions and provide timely updates on river and flood status to relevant sectors. Daily water level updates, hydrological outlooks, and flood advisories are regularly disseminated to key stakeholders. Flood warnings and advisories are issued during extreme events in order to inform the general public about the risk of floods and landslides. Following any flood event, detailed flood incident reports are compiled for documentation and future reference.

Table 13: List of flood advisories & information issued

Activity	No. Issued (2025-2026)
Daily water level status	533
Hydrological Outlook	533
Flood Advisory and Warning	2
Flood incident report	6

12.3 Education and Awareness on Flood and GLOF EWS warnings

The NCHM, in collaboration with the Department of Local Governance and Disaster Management (DLGDM) and the respective Dzongkhag Administrations, conducted GLOF Early Warning System (EWS) Education and Awareness Programmes and Mock Drills in the Puna-Wangdue Basin from 4–6 March 2026 and in the Chamkhar-Mangdechhu Basin from 27 May–2 June 2026. The programmes brought together local authorities, emergency responders, hydropower officials, schools, and vulnerable communities to enhance awareness of GLOF and rainstorm flood risks, climate change impacts, glacial lake conditions, and the operation of Bhutan's Early Warning Systems. Through presentations, siren demonstrations, mock drills, and evacuation exercises, participants gained practical knowledge of warning signals, emergency response procedures, and community preparedness, while reinforcing the importance of regular drills, stakeholder coordination, protection of monitoring infrastructure, and continued maintenance of Early Warning Systems to strengthen disaster resilience in flood-prone communities.



Figure 40: Photos from: GLOF Awareness Workshop

12.4 Debriefing for Staff Posted at Lunana (5 September 2025)

Located at 4,500 m a.s.l., NCHM's Flood Warning Office in Thanza, Lunana was staffed by two regular personnel responsible for monitoring regional glacial lakes and transmitting real-time data to the NCHM Headquarters and the GLOF-EWS Control Room in Wangdue. Mr. Nedup Dorji, a newly appointed Hydro-met Technician, was posted to Lunana and traveled with an NCHM technical team deputed for siphon testing.

Before the team's departure to Lunana, NCHM management conducted a formal debriefing session for the technical team and Mr. Dorji. Management extended full support and best wishes for a safe and successful mission, underscoring its critical role in safeguarding vulnerable downstream communities and strengthening national resilience to climate change and GLOF hazards.



Figure 41: Photos from NCHM Management De-briefing from Mr. Nedup Dorji and Siphon team

13 CRYOSPHERE MONITORING AND SERVICES

The cryosphere- encompassing glaciers, snow covers, permafrost, and ice-covered lakes- functions as Earth's thermostat and hydrological lifeline, orchestrating critical feedbacks within the global climate system. In Bhutan, the Himalayan cryosphere represents far more than frozen water; it is a dynamic, high-altitude reservoir that governs the seasonal pulse of river discharge, underpins hydropower generation, sustains agricultural productivity, and maintains the ecological integrity of downstream ecosystems.

As climate change accelerates glacial retreat and alters snow accumulation regimes across the Hindu Kush-Himalaya, understanding cryospheric dynamics has become an urgent scientific and developmental imperative. The Cryosphere Services Division responds to this imperative through a rigorous, multi-disciplinary mandate: conducting systematic annual glacier mass balance studies to quantify ice volume flux, executing long-term time series monitoring to detect spatiotemporal trends in glacial extent and behaviour, and assessing cryosphere-linked hazards — including glacial lake outburst floods (GLOFs) — that pose existential risks to downstream communities and infrastructure.

Complementing these efforts, the Division, in collaboration with other international institutions, also conducts other related activities in the fields of Cryosphere monitoring, such as black carbon monitoring in the high mountain areas and permafrost monitoring.

13.1 Annual Monitoring of Benchmark Glaciers

13.1.1 Gangju La Glacier

Annual glacier mass balance monitoring on Gangju La glacier for the FY 2025 - 2026 was conducted from August 11 - 24, 2025.

Gangju La Glacier facts:

Type: Clean type

Area: 0.169 km²

Location : 27°56'24.17"N, 89°56'53.70"

Elevation : 5145 m a.s.l

Maximum Elevation: 5200m a.s.l

Minimum Elevation: 4900m a.s.l

Basin: Headwater of Pho Chhu, Punatsangchu basin.

Initial Survey: 2004

Survey status: Continuing

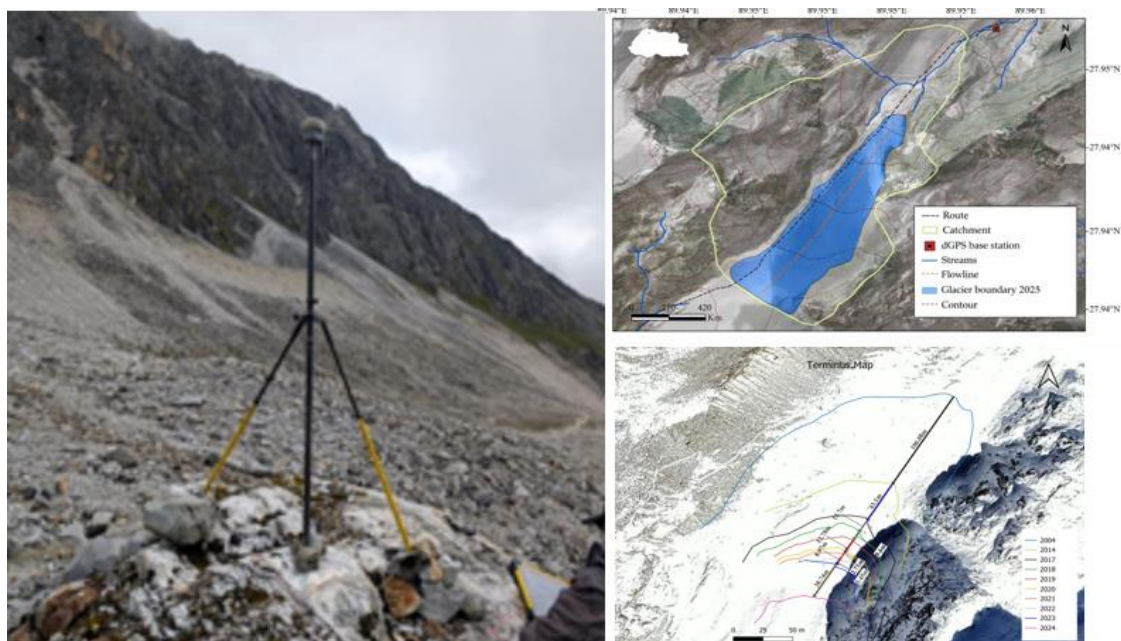


Figure 42: Gangju la Glacier headwater of Phochhu

Activities on Gangju la glacier

- Data collection for Annual Glacier Mass Balance using *in-situ* Geodetic Method (dGPS)
- Snow Depth profile
- Repeat Photography from the predefined spot
- Glacier terminus mapping through dGPS survey

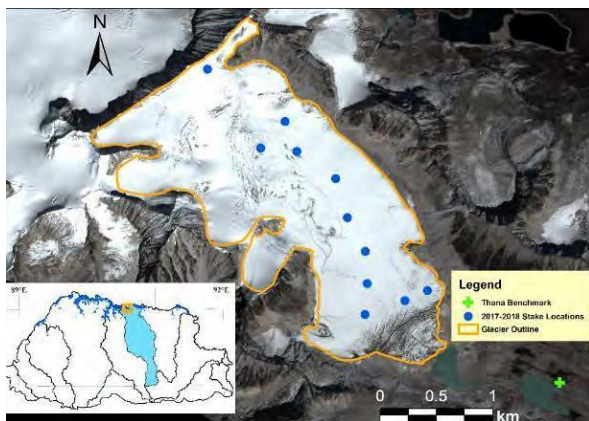
Some of the activities carried out are shown in figures 38 and 39.

For the 2024-2025 glacio-hydrological year, the glacier experienced a glacier mass balance of $-1613.876 \text{ mm w.e. a}^{-1}$ and terminal retreat of 11.86 m (maximum). The details

on methodologies, data processing, results, and recommendations are compiled in the technical report on Gangju La Glacier 2024-2025.

13.1.2 Thana Glacier

The data collection for annual glacier mass balance studies on Thana Glacier was carried out from September 12, 2025, to October 4, 2025.



Thana Glacier Facts:

Type: Clean type

Area: 3.0 km²

Location: 28° 1'17.90"N, 90°36'39.16"E

Elevation: 5340m a.s.l

Maximum Elevation: 5600 m a.s.l

Minimum Elevation: 5250 m a.s.l

Aspect: South-East

Basin: Headwater of Chamkhar Chhu,
Manas Basin

Initial Survey: 2013

Survey Status: Ongoing

Figure 43: Thana Glacier head water of Chamkharchhu

Activities on Thana Glacier

- Data collection for Annual Glacier Mass Balance using Trimble R10-2 (*in-situ* geodetic method)
- Snow pit survey
- Repeat Photography from the predefined spot
- Glacier terminus mapping through dGPS

Some of the field activities are shown in figure 47



Figure 44: Photos from Thana field Activities September-October,2025

For the glacio-hydrological year 2025-2026, Thana glacier lost -1581.68 mm w.e. a⁻¹ and the terminus of the glacier receded by 23.9 m (mean). The detailed methodologies, data processing, results, and recommendations are compiled in the technical report titled "Glacier Mass Balance studies on Thana Glacier 2024-2025."

13.1.3 Shodug Glacier

NCHM started monitoring Shodug glacier as a benchmark glacier from Spring 2022 and continues to measure the summer balance. Data collection and annual summer glacier mass balance studies for the glacio-hydrological year 2025-2026 were conducted from May 8 to 22, 2026.

Activities conducted on Shodug Glacier

- Annual Glacier Mass Balance using *in-situ* Geodetic Method (dGPS)
- Installation of bamboo stakes for the glaciological method
- Snow Depth survey
- Glacier terminus mapping through dGPS

Some of the main activities carried out on Shodug glacier are shown in Figure 49.

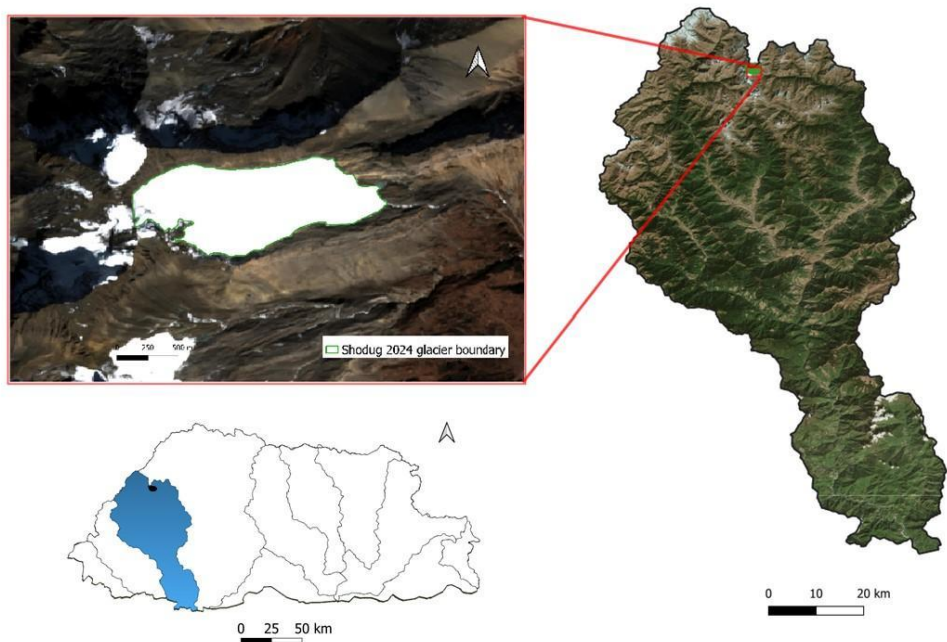


Figure 45: Location map of Shodug glacier in the headwaters of Thimchu

Shodug Glacier Facts:

Type	: Clean type
Area	: 1.12 km ²
Location	: 27.940 N, 89.950 E
Elevation	: 5278m. A.s.l
Maximum Elevation	: 5517 m a.s.l
Minimum Elevation	: 5166 m a.s.l
Aspect	: North-East
Basin	: Thimchu sub-basin, Wang Chhu Basin
Initial Survey	: 2022
Survey Status	: Ongoing



Figure 46: Photos from Shodug field Activities in May, 2026

For the glacio-hydrological year, Shodug glacier showed -1769.48 mm w.e. of mass loss, with a terminus retreat of 12.55m over the period of 2025-2026. The cumulative terminus recession of Shodug Glacier from 2022 to 2026 was estimated at 76.24 m. The detailed methodologies, data processing, results and findings are compiled in the “Technical report spring mass balance on Shodug Glacier 2025-2026”.

13.1.4 Collaborative Activity on Shodug Glacier

In addition to the annual summer mass balance monitoring of Shodug Glacier, the glacier has also been adopted for seasonal mass balance monitoring by the International Centre for Integrated Mountain Development (ICIMOD) in collaboration with National Center for Hydrology and Meteorology. The first joint seasonal monitoring activity on Shodug Glacier was carried out from October 31 to November 16, 2025.

The summer glacier mass balance was -1876.70 mm w.e., with the mean glacier surface lowering of 2.09 m.



Figure 47: Photos from field activities on Thana glacier (Autumn) 2025

13.1.5 Black Carbon Monitoring Station

The first-ever high-altitude black carbon monitoring station in the Bhutan Himalayas was installed on *Shodug* glacier at an elevation of 5168 m a.s.l., in partnership with the International Center for Integrated Mountain Development (ICIMOD) from May 23 to June 7, 2026. The station is also equipped with a Starlink communication system for real-time data transmission, which will ultimately provide valuable information on black carbon transport and deposition in Bhutan's high mountain environment.



Figure 48: Photos from Installation of first Black Carbon station at Shodug Glacier May-June 2026

13.1.6 Pilot Permafrost Monitoring in Bhutan

NCHM in collaboration with the International Centre for Integrated Mountain Development (ICIMOD) started a Pilot Permafrost monitoring in Bhutan from November 15, 2024, till December 3, 2024, and installed 19 HOBO TidBit temperature sensors in headwaters of Thim Chhu.

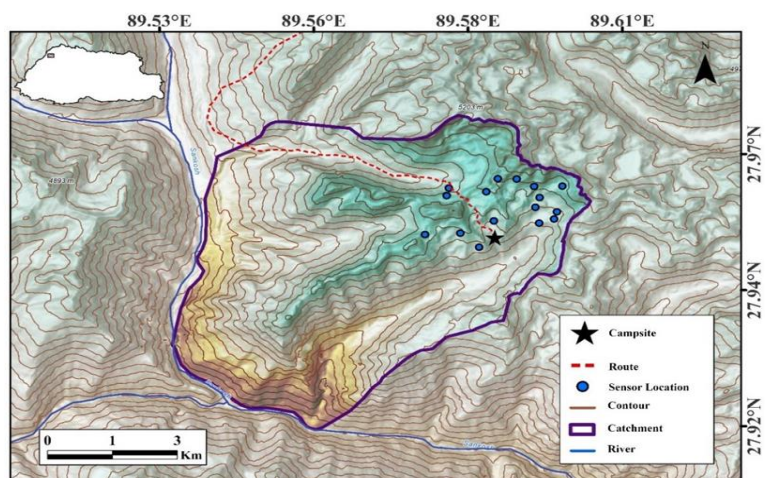


Figure 49: Map showing the location of permafrost monitoring sensors installed in Ri Druzhi area (Head water of Mochhu)

To expand the network and to initiate long-term monitoring of permafrost conditions and assess their stability, especially in areas critical for Cordyceps collection and community livelihoods, NCHM in collaboration with ICIMOD installed 19 more near-surface ground temperature sensors (GeoPrecision) at Ri Druzhi area in the headwaters of Mo Chhu.

13.1.7 Assessment of Thorthomi Glacier Lake for Test Siphoning

Based on the recommendations submitted by NCHM to the government after the two recent GLOF incidents from Thorthormi, NCHM has conducted a test siphon on Thorthormi to initiate natural flow using HDPE pipes along the paleo-channel from September 7 to November 11, 2025. Although the construction of the siphon system was successful, unfortunately, the flow in the siphon system could not be initiated. However, a second pilot test will be conducted at a new location in the month of September and October 2026.



Figure 50: Photos NCHM conducting test siphon and bud-fusion joining of HDPE pipes at Thorthormi Lake site

13.1.8 Updating of Inventories on Glaciers (BGI) and Glacial Lakes (BGLI)

The existing inventories on glaciers and glacial lakes of Bhutan were developed more than five years ago. In line with the objectives of the 13th Five-Year Plan (13-FYP) under NCHM, the Cryosphere Services Division has undertaken a task to update both Bhutan Glacier Inventory (BGI) and Bhutan Glacial Lake Inventory (BGLI). The updated inventories were generated using a deep learning-based semi-automated approach, followed by manual verification and correction to improve accuracy and reliability. A key distinction from the last inventory is the application of emerging Machine Learning (ML) and Deep Learning (DL) techniques for glacier mapping and glacier boundary delineation in the present work. These advanced approaches have enhanced the efficiency, consistency, and accuracy of glacier identification, enabling improved representation of glacier boundaries across Bhutan's complex mountain terrain. Based on the updated inventories, Bhutan currently hosts 673 glaciers and 620 glacial lakes, respectively, as presented in *Figures 12 and 13*.

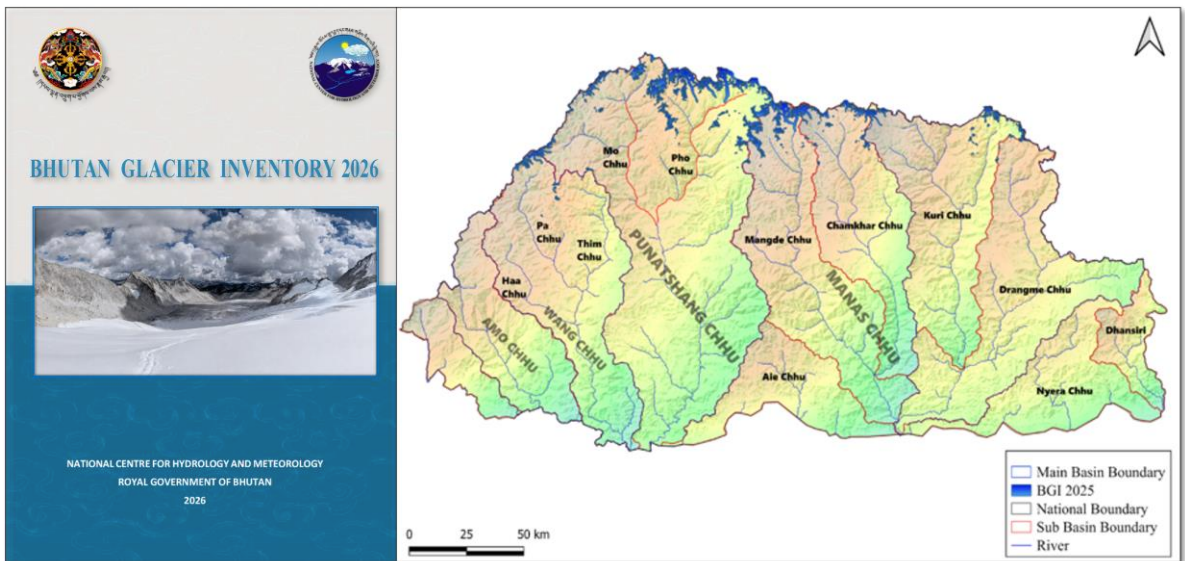


Figure 51: Bhutan Glacier Inventory 2026 with updated Glacier map of Bhutan

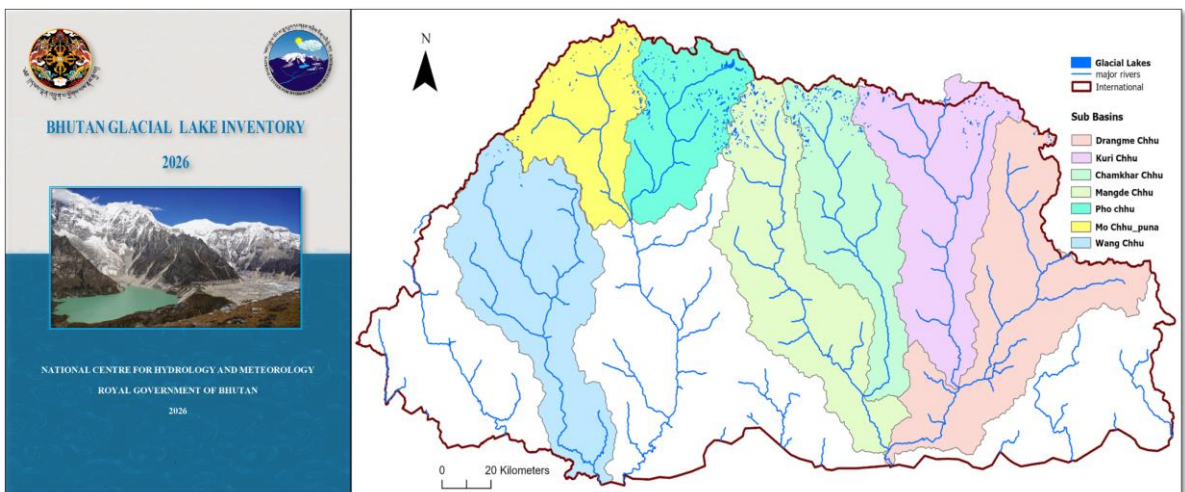


Figure 52: Bhutan Glacier Lake Inventory 2026 with updated map of Bhutan

13.1.9 GLOF Awareness for Lunana Community

The Cryosphere Services Division conducted two rounds of community-based awareness programs on Glacial Lake Outburst Flood (GLOF) risks in the Lunana community, covering the Chiwogs of Tshojo, Tenchoe, and Thanza. The first round took place on September 15–16, 2025, and the second on March 23, 2026. The initiatives aimed to enhance local understanding of GLOF phenomena, hazards, and potential impacts on communities and

infrastructure.

The team provided detailed information on GLOF causes, early warning mechanisms, preparedness strategies, emergency response procedures, and safety measures. These engagements strengthened community resilience and improved local capacity for disaster preparedness in one of Bhutan's most vulnerable high-mountain regions.



Figure 53: Photos of NCHM community awareness at Thanza Chiwog, Lunana

14 TECHNICAL STANDARD AND RESEARCH SERVICES

The Technical Standard and Research Division (TSRD) was created in July 2022 with the primary objective of overseeing and developing necessary standards in line with regulatory requirements of WMO and ICAO for the operation of national hydrology, meteorological, aviation and cryosphere services. The division is also responsible for coordinating research work with technical divisions about hydrology, water resources, weather, climate, snow, glaciers and its applications.

14.1 Development of Hydro-met Manuals and Guidelines

The TSRD is responsible for developing and implementing standardized procedures, guidelines, and protocols to facilitate consistent and reliable data collection, analysis, and dissemination. By adhering to the quality control checklist provided by the WMO, the division ensures that the data and services provided by the National Meteorological and Hydrological Services (NMHS) meet international quality standards. This quality control checklist for national hydrological services, as defined by the WMO, can be accessed at the following site:

<https://community.wmo.int/en/checklist-developing-quality-management-system-national-hydrological-service>

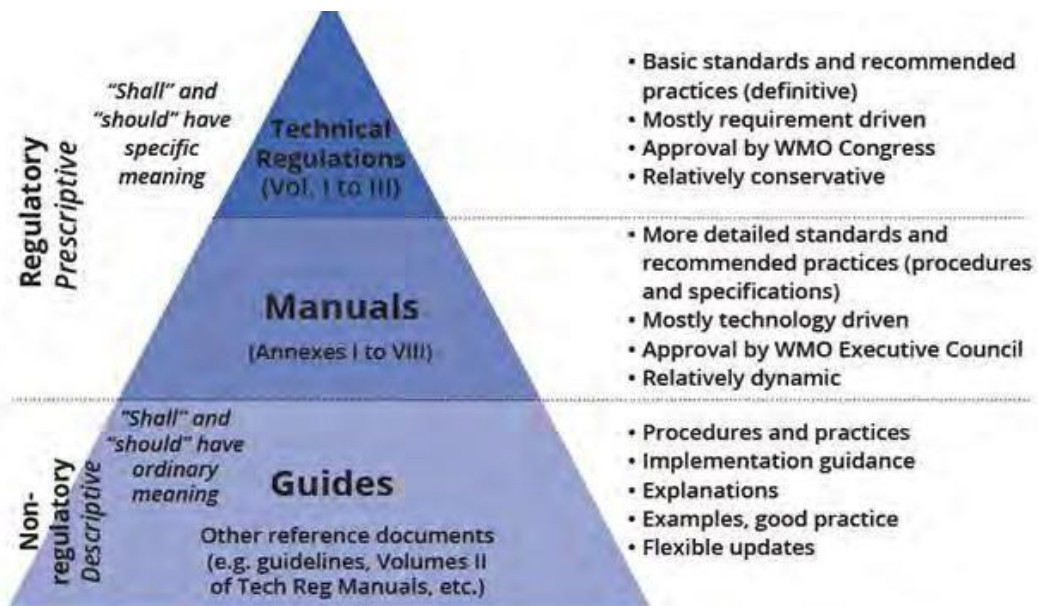


Figure 54:: WMO Technical Regulations and other guidance material (Source WMO)

During the FY 2025-26, the division prepared four technical manuals (Draft Version of NCHM Safety Manual for Field Activities (2026), Draft Operational Manual for Meteorological Instrument Calibration, Draft Guidelines on the Exchange and Dissemination of Hydrological and Meteorological Data and Information of Bhutan and Operational Manual for Weather Forecasting and Warning Services to standardize operations and enhance workforce competency.

14.2 Calibration of Instruments at Laboratory

Calibration is the process of adjusting the accuracy of instruments and sensors used in hydro-meteorological data collection to meet international standards, ensuring reliable and precise data. Proper hydro-meteorological calibration is essential because it helps maintain measurement accuracy, enabling more precise and reliable assessments of water resources, weather conditions, and climate patterns. This accuracy is crucial for various sectors such as agriculture, water management, and climate research. During the FY 2025-2026, a total of 25 (Dry-Wet & Max-Min) thermometers and 3 nos. Barometer for aviation met which includes both newly procured units and reused instruments were calibrated. This rigorous calibration guarantees consistent measurement accuracy across all temperature monitoring meteorological stations, upholding the highest standards of data quality.

S. NO.	ID NO.	Type of Sensor	Sensor Code	Manufacturer	Model Number	Serial Number	Date of Calibration	Calibration	past calibration	Location	Date of Installation	Type of station	Station ID	Remarks
1		Manual Thermometer (DRY-WET)	Tsw2024010001	GH ZEAL Ltd, England	PM 23005	N/A	03/07/2023	Link (Please click here)		Bamdingkha Bkt		Class C		Brought from Punakha Met Station
2		Manual Thermometer (DRY-WET)	Tsw0002	GH ZEAL Ltd, England		N/A	03/08/2023	Link (Please click here)		Gasa Met Station		Class A		Brought from Basesa Met Station
3		Manual Thermometer (DRY-WET)	Tsw0003	GH ZEAL Ltd, England		N/A	31/05/2023	Link (Please click here)		Basesa Met Station		Class A		
4		Manual Thermometer (DRY-WET)	Tsw0004	GH ZEAL Ltd, England		N/A		Link (Please click here)		Bhur Met Station		Class A		
5		Manual Thermometer (DRY-WET)	Tsw0005	GH ZEAL Ltd, England		N/A		Link (Please click here)		Punakha Met Station		Class A		
6		Manual Thermometer (Mini-Max)	Tm0001			N/A	01/06/2023	Link (Please click here)		Gasa Met Station		Class A		
7		Manual Thermometer (Mini-Max)	Tmnm0002			N/A	01/06/2023	Link (Please click here)		Bhur Met Station		Class A		
8		Manual Thermometer (Mini-Max)	Tmnm0003			N/A	10/07/2023	Link (Please click here)		Gharka/Royal				Brought From Gasa Met Station
9		Manual Thermometer (Mini-Max)	Tmnm0004			N/A	10/07/2023	Link (Please click here)						Brought From Bhur Met Station
10		Manual Thermometer (Mini-Max)	Tmnm0005			N/A	10/06/2023	Link (Please click here)						
11		Barometer (Pressure)	P-T5110626	VAISALA	T5110626		31/10/2023	Link (Please click here)		Para Air port				
12		Barometer (Pressure)	P-L3310429	VAISALA	L3310429		08/10/2022	Link (Please click here)						
13		Barometer (Pressure)	P-T1730076	VAISALA	T1730076		28/11/2022	Link (Please click here)						
14		Barometer (Pressure)	P-L1730077	VAISALA	L1730077		27/08/2022	Link (Please click here)						
15		Barometer (Pressure)	P-MBB 181-1.3.1603.685	MicroStep	MSB 181-1.3.1603.685		26/08/2022	Link (Please click here)						
16		Barometer (Pressure)	P-L1730077	VAISALA	L1730077		08/10/2022	Link (Please click here)						
17		Barometer (Pressure)	P-MBB181-13-1512-045	MicroStep	MSB181-13-1512-045		13/10/2022	Link (Please click here)		Gasa Met Station		Class A		
18		Manual Thermometer (DRY-WET)		GH ZEAL Ltd, England		N/A	25/01/2024	Link (Please click here)						Isken by Norbu wangdi
19		Manual Thermometer (DRY-WET)		GH ZEAL Ltd, England		N/A	26/01/2024	Link (Please click here)						
20		Manual Thermometer (Mini-Max)	Golephu			N/A	08/03/2024	Link (Please click here)						
21		Manual Thermometer (DRY-WET)	Golephu			N/A	11/03/2024	Link (Please click here)						
22		Manual Thermometer (DRY-WET)				N/A	12/03/2024	Link (Please click here)						
23		Manual Thermometer (Mini-Max)	New Mini-Max1			N/A	18/3/24	Link (Please click here)						New
24		Manual Thermometer (Mini-Max)	New Mini-Max2			N/A	18/3/25	Link (Please click here)						New
25		Manual Thermometer (Mini-Max)	New Mini-Max3			N/A	18/3/26	Link (Please click here)						New
26		Manual Thermometer (DRY-WET)	New Dry-Wet 1			N/A	19/3/2024	Link (Please click here)						New
27		Manual Thermometer (DRY-WET)	New Dry-Wet 2			N/A	03/03/2025	Link (Please click here)						New

Figure 55: Calibration Instrument Inventory



Figure 56: Photo showing calibration of the instrument at NCHM Calibration at the Laboratory

14.3 Calibration of Instruments at Field

To ensure nationwide data accuracy, the TSRD conducted comprehensive field calibration and inspection of instrument/sensors in 21 Weather Stations across Bhutan during FY 2025-26. This critical maintenance activity guarantees that all sensors adhere to operational standards, providing reliable hydro-meteorological data.

The field calibration included:

- a) Manual thermometers (Dry-Wet and Max-Min)
- b) Automated Weather Station (AWS) sensors:
 - i) Temperature and Humidity (PT) sensors
 - ii) Barometers (Pressure)
 - iii) Tipping bucket rain gauges

Table 14: List of Weather Stations and sensors calibrated/inspected

Sl.No.	Station	Station Type	Sensor Calibrated/Inspected
1	Gaselo	Class C	Manual Thermometers (Dry-wet, Max-min). AWS (PT Sensor, Barometer, Tipping bucket rain gauge)
2	Phobjikha	Class C	Manual Thermometers (Dry-wet, Max-min). AWS (PT Sensor, Barometer)
3	Khotakha	Class C	AWS (PT Sensor, Barometer, Tipping bucket rain gauge)
4	Bajo	Class A	Manual Thermometers (Dry-wet, Max-min). AWS (PT Sensor, Barometer, Tipping bucket rain gauge)
5	CNR	Class C	AWS (PT Sensor, Barometer, Tipping bucket rain gauge)

6	Punakha	Class A	Manual Thermometers (Dry-wet, Max-min). AWS (PT Sensor, Barometer, Tipping bucket rain gauge)
7	Singye Dzong	Class C	AWS (PT Sensor, Barometer, Tipping bucket rain gauge)
8	Dungkar	Class C	AWS (PT Sensor, Barometer, Tipping bucket rain gauge)
9	Bumthang	Class A	Manual Thermometers (Dry-wet, Max-min). AWS (PT Sensor, Barometer, Tipping bucket rain gauge)
10	Babesa	Class A	Manual Thermometers (Dry-wet, Max-min). AWS (PT Sensor, Barometer, Tipping bucket rain gauge)



Figure 57: Photos calibration of field station instruments

14.4 Workshop for Review of Draft Manuals and SOP

TSRD organized a three-day consultation workshop in Thimphu from 21–23 May 2026 to finalize operational guidelines and standard operating procedures (SOPs), and to strengthen staff capacity on the Quality Management System (QMS). The workshop brought together hydrometeorological technicians and officials to review manuals on safety, observations, forecasting, data sharing, calibration, and early warning systems.

Through field-based feedback, key SOPs were refined to ensure practicality and alignment with operational realities. Participants enhanced their understanding of QMS principles, quality assurance, instrument calibration, and disaster preparedness, while hands-on calibration exercises further strengthened technical skills.



Figure 58: Three-day consultation workshop on manual and SOP review

15 TECHNICAL BACKSTOPPING SERVICES

15.1 Drone Topographical Survey and Mapping for Jamjee Solar PV Project Site

Based on the request of DGPC, NCHM deputed a technical team to carry out a topographical survey and mapping for the Jamjee Solar PV Project Site from 21st to 23rd August 2025. The team completed the drone survey and data processing and submitted the maps to DGPC on 28th August 2025.

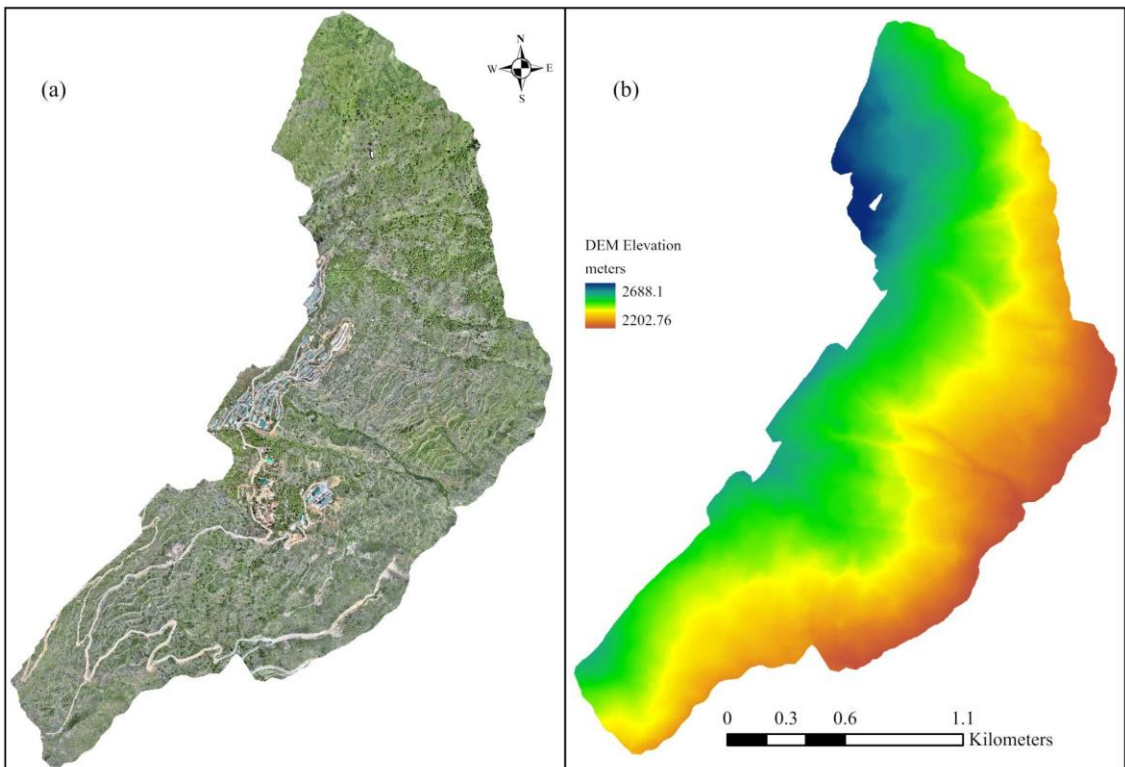


Figure 59: Ortho-rectified aerial image (a) and Digital Terrain Model (DTM) (b) of the Jamjee Project area.

15.2 Joint Field Assessment Conducted to Strengthen Flood Early Warning System for PHPA-II

Following concerns raised by the Punatshangchu Hydropower Project Authority-II (PHPA-II) regarding recurring flood risks from key tributaries between the PHPA-I and PHPA-II dams, a joint field assessment was conducted from by officials from PHPA-II, the National Center for Hydrology and Meteorology (NCHM), and WAPCOS to identify suitable locations for establishing monitoring stations on the Jalap, Rurichhu, Basachhu, and

Lhawakha streams. The assessment forms part of a collaborative effort to strengthen the flood early warning system in the Punatshangchhu basin through improved hydrometeorological monitoring and real-time data collection. The proposed monitoring network will enhance PHPA's capability to get timely flood warnings, enabling PHPA-II dam operators to make informed operational decisions, improve preparedness for sudden flood events, optimize reservoir and dam management, and ultimately enhance the safety and resilience of hydropower infrastructure and downstream areas.



Figure 60: Joint Field Assessment Conducted for PHPA-II

15.3 Preliminary Flood Risk Assessment for Gyalsung Academy Sites

Following a request from the Gyalsung Head Office, NCHM deputed two officials to conduct a preliminary flood risk assessment of two Gyalsung Academy sites from 4–9 March 2026. The assessment focused on identifying potential flood hazards and evaluating the exposure of academy infrastructure and training facilities to flood-related risks. Based on the findings, NCHM will provide recommendations to mitigate identified risks, with particular emphasis on strengthening flood monitoring, forecasting, and early warning systems to enhance the safety and resilience of the academy facilities.

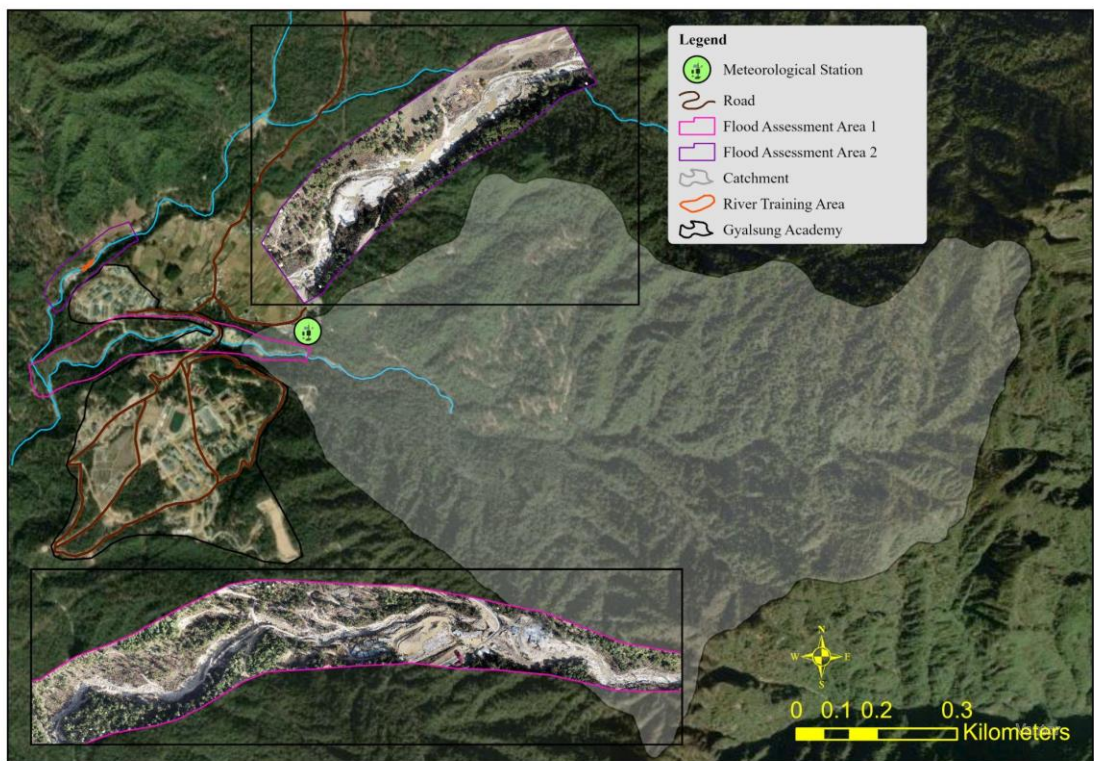


Figure 61: Preliminary Assessment sites: Khotokha Gyalsung Academy

16 INSTITUTIONAL PARTNERSHIP AND COLLABORATION

16.1 NCHM signed MoU with DHI

The National Centre for Hydrology and Meteorology (NCHM) and Druk Holding & Investments (DHI) signed a Memorandum of Understanding (MoU) to collaborate on joint research in the fields of weather, climate, cryosphere, hydrology, and water resources on 26 June 2026. The MoU establishes a framework for cooperation to advance scientific research, innovation, and technology development in hydromet sciences.

Under the agreement, NCHM will share hydromet data, scientific expertise, and facilities, while DHI will lead the design and deployment of innovative technologies, including IoT based monitoring systems and advanced forecasting tools. Together, the Parties will promote knowledge exchange, organize joint training programs, and explore funding opportunities for projects of national importance.

Currently, DHI, in collaboration with Newcastle University (UK), is implementing a research project on GLOF mitigation in the Lunana region in partnership with NCHM.

The signing was witnessed by the Chair and members of the Scientific and Technical Advisory Committee (STAC) of NCHM, along with officials from DHI InnoTech, marking a significant step toward collaborative research and innovation in Bhutan's hydromet sector.



Figure 62: Photos from MoU signing between NCHM and DHI on 26 June 2026

16.2 Development of Flow Forecasting System for Chhuka Power Plant

The NCHM, in partnership with Druk Green Power Corporation (DGPC), is implementing the project *“Development of a Hydropower Forecasting System Framework and Pilot Project on Hydropower Optimization in Bhutan.”* The project is funded by DGPC through an ongoing World Bank support project.

As part of the initiative, DGPC and NCHM are upgrading several automatic rain gauges and water-level stations across the major tributaries of the Wangchhu. The Energy and Resources Institute (TERI), India, together with its partner firms Kingfisher Hydro (Australia) and JOMISO (India), are providing consultancy support for the development of a Wangchhu River flow forecasting system.



Figure 63: NCHM and DGPC Meeting on implementation of “Development of a Hydropower Forecasting System Framework and Pilot Project on Hydropower Optimization in Bhutan”

16.3 Internship of College students at NCHM

“...The future is neither unseen nor unknown. It is what we make of it. What work we do with our two hands today will shape the future of our nation. Our children’s tomorrow has to be created by us today.” His Majesty The King Jigme Khesar Namgyel Wangchuck November, 2008

16.3.1 Internship Program of Sherubtse College and College of Science and Technology Students (CST) at NCHM.

Three final-year BSc Statistics students from Sherubtse College, Royal University of Bhutan and one third-year BTech student in Water Resources Engineering from the (CSD) completed their internship after a final presentation to the NCHM Management on 30 January 2026.

- Ms. Ayushi Suba (BTech, Water Resources Engineering, CST) presented her work on the "Comparative Assessment of the Cyclone Aila and 5th October 2025 Flood Events on Amo Chhu Basin using Statistical Method".
- Ms. Sonam Tshomo (BSc Statistics, Sherubtse College) presented her work on the "Comparative assessment of air temperature of Manual and Automatic weather stations of Lunana region".
- Ms. Tandin Yangzom (BSc Statistics, Sherubtse College) presented her work on the "Water Quality Assessment of the Pachhu River".
- Ms. Rinchen Zangmo (BSc Statistics, Sherubtse College) presented her work on the "Analysis of Water Level Trends of Chamkarchhu".

During attachment at NCHM, the interns were introduced to various scientific and statistical tools, such as R, and Q-GIS for handling and analyzing hydro-meteorological data. Their training covered trend and frequency analysis, data interpretation, and the fundamentals of writing research papers.

16.3.2 Internship for CNR Students

Three third-year BSc Environmental and Climate Studies students from the College of Natural Resources, Royal University of Bhutan attended a two months internship programme at NCHM.



Figure 64: CNR Students for internship at NCHM

The interns presented their internship assignments to the NCHM Management on 4th February 2026 and were awarded completion certificates.

- a. Mr. Karma Chimi Lekden, presented his work on the "Characterization of Wind Climatology and Warning Thresholds over Complex Terrain of Bhutan".
- b. Ms. Tshering Dema presented her work on the "Comparative Assessment of Historical Flood Events on Puna Tshang Chhu basin using Statistical methods
- c. Ms. Karma Mindu presented her work on the "Comparative Analysis of Historical Flood Events on Wangchu Chhu Basin".

16.3.3 Student Study Visit to NCHM

The NCHM hosted an industrial tour for final-year Surveying and Geoinformatics students and faculty from Jigme Namgyel Engineering College (JNEC) on September 16, 2025. Participants were given a comprehensive overview of NCHM's core mandates, observation networks, and public forecasting services via an institutional video presentation. The program also featured an interactive knowledge-sharing session with NCHM experts specializing in weather, climate, cryosphere, data management, and flood forecasting. The visit wrapped up with a guided tour of the operational National Weather and Flood Warning Center (NWFWC) and other core scientific infrastructure.



Figure 65: Photos from JNEC students on study visit at NCHM

16.3.4 CST Student Study Visit to NCHM

As part of the study tour, final-year students majoring in Instrumentation and Control Engineering from the College of Science and Technology (CST) visited the centre on 19th August, 2025. The study tour was aimed at providing students with hands-on exposure to real-world working environments.

The Centre made a presentation on NCHM mandates and functions, followed by visits to NWFWC and Hydro-met stations. During the visit, the students were introduced to the equipment and processes used in data collection and transmission, offering them firsthand experience and an opportunity to bridge their academic knowledge with practical applications in the field of hydrology and meteorology.



Figure 66: Photos from CNR students' study visit to NCHM

16.3.5 Study Visit by CNR Students on 27 May 2026

As part of NCHM's outreach and knowledge-sharing initiatives, the Centre hosted a study tour for students from the College of Natural Resources (CNR) on 27 May 2026 at the NCHM headquarters in Thimphu. The program provided students with an overview of

NCHM's mandates, functions, and core service areas, including meteorology, hydrology, and cryosphere science. Participants attended technical presentations on climatology and meteorology, visited the weather and flood warning control rooms, and undertook a field visit to Babesa to gain practical insights into hydrometeorological monitoring and services. The study tour served as a valuable platform to enhance students' understanding of NCHM's role in supporting disaster risk reduction, climate resilience, and sustainable development in Bhutan while fostering interest in hydrology and meteorology-related fields.



Figure 67: Photos from 1st Year CNR student study visits at NCHM

16.3.6 NCHM meeting with the National Council

NCHM management attended a meeting with the Natural Resources and Environment Committee (NREC) of the National Council on 14 August 2025 to deliberate on strategies for climate-resilient watershed management.



Figure 68: NCHM Management Team at the NREC meeting of the National Council

16.4 NCHM engagement with agencies and other stakeholders

The sustained level of engagement by the NCHM during FY 2025–26 reflects its growing role as a key technical institution in supporting evidence-based planning and decision-making across multiple sectors. Participation in more than 35 inter-agency meetings, workshops, and consultations indicates strong institutional integration with national ministries, departments, and agencies. The nature of these engagements shows that NCHM is not only contributing as a data and information provider but is also increasingly involved in advisory, consultative, and capacity-building functions. This demonstrates a shift toward more collaborative and interdisciplinary approaches in addressing hydromet-related challenges such as climate variability, disaster risk reduction, water resource management, and sectoral planning.

Overall, the engagements highlight enhanced stakeholder trust in NCHM’s technical expertise and underscore its expanding mandate in supporting national development priorities through scientific and meteorological services.

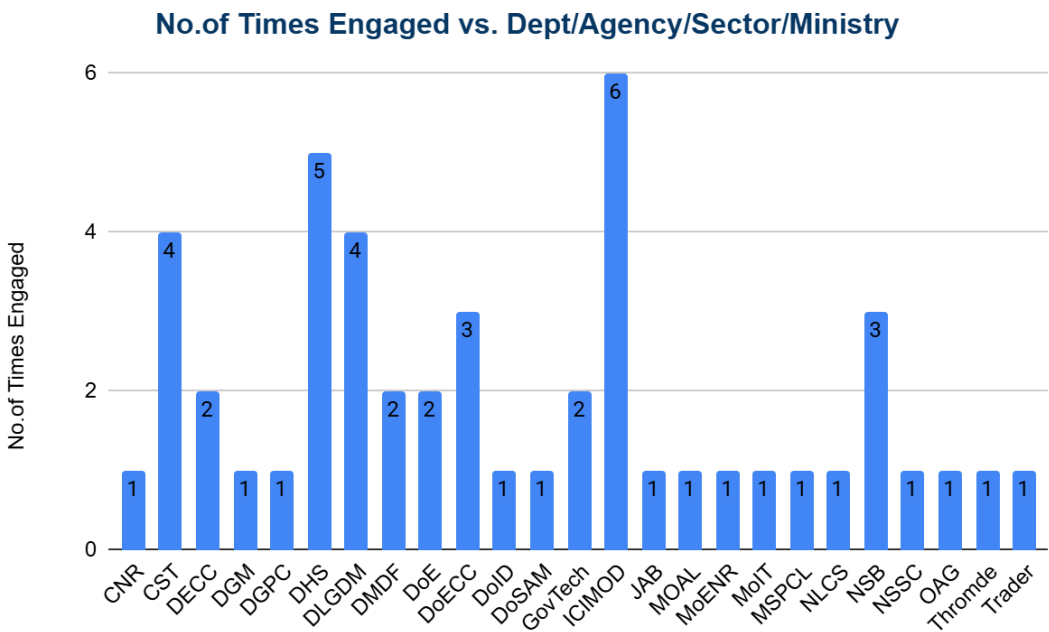


Figure 69: NCHM engagement with other Agencies/Sectors

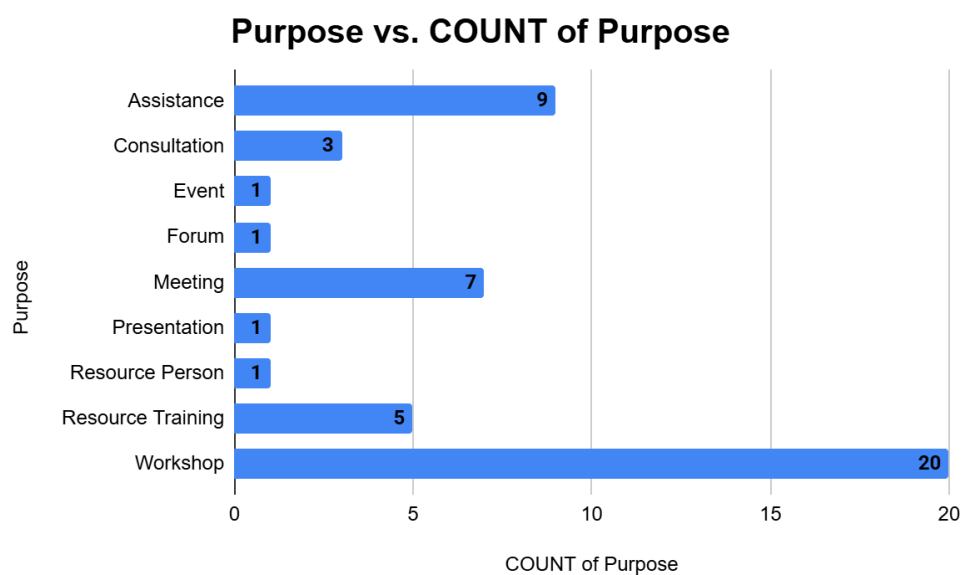


Figure 70: Engagement of NCHM employees with other sectors' activities as experts and resource persons

17 PROJECTS

17.1 Bhutan Systematic Observations Financing Facility Project

The Systematic Observations Financing Facility (SOFF) is a United Nations Multi-Partner Trust Fund established in 2021 by the World Meteorological Organization (WMO), United Nations Environment Programme (UNEP), and United Nations Development Programme (UNDP) to provide grant funding for the collection and sharing of weather and climate data.

Bhutan is a recipient of USD 4.5 million under SOFF. The project, implemented by the NCHM in coordination with relevant agencies since January 2025, will establish Bhutan's first Upper-Air Observation Facilities, a WMO GBON-compliant Automatic Weather Station (AWS), and hydro-met instrument calibration facilities, alongside capacity building and certification programs.

17.1.1 Systematic Observations Financing Facility (SOFF) High-Level Event on 11 November 2025 in Belém, Brazil

On 11 November 2025, during COP-30, His Excellency Lyonchen Dasho Tshering Tobgay, Honourable Prime Minister of Bhutan, delivered Bhutan's statement (virtually) at the World Meteorological Organization (WMO) high-level side event on the Systematic Observations Financing Facility (SOFF).



Figure 71: His Excellency Lyonchen Dasho Tshering Tobgay, Honourable Prime Minister of Bhutan, delivered Bhutan's Statement (virtually) at the WMO high-level side event on the SOFF

This special participation was at the invitation of Professor Celeste Saulo, Secretary-General of WMO, in recognition of Bhutan as a recipient of SOFF funding and a forerunner in implementing the SOFF investment project. In his remarks, the Prime Minister emphasized partnerships and Bhutan's strong commitment to strengthening its climate observation infrastructure.

The WMO SOFF side event highlighted financing mechanisms to support critical climate observations and to close the global weather and climate data gap.

17.1.2 Second Bhutan SOFF Project Steering Committee and Stakeholders Meetings

The 2nd Bhutan SOFF project Steering Committee meeting was held in Thimphu on 27 January 2026. The meeting reviewed progress from the first year of implementation, approved adjusted civil engineering budgets, and ratified the FY 2026–2027 Work Plan and Procurement Schedule. The Steering Committee's Members from the Department of Air Transport (DoAT), Bhutan Civil Aviation Authority (BCAA), Bhutan InfoComm and Media Authority (BICMA), GovTech Agency, along with Project Implementation Entity UNEP, and Project Peer Advisor (PR) Financial Meteorological Institute (FMI) attended the meeting.



Figure 72: Photos from 2nd Bhutan SOFF Project Steering Committee Meeting

17.1.3 Key Achievements of Bhutan SOFF Project



Figure 73: Key Achievements of Bhutan SOFF project activities

17.2 World Bank RIR Project

NCHM is one of the implementing agencies of the World Bank-supported project “*Strengthening Risk Information for Disaster Resilience in Bhutan (RIR, P175081, 2021-2023)*”. An amount of USD 651,000.00 is allocated for the Centre. For FY 2025-2026, the Centre implemented the following activities.

- a. NCHM carried out a national flood hazard assessment and mapping of all the vulnerable river basins and settlement areas
- b. Testing and verification of the medium-range weather forecasting System developed for Bhutan
- c. Pilot testing of the siphon system was carried out at Thorthormi Lake during October and November 2025; however, the test was not successful. [Natural Siphon Technology for GLOF Hazard Reduction: Lessons from Thorthormi Glacial Lake Report \(2025\) submitted to HPM in February 2026](#). NCHM will pilot the natural siphon method of Thorthormi lake at an alternative site (lake outlet) in the coming Sep-Oct 2026)
- d. In studying the cost recovery mechanism for providing Aviation Meteorological Services in Bhutan, updates of project activities are reported under the different sections of the report.

17.3 NCHM-ICMOD Partnership

17.3.1 ICIMOD-NCHM-DLGDM Partnership Project

A Project Agreement for the "ICIMOD-NCHM-DLGDM Partnership Project 2025–2026" was signed on June 4, 2025. ICIMOD is providing an in-kind contribution of approximately USD 164,000 (One Hundred Sixty-Four Thousand) for goods and services. The priority collaborative activities identified under this partnership include:

- a. Permafrost monitoring and research in Bhutan.
- b. Long-term monitoring of Shodug Glacier for mass balance.
- c. Black carbon monitoring station establishment in Bhutan.
- d. Integrated Disaster Risk Reduction (DRR) solutions in a selected flood-prone watershed, featuring:
- e. Capacity building initiatives

The implementation status of permafrost monitoring and research, long-term monitoring of the Shodug Glacier for mass balance, and the black carbon monitoring station reported under the Cryosphere Services Section.

17.3.2 Participation in Regional Cryosphere Meetings

On the invitation of ICIMOD, NCHM attended the following meetings:

- a. **CryoHub Technical Working Group:** Mr. Karma, Specialist, Cryosphere Services Division (CSD), participated in the regional meeting held from 25–27 August 2025 at ICIMOD, Nepal. The meeting reviewed cryosphere monitoring status across member countries, identified gaps and opportunities, and provided recommendations for regional cooperation and data sharing.
- b. **HKH Cryosphere Advisory Working Group (AWG):** The Director General, NCHM, attended the first AWG meeting in Nepal from 28–29 August 2025. The AWG was established following recommendations of the 2nd Hindu Kush Himalaya (HKH) Science-Policy Forum on Climate and Cryosphere Crisis (September 2023). As the highest-level regional advisory group on cryosphere science, policy, and practice for the HKH region, the AWG will oversee emerging science and policy needs, review global technological and scientific advancements, and guide research to generate relevant knowledge and innovative solutions to address cryosphere impacts and risks in the region.



Figure 74: NCHM participated in the Regional Cryosphere meeting

17.4 New Projects

A Project Agreement of USD 262,000.00 for “Reducing Imminent Risks due to Glacial Lake Outburst Flood (GLOF) in the Punatsangchhu Basin” was signed between the Ministry of Finance (RGoB) and the Swiss Polar Institute (SPI) on 27 February 2026, with NCHM designated as the implementing agency.

In addition, NCHM, through the Ministry of Finance, has submitted the project concept note “Enhancing Climate Information and Multi-Hazard Early Warning for Resilience in Bhutan” to the Green Climate Fund (GCF). The concept note was approved by GCF in June 2026, and the United Nations Environment Programme (UNEP) will submit the Project Preparatory Facility (PPF) application to GCF.

18 CAPACITY BUILDING AND SHORT-TERM TRAINING (STT)

Well-trained staff are essential for delivering high-quality services. Advances in scientific knowledge and technology have enabled more accurate forecasts and enhanced the quality of hydro-met services. To ensure providers can meet the growing demand for hydro-met information, particularly in light of the adverse impacts of extreme events on socio-economic sectors, NCHM has prioritized capacity development through education and training. Short-Term Trainings (STTs) were implemented to strengthen the technical and professional capacity of employees and to keep them abreast of evolving developments in meteorology, hydrology, and cryosphere studies. These initiatives were supported by funding from international, bilateral, and regional partners and projects.

18.1 Short-term training implementation by Type

In FY 2025–2026, the Centre facilitated 38 short-term trainings (STTs) attended by 56 employees. Most were structured technical training programmes, complemented by meetings and workshops. This distribution underscores the Centre's focus on strengthening technical competencies, institutional knowledge, and operational efficiency through targeted training. Participation in meetings and workshops further enhanced knowledge exchange, stakeholder engagement, and exposure to emerging practices aligned with the Centre's mandate.

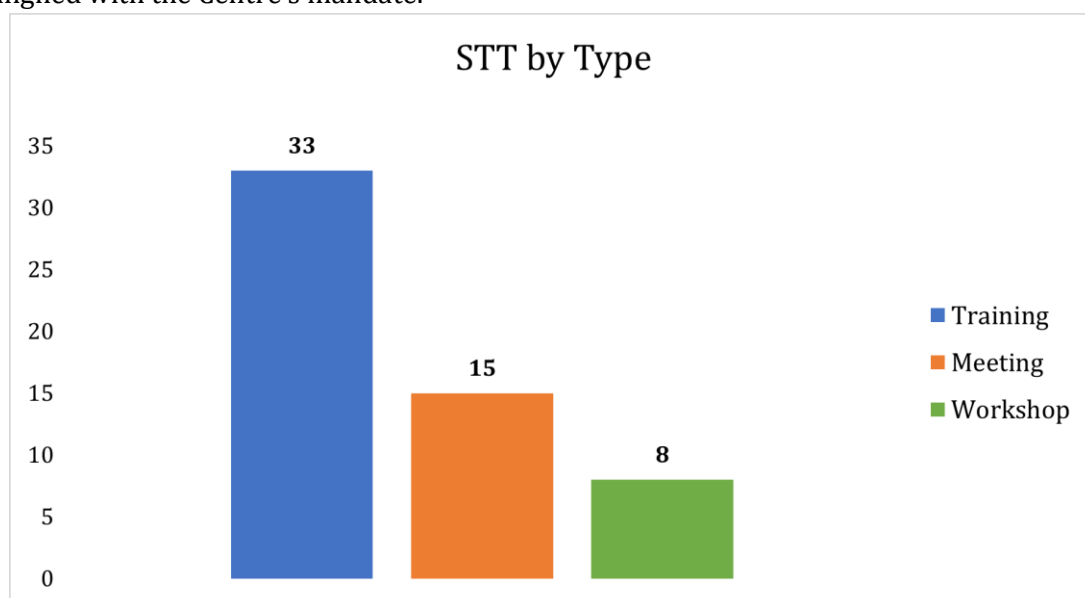


Figure 75: STT Implementation by STT Type

18.2 Short-term training implementation by Source of funding

During FY 2025–2026, the majority of STTs were funded by the Royal Government of Bhutan, with additional support from the Systematic Observations Financing Facility (SOFF) and the WMO. SOFF made a particularly significant contribution by strengthening skills in meteorology, hydrology, and early warning services. Beyond specialized training, SOFF supported the establishment of 24/7 weather and flood warning facilities, scientific infrastructure, and upper-air observation systems, thereby enhancing both institutional capacity and technical expertise.

As Bhutan’s national focal institution for WMO, the Centre continued to benefit from technical cooperation, global knowledge-sharing platforms, and capacity-building programmes. These engagements have substantially advanced professional development and reinforced the Centre’s technical and operational capabilities.

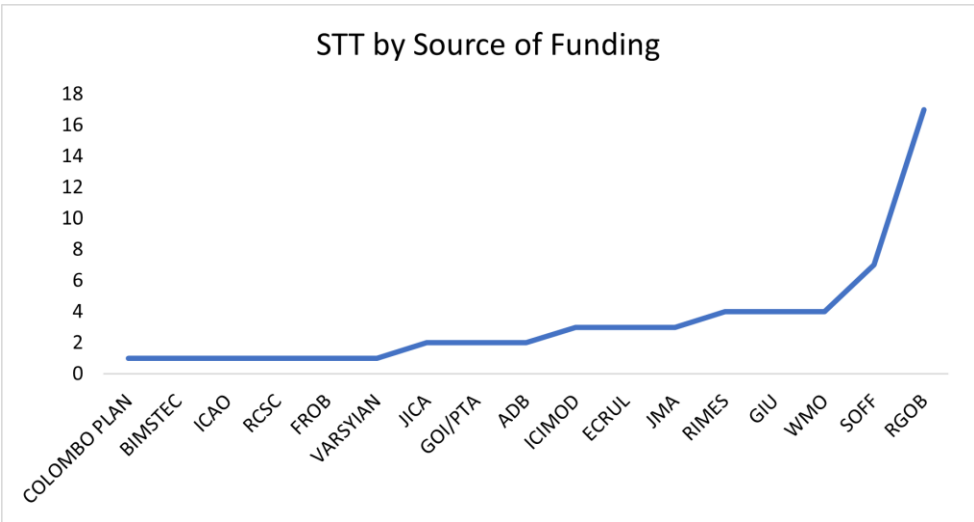


Figure 76: STT Implementation by Source of Funding

18.3 Short-term training implementation by Position Level

In FY 2025–2026, officials in the PMC accounted for the highest participation in STTs, followed by those in the SSC, while officials in the Executive Category recorded comparatively lower participation.

This trend reflects the Centre’s focus on strengthening the technical, managerial, and operational competencies of officials engaged in planning, coordination, scientific services, and programme implementation. The higher participation of PMC officials also underscores the specialized nature of training in hydrology, meteorology, climate

services, ICT, and project management, which demand both technical expertise and decision-making responsibilities.

Meanwhile, the participation of officials from the SSC reflects the Centre’s commitment to broadening institutional capacity and enhancing administrative and operational efficiency.

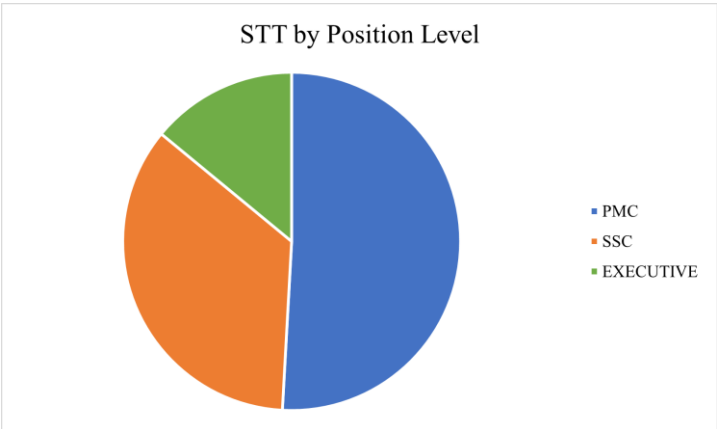


Figure 77: STT implementation by Position level

18.4 Short-term training implementation by Country

The distribution of Short-Term Trainings (STTs) shows that Thailand hosted the highest number of trainings, followed by India, Nepal, and Japan. This pattern underscores the Centre’s strong regional and international collaboration in hydrology, meteorology, climate services, disaster risk reduction, and technical capacity development.

The higher concentration of training in Thailand can be attributed to the presence of regional organizations, specialized training centres, and development partners that regularly facilitate technical programmes and workshops for member countries. Participation in these trainings across the four countries has significantly enhanced the technical knowledge, professional exposure, and institutional capacity of officials, aligning their expertise with emerging regional and global practices.

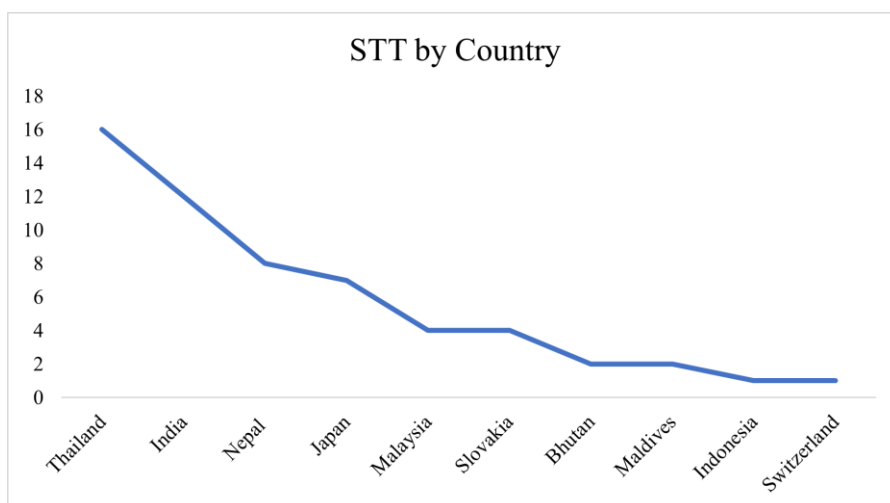


Figure 78: STT Implementation by Country

18.5 Mandatory Training

The NCHM is designated as the national focal point of Bhutan for the WMO, IPCC, ICAO, and other regional organizations. The Centre attended mandatory meetings, seminars, and workshops hosted by the IPCC, WMO, ICAO, SAHF (RIMES) and BIMSTEC (BCWC), and bilateral organizations during the financial year 2025–2026, as detailed in the table below.

Table 15: List of mandatory meetings, seminars, and conferences attended for FY 2025–2026

Sl#	Title of Meeting/Conference/Seminar	Delegation	Date	Institute/Country
1	The ICAO Asia and Pacific (APAC) MET/ATM Seminar and the Fifteenth Meeting of the Meteorological Requirements Working Group (MET/R WG/15) were held in Bangkok, Thailand, from	Mr. Tshering Dorji, Met/Hyd Officer	7 to 10 April 2026	Bangkok, Thailand
2	Twenty-Ninth Meeting of the Meteorology Sub-Group (MET SG/29) of the ICAO Asia and Pacific, from	Ms. Ugyen Lhamo . Hydromet Officer, AMS, MSD, NCHM	18–22 August 2025	Bangkok, Thailand,
3	To attend the Extraordinary Session of the World Meteorological Congress (Cg-Extra (2025) 20-23 October 2025 at WMO Headquarters in	Mr. Karma Dupchu, Director	18-25 October 2025	Geneva. Switzerland

	Geneva, Switzerland			
4	64th Plenary Session of the IPCC (IPCC-64),	Mr. Karma Dupchu, Director General	23-30 March 2026	Bangkok, Thailand
5	The 5th Governing Board (GB) for BIMSTEC Centre for Weather and Climate (BCWC)	Mr. Karma Dupchu, Director General Mr. Ugyen Chhophel, Offtg. Chief, MSD	22 - 23 April 2026	Thimphu, Bhutan
6	The 9th Joint Technical Team (JTT) Meeting between the Royal Government of Bhutan (RGoB) and the Government of India (GoI) was held in Phuentsholing from 15-17 June 2026.	Mr. Trashi Namgayl, Chief/Team Leader	15-17 June 2026	Phuentsholling, Thailand

15th Meeting of the Meteorological Requirements Working Group (MET/R WG/15)
ICAO Asia and Pacific Regional Office, Bangkok, Thailand, 07-10 April 2026



ICAO APAC Twenty-Ninth Meeting of the Meteorology Sub-Group (MET SG/29)
ICAO Asia and Pacific Regional Office, Bangkok, Thailand, 18 – 22 August 2025



Figure 79: Photos from the mandatory training

18.6 Overview of Short-Term Trainings implemented for FY 2025-2026

18.6.1 Quality Management System (ISO: 9001:2015) Internal Audit Training

From 11–15 May 2026, NCHM conducted a QMS Internal Audit Workshop facilitated by Mr. Alberto Blanco Sequeiros from the Finnish Meteorological Institute (FMI) with support from SOFF. The workshop strengthened internal audit capacity for aviation meteorological services through practical exercises and mock audits based on ISO 9001:2015. A key outcome was the development and endorsement of the Aviation Internal Audit Plan by NCHM management, marking an important step in enhancing

quality assurance and compliance.



Figure 80: Photos from Mock audits covering different scopes of ISO 9001:2015.

18.6.2 Training of Instructor Course

The ToT program enhanced participants' capacity to design and deliver competency-based, learner-centered courses, while the ICAO Instructor Course (TIC) equipped aviation trainers with skills in course design, facilitation, assessment, and feedback in line with ICAO standards.

Two officials from the Aviation Meteorological Services at Paro International Airport (PIA)—Ms. Ugyen Lhamo (Aviation Meteorology) and Mr. Tshering Dorji (Instrumentation)—successfully completed the TIC at CATC, Bangkok (23–27 March 2026) under the ICAO Training Package for Evaluating Mastery of Skills (TPEMS). Their certification strengthens NCHM's capacity to deliver competency-based training, advancing national capacity building and supporting the safety and resilience of aviation operations in Bhutan.



Figure 81: Certificate of achievement and successful completion of the course

18.6.3 Quality Management System (ISO:9001:2015) Internal Audit Training Advanced BIP-M Training for Aviation Meteorologists

Five staff from the Aviation Meteorological Section completed the Advanced Basic Instruction Package for Meteorologists (BIP-M) under the WMO framework at the Regional Training Centre, Pune, India, with operational training at Dum Dum Airport Station and the Regional Meteorological Centre (RMC), Kolkata, from January–April 2026. The training was funded by RGoB and facilitated by the India Meteorological Department (IMD), Ministry of Earth Sciences, GoI.

The program combined e-learning, classroom sessions, and hands-on training in aviation meteorology, forecasting techniques, satellite and radar meteorology, and numerical weather prediction. Upon completion, participants received BIP-M certification, internationally recognized under WMO and ICAO standards.

This milestone strengthens NCHM's capacity to deliver aviation meteorological services in preparation for the Gelephu International Airport, enhancing the accuracy and reliability of aviation weather support.



Figure 82: Certificate of achievement and successful completion of the BIP-M training

18.6.4 Centralised Data Management System (CDMS) Workshop and IMS4 Software Application



Figure 83: Climate Data Management Systems (CDMS) Workshop

NCHM, conducted the *Centralised Data Management System (CDMS) Workshop* with experts from M/s MicroStep-MIS, Slovakia, conducted from 27 April to 8 May 2026, in Thimphu to strengthen ICT infrastructure for meteorological services. The training covered aviation meteorology tools, NWP-based synoptic analysis, graphical product generation, IMS Weather Studio operations, CDMS architecture, database administration, API security, and system maintenance. The training was supported by the WMO-SOFF Project to enhance NCHM's capacity to operate and maintain advanced weather and aviation monitoring systems to international standards.

18.6.5 SmartMet Operational and Portal Development Training

With support from FMI experts Mr. Joni Hakkanen and Mr. Sami, NCHM conducted a five-day training from 11–15 May 2026 to develop a weather forecasting portal for dissemination of weather information. Key outcomes included automated map production using Dali scripting for high-resolution weather maps, dynamic data overlays through WMS feeds for real-time visualization of key meteorological parameters, and live data pipelines using cron-based triggers to stream observation data from Rocky Linux servers to the portal.

The SmartMet portal has also integrated nine data sources, including GFS, ECMWF, WRF regional models, Himawari satellite imagery, and national CDMS observations, enabling

automated 7-day forecast visualizations for public use.



Figure 84: Photo from SmartMet Portal Technical Workshop

18.6.6 Institutional Quality Assurance and Audit Training

Concurrently with the SmartMet workshop, FMI expert Alberto and NCHM Quality Lead Ugyen Lhamo co-facilitated a five-day ISO 9001:2015 Internal Audit Certification Training. The program marked an important institutional milestone by strengthening NCHM's capacity for internal quality management audits, a key step toward ISO certification and alignment with international standards. Using field-based practical exercises, participants conducted mock audits on operational forecasting logs and SOPs, identifying real gaps and non-conformities and developing structured escalation and correction workflows with defined timelines.

As a result, 15 NCHM staff are now qualified internal auditors, reducing dependence on external expertise and strengthening in-house quality assurance capacity.



Figure 85: Quality Assurance (QMS) and Audit Training

18.6.7 Upper Air Observation (Weather data systems and WIS 2.0) Training

Three officials (two Hydro-met Officers and one ICT Associate) completed a two-week training organized by the Oriental Electronics Inc. with Japan Meteorological Agency, Japan Meteorological Business Support Center and Earth System Sciences (May 25–June 5, 2026) under the Bhutan SOFF Project. The program prepared NCHM personnel for the installation of Bhutan’s first upper air observation system and adoption of WMO Information System (WIS 2.0) for GBON data exchange. The training included exposure to upper-air observation systems, radiosonde launching procedures, WIS1.0/WIS2.0 data exchange, global data exchange requirements, satellite data analysis using SATAID, forecast guidance tools, and practical WIS2.0/wis2box implementation.



Figure 86: WIS 2.0 training and Upper air observation training at Aeronautical Observatory

18.6.8 Certification Course on Instrumentation and Calibration of Hydromet Equipments and Systems at MicroStep, Slovakia

Under the SOFF project support four Hydromet Officer/Technicians attended a 12-day training program at M/s MicroStep-MIS Headquarters on Instrumentation and Calibration of Hydromet Equipment and Systems, including automated sensor calibration, AWS siting, and maintenance from 8-18 September 2025. A knowledge-sharing session by participants was held with other office staff on December 5, 2025



Figure 87: NCHM team at M/s MicroStep-MIS Headquarters, Slovakia, for instrumentation and Calibration training

18.6.9 Refresher course for Hydromet Technical (Met Observers) at CST

A six-day refresher course on meteorological instrumentation was conducted at the College of Science and Technology, Phuentsholing, from 22–27 December 2025. The program strengthened the capacity of meteorological observers in operating and maintaining hydro-meteorological equipment. A total of 26 Hydromet Technicians from sites and HQ attended the training.

Training covered instrument calibration, routine maintenance, troubleshooting, and data collection protocols, ensuring optimal station performance and reliable weather monitoring. The workshop reinforced the importance of well-trained observers for sustaining the accuracy and longevity of Bhutan's hydro-meteorological network, representing a strategic investment in human resource development and service sustainability. Training was supported by the SOFF project.



Figure 88: Hydromet Technicians Refresher Course at CST

18.6.10 Conducts ICT System Integration Workshop by FMI

The NCHM conducted an ICT System Integration Workshop in collaboration with the Finnish Meteorological Institute (FMI) from 26–30 January 2026 in Thimphu.

The workshop aimed to strengthen NCHM's technical capacity in configuring, integrating, and managing SmartMet infrastructure and meteorological data systems. Combining theoretical sessions with hands-on technical activities, the training enabled NCHM staff to enhance their skills in SmartMet server architecture, system migration, data integration, and service continuity through redundancy and backup configurations.

During the workshop, old systems were successfully migrated to the new SmartMet Server C, which now serves as the primary operational server. Meanwhile, SmartMet Server B has been configured as a public API server and hot backup, significantly improving system reliability and accessibility.



Figure 89: Photos from ICT System Integration Workshop by FMI in Thimphu

18.6.11 Training on Numerical Weather Prediction (NWP) Model

From September 22 to October 3, 2025, three NCHM staff members (two forecasters and one ICT official) participated in specialized training on the Numerical Weather Prediction (NWP) Model for Weather Forecasting at RIMES in Bangkok, Thailand.

The program provided practical, hands-on training in the Weather Research and Forecasting – Environmental Modeling System (WRF-EMS), covering installation, framework introduction, troubleshooting, physics configuration, and initial 24-hour test runs. Advanced modules also addressed data assimilation, post-processing, and forecast verification. This training directly strengthens NCHM’s operational forecasting capacities to bolster Bhutan’s early warning systems and disaster resilience.



Figure 90: Photos from Numerical Weather Prediction (NWP) Model for Weather Forecasting Training at RIMES in Bangkok, Thailand

18.6.12 Refresher Workshop on Operational Hydro Meteorology for Site Observer

The Refresher Workshop on Operational Hydrometeorology for Site Observers was conducted from 25th March to 3rd April 2026 at the RAA Professional Development Centre Tsirang, to strengthen the technical and operational capacity of field observers. The workshop covered key thematic areas including meteorology, hydrology, cryosphere science, sediment monitoring, and early warning systems, along with institutional aspects such as ICT, administration, and planning.

A total of 18 site observers and 2 new officers from HQ participated in the workshop, benefiting from a combination of theoretical sessions, practical exercises, and field visits. The workshop enhanced participants' knowledge, improved their technical skills in operating and maintaining hydro-meteorological equipment, and strengthened their capacity in data collection, analysis, and reporting. The workshop contributed significantly to improving the reliability and accuracy of hydro-meteorological services in Bhutan, thereby supporting disaster risk reduction and sustainable water resource management. The workshop was supported by the GOI flood warning program.



Figure 91: Photos from Hydro-met Technician Refresher Workshop on Operational Hydro Meteorology at Tsirang.

18.6.13 Operational Coordination and SOP Harmonization Workshop for GLOF-EWS Control Rooms and FMCR

Conducted workshops from April 20–29, 2026, in Control Centres at Wangdue, Trongsa, and Bumthang to strengthen coordination, technical capacity, and operational efficiency for GLOF-EWS control rooms and FMCR. The sessions covered key topics such as GLOF risk, telemetry, real-time monitoring, hydrograph interpretation, and communication protocols, along with hands-on training and improved use of SAsia FFGS. A key outcome was the harmonization of SOPs and enhanced coordination between control rooms, contributing to improved flood preparedness and more effective early warning services in Bhutan.



Figure 92: Coordination and SOP harmonization Workshop for GLOF-EWS at Wangdue, Trongsa and Bumthang

18.6.14 Advance Training on Hydrological Modelling and Flood Forecasting

Four officials from NCHM completed advanced training on hydrological modelling for

flood forecasts and early warning systems. The training was conducted at Universiti Sains Malaysia (USM), Malaysia, from 22nd September 2025 to 3rd October 2025 with financial support from the ECRUL project. This training was aimed at enhancing the capacity of NCHM officials in the development of flood forecasting models through hands-on modules and strengthening NCHM's capacity in the operationalization of the Flood Forecasting and Early Warning System (FFEWS).



Figure 93: Photos from the advanced training on hydrological modelling for flood forecasts and early warning systems

18.7 Long-term Training

As part of its commitment to strengthening institutional capacity and ensuring a highly skilled workforce, the NCHM continued to support staff in pursuing long-term academic studies through various scholarship and funding programs. During the reporting period, three Officers are pursuing Long-term Studies as given in the following table. These long-term study opportunities are expected to enhance technical expertise, strengthen research and analytical capacities, and contribute to the delivery of high-quality hydrological, meteorological, and climate services in Bhutan.

Table 16 List of NCHM Officers pursuing Long-Term Studies

Sl #	Name	Course	Funding	Institute	Duration
1	Ms. Yeshi Choki, Sr. Met/Hyd Officer	Master of Science in Water and Sustainable Development	WMO Scholarship	IHE-Delft, Amsterdam, the Netherlands	03-Nov-2025 to 16-Oct-2026
2	Mr. Chimi Namgyel, Sr. Statistical Officer	MA in Economics (Economic Policy Development	JDS Scholarship	International University of Japan	01-Sep-2025 to 30-Jun-2027
3	Ms. Dechen Lhamo Gyeltshen, Met/Hyd Officer	PhD in Space Weather and Solar- Terrestrial Physics	University of Reading, UK (United Kingdom)	University of Reading	01-Sep-2024 to 31-Aug-2027

18.8 Regional Training and Workshop

18.8.1 Regional Workshop on Impact-Based Forecasting

From 24–28 November 2025, SAHF convened NMHSs, user agencies, and partners to co-develop a Regional IBF Framework and Toolkit for temperature-related hazards. The workshop also guided national demonstration projects and IBF workplans integrating MEL, GEDSI, and risk management.

Supported by the UK Met Office through the WISER Programme (FCDO-funded), the event advanced regional IBF and early warning capacity. NCHM was represented by Dr. Singay Dorji (Specialist, Weather & Climate) and Mr. Kinley Tenzin (Forecaster)



Figure 94: Regional Workshop on Impact-based forecasting for temperature-related hazards

18.8.2 Colombo Plan Training

Ms. Ugyen Lhamo represented NCHM at the Capacity-Building Training on Climate Services held in Tangerang, Banten, Indonesia, from August 24 to 30, 2025. Organized under the Colombo Plan by the Government of Indonesia (SSTC, STMKG, and BMKG), the program hosted delegates from 11 countries to enhance technical capabilities in delivering critical climate services for food security, energy, water resource management, and health sectors.

The training focused on practical, data-driven solutions and collaborative approaches designed to translate climate information into policy-supporting actions and sustainable development goals. This professional development opportunity directly strengthens NCHM's capacity to provide faster, smarter, and more impactful climate services to enhance national preparedness.



Figure 95: Ms. Ugyen Lhamo at Colombo Plan Training

18.8.3 Regional Training on the Application of Machine Learning (ML) and Deep Learning (DL) in the Mountain Cryosphere

From 8–12 December 2025, NCHM, in collaboration with ICIMOD, hosted a five-day regional training in Punakha on applying machine learning and deep learning to the mountain cryosphere. Participants from five HKH member countries gained practical skills in AI-driven cryosphere research as part of ICIMOD's regional capacity-building program.

NCHM's Director General attended the opening and closing session of the workshop



Figure 96: Regional Training on the Application of Machine Learning (ML) and Deep Learning (DL) in the Mountain Cryosphere

18.8.4 NCHM Quarterly Knowledge Sharing Session: 5 December 2025

The NCHM conducted its quarterly Knowledge Sharing and Learning Session today, bringing together 5 teams who attended various short-term trainings supported by international agencies, regional institutions and projects. As part of the Centre's ongoing effort to strengthen institutional capacity and foster a learning culture, the teams presented key learnings, tools and best practices relevant to enhancing hydromet operations. The session also featured a detailed presentation on the Test Siphon activities carried out at Thorthormi Lake in Lunana. The session was organized to ensure that technical knowledge gained from training is shared, contextualized and translated into operational improvements, in compliance with BCSR 2023 and the Centre's commitment to effective service delivery and informed decision-making.



Figure 97: Quarterly knowledge-sharing sessions by employees who attended trainings

19 IMPORTANT EVENTS

19.1 NCHM honoured with Awards During Civil Service Innovation Day 2026

The Civil Service Innovation Day, organised for the first time by the RCSC, was held from 15–16 June 2026 at the Royal Textile Academy (RTA), Thimphu. The event featured over 60 innovative projects from ministries, agencies, Dzongkhags, Thromdes, and Technical Training Institutes.

The NCHM achieved notable success, receiving the Gold Award in the Innovation in Service Delivery category for the project *“Strengthening Cryosphere Monitoring through a Standardised Semi-Automated Glacier Mass Balance Analysis System,”* led by Mr. Tshewang Jamtsho and Mr. Arun Puri from the Cryosphere Services Division, presented by the CSD team. In addition, the Centre was awarded the Project Excellence Award for the *Implementation of Quality Management System for Aviation Meteorology Services*, a project led by Ms. Ugyen Lhamo, Head of AMS Paro team, Meteorological Services Division (MSD). Recognition marks mark a significant milestone and a proud achievement for the NCHM family.



Figure 98: Ms. Ugyen Lhamo (Left) receiving the Project Leadership Excellence Award and Mr. Tshewang Jamtsho (Right) receiving Gold in the Innovation in Service Delivery Category

19.2 NCHM Director Promoted to Director General

In recognition of his exemplary leadership, professional excellence, and dedicated service to the nation, Mr. Karma Dupchu, Director (EX-IIA) of the NCHM was promoted to the position of Director General (EX-IIA), effective 1 October 2025. Throughout his distinguished career, Mr. Dupchu has played a pivotal role in strengthening Bhutan’s hydrological, meteorological, and cryosphere services, advancing institutional development, and enhancing the Centre’s contribution to national development and disaster risk reduction efforts. His promotion reflects the confidence placed in his leadership and vision to further elevate NCHM as the National Centre of excellence in hydrology, meteorology, and cryosphere science and services. Under his stewardship, the

Centre continues to strengthen its technical capabilities, expand stakeholder engagement, and support evidence-based decision-making for climate resilience and sustainable development in Bhutan.



Figure 99: Mr. Karma Dupchu, Director General of NCHM, with His Excellency Lyonpo Gem Tshering and Dasho Karma Tshering, Secretary of MoENR

19.3 Bhutan hosted Cryosphere and People at Risk in Bhutan and the Hindu-Kush Himalaya Workshop, Thimphu, Bhutan

The National Centre for Hydrology and Meteorology (NCHM), in collaboration with the Swiss Polar Institute (SPI) and the International Centre for Integrated Mountain Development (ICIMOD), organised a three-day workshop titled “*Cryosphere and People at Risk in Bhutan and the Hindu-Kush Himalaya*” from 30 September to 2 October 2025 in Thimphu.

The workshop brought together around 25 glaciologists, environmental scientists, social scientists, and stakeholders from Europe and the Hindu Kush Himalaya region to address glacier retreat, glacial lake outburst floods (GLOFs), and related risks. Bhutan, home to over 700 glaciers and 567 glacial lakes, faces increasing hazards due to climate change, with 17 lakes identified as potentially dangerous.

Supported by Dr. Frederik Paulsen through the Swiss Polar Institute, the workshop presented Bhutan’s Glacier Stewardship Program, assessed hazards, and drafted proposals for immediate, mid-term, and long-term actions, including early warning systems, sensor networks, and training programs.

This initiative underscores Bhutan’s commitment to regional cooperation and scientific

innovation in safeguarding communities against cryosphere-related risks.



Figure 100: Opening Session of Cryosphere and People at Risk in Bhutan and the Hindu-Kush Himalaya Workshop, Thimphu, Bhutan

19.4 Dr. Singay Dorji, Specialist -III A, appointed as Dzongdag of Pemagatsel

The NCHM bid farewell to Dasho Dr. Singay Dorji upon his appointment as Dzongdag of Pemagatshel Dzongkhag. He joined the Centre on 1 December 2012 as Chief of the MSD and was promoted to Weather and Climate Specialist on 1 January 2021. With over 12 years of dedicated service, he made significant contributions to strengthening weather and climate services in Bhutan, enhancing operations, improving service delivery, and advancing capacity development in support of the Centre's mandate.



Figure 101: Photographs of Dasho Dr. Singay Dorji during the farewell ceremony at the Centre, and joining the reception at Pemagatshel Dzongkhag

19.5 Dr. Andreas Schild Memorial Mountain Award

Mr. Karma, Specialist from the CSD, was conferred the prestigious *Dr. Andreas Schild Memorial Mountain Award* by ICIMOD on the eve of International Mountain Day 2025. The award recognizes outstanding contributions to mountain research and sustainable development in the Hindu Kush Himalaya region. This honour reflects his dedicated work in advancing cryosphere monitoring and strengthening scientific understanding of glacier dynamics, which are critical for climate resilience and water resource management in Bhutan and the wider region.



Figure 102: Mr. Karma, Specialist receiving the Dr. Andreas Schild Memorial Mountain Award in Kathmandu, Nepal

19.6 Celebration of World Day for Glaciers and World Meteorological Day

On 23 March 2026, the NCHM, in partnership with Royal Thimphu College, celebrated “World Day for Glaciers and World Meteorological Day” by organizing a science seminar under the theme “*Empowering the Next Generation.*” The event engaged emerging students and professionals in weather, water, and climate sciences, showcased Bhutan’s work in cryosphere monitoring, hydrology, climate trends, and socio-economic impacts of climate change, and promoted knowledge-sharing for evidence-based decision-making. Updates on initiatives such as the SOFF and Bhutan’s upper-air observation plans highlighted the country’s commitment to strengthening observation systems and services.



Figure 103: World Day for Glaciers and World Meteorological Day Celebration on 23 March 2026, Royal Thimphu College (RTC)

On the same day, NCHM conducted community-level awareness programs in high-risk areas to translate scientific knowledge into practical preparedness. In Phochu Dumra Lobdra, Punakha, sessions addressed GLOF risks, cryosphere monitoring, early flood warning systems, and the use of weather and climate information to enhance safety. In Lunana, the technical team delivered targeted engagement on GLOF Early Warning Systems, strengthening local preparedness and response capacity. This was initiated in an effort to bridge science and society, fostering collaboration and advancing Bhutan's commitment to timely, informed action against the growing challenges of climate change and glacier retreat.



Figure 104: Awareness program during World Day for Glaciers and World Meteorological Day Celebration on 23 March 2025, Pochu Dumra, Punakha and Lunana Community, Gasa

19.7 The 5th Governing Board (GB) for BIMSTEC Centre for Weather and Climate (BCWC), Thimphu, Bhutan on 22 - 23 April 2026

NCHM has the national focal point of BIMSTEC Centre for Weather and Climate (BCWC), hosted the 5th Governing Board (GB) meeting of the BIMSTEC Centre for Weather and Climate (BCWC) in Thimphu from April 22–23, 2026. Key outcomes included transitioning the Governing Board into the BCWC Advisory Council (AC) and transferring the Chairmanship from India (Dr. V. S. Prasad) to Myanmar (Dr. Kyaw Moe Oo). The meetings finalized critical regional initiatives, including expanding meteorological observation stations to improve numerical weather predictions, developing agricultural decision support systems, and launching PhD fellowships and training programs at BCWC India. Delegates also visited Class A Meteorological Station at Babesa, Thimphu.

The BCWC members expressed their appreciation to the Royal Government of Bhutan and the National Centre for Hydrology and Meteorology (NCHM) for their warm hospitality and for successfully hosting the meetings.



Figure 105: The 5th Governing Board (GB) for BIMSTEC Centre for Weather and Climate (BCWC), Thimphu, Bhutan, on 22 - 23 April 2026

19.8 Joining New Technical Maintenance Officer (TMO)

On April 8, 2026, NCHM hosted a joint welcome and farewell dinner for the incoming Technical Maintenance Officer (TMO), Shri Mandeep Ralan (joined April 6, 2026), and the outgoing TMO, Shri Sudhi Janardhanan Radhamany, following his successful tenure in Bhutan. Deputed by the Government of India (GoI) for a two-year term, TMOs oversee the India-Bhutan Flood Warning Programme. Established in 1955, this collaborative initiative shares critical hydrometeorological data from Bhutan with India's Central Water Commission (CWC) to facilitate flood forecasting and warning in Assam and West Bengal.



Figure 106: New Technical Maintenance Officer (TMO), Mandeep Ralan joined the Centre in place of outgoing TMO, Mr. Sudhi Janardhanan Radhamany

19.9 A Secretary-level meeting between Bhutan and India

A Secretary-level meeting between the Ministry of Energy and Natural Resources (MoENR), Royal Government of Bhutan (RGoB), and the Ministry of Jal Shakti, Government of India (GoI), was held on 25 February 2026 in Thimphu. The Bhutanese delegation was led by Mr. Karma Tshering, Secretary of MoENR, while the Indian delegation was led by Secretary Shri V.L. Kantha Rao.

The meeting reviewed bilateral mechanisms for hydromet observation, flood forecasting, and flood management. Both sides agreed to modernize flood warning networks to enhance climate resilience for Bhutan and downstream communities. MoENR reaffirmed Bhutan's commitment to sharing critical hydrological data for Assam and West Bengal,

while acknowledging India's foundational support to the sector since 1955. The Indian delegation also visited several GoI-supported project sites, including the Chamgang Water Treatment Plant, the Changyuel-Ritsa Solar Lift Irrigation Scheme, the Punatsangchhu Hydropower Projects, and the GLOF Early Warning System Control Room in Wangdue.



Figure 107: A Secretary-Level Meeting between Bhutan and India

19.10 SOFF Project Steering Committee Meeting, 27 January 2026

The 2nd Project Steering Committee (PSC) Meeting of the Bhutan SOFF Project was successfully held on 27 January 2026 in Thimphu. The meeting reviewed Year 1 project achievements, including the successful implementation of capacity-building programmes, the ongoing procurement of Automatic Weather Stations (AWS), and progress on the construction of the calibration laboratory and upper-air observation facilities. The PSC approved fund reallocations to further enhance technical competencies and critical hydro-met infrastructure development. The meeting also endorsed the annual project Work Plan for FY 2026–2027, placing particular emphasis on gender mainstreaming and enhanced stakeholder engagement.

The Director General of NCHM, serving as the Chair of the SOFF PSC, expressed his sincere appreciation to UNEP (the Implementing Entity), FMI (the peer advisor), and all PSC members for their continued guidance and support toward the successful implementation of the project. He also thanked the WMO-SOFF Secretariat for its ongoing funding, guidance, and continuous engagement of Bhutan in the SOFF international forum.



Figure 108: Photos from the 2nd Project Steering Committee (PSC) Meeting of the Bhutan SOFF Project

19.11 NCHM Civil Service Award Ceremony 2025, 15 December 2025

Coinciding with the auspicious *Zakar*, the Civil Service Award Ceremony for the NCHM for the year 2025 was held today. The ceremony was graced by the Director General and Management. The Civil Service Awards were conferred upon the recipients in keeping with the Royal Command issued to the Royal Civil Service Commission, recognizing their dedicated service to the *Tsa-Wa-Sum*, as detailed below:

- a. Medal and certificate for lifetime dedicated service to 3 employees
- b. Gold medal and certificate for 30 years of dedicated service to 8 employees
- c. Silver medal and certificate for 20 years of dedicated service to 13 employees
- d. Bronze medal and certificate for 10 years of dedicated service to 1 employee

Furthermore, appreciation certificates were awarded to 12 outstanding employees for their exceptional contributions during the appraisal period 2024–2025, reflecting their dedication, professionalism, and invaluable talents. This recognition aims to honour the achievements while fostering motivation and retention of NCHM's skilled workforce. Promotion orders for 21 employees promoted to the next higher position with effect from January 2026 were also presented in recognition of their unwavering dedication, exceptional performance, and valuable contributions to the success of the organization.



Figure 109: Photos from Civil Service Award Ceremony

19.12 39th India-Bhutan Joint Expert Team (JET) Meeting

The 39th Joint Expert Team (JET) meeting between the Royal Government of Bhutan and the Government of India was held in Paro, Bhutan, on October 8–9, 2025. Established in 1955, the JET oversees the "Comprehensive Scheme for Establishment of Hydro-meteorological and Flood Forecasting Network on Rivers Common to India and Bhutan." As the upper riparian state, Bhutan shares vital hydro-meteorological data with India to support flood forecasting in Assam and West Bengal.

The Bhutanese delegation was led by Mr. Karma Dupchu, Director General of the NCHM, and the Indian delegation was led by Shri Subhrangshu Biswas of the Central Water Commission. The team reviewed the FY 2025–2026 progress of the GoI Flood Warning Program, approved new activities for FY 2026–2027, and discussed long-term initiatives for 2026–2031. Notably, plans were advanced for a 24/7 Flood Monitoring Control Room for the Amochhu River basin in Phuentsholing, Bhutan. The meeting concluded in a spirit of warm cooperation, with the next session tentatively scheduled for April 2026 in India.



Figure 110: 39th India-Bhutan Joint Expert Team (JET) Meeting

19.13 The 9th Joint Technical Team (JTT) Meeting of Flood Management between Bhutan India

The 9th Joint Technical Team (JTT) Meeting between the Royal Government of Bhutan (RGoB) and the Government of India (GoI) was held in Phuentsholing from 15–17 June 2026.

The Bhutanese delegation was led by Mr. Trashi Namgyal, Chief Engineer of the HWRSD, National Centre for Hydrology and Meteorology (NCHM), RGoB. The Indian delegation was led by Shri Goverdhan Prasad, Chief Engineer of the Brahmaputra Basin Organisation, Central Water Commission, DoWR, RD & GR, Ministry of Jal Shakti, Government of India. The meeting reviewed the implementation status of decisions and recommendations from the 11th Joint Group of Experts (JGE) Meeting and discussed key issues and strategic frameworks for effective flood management along the trans-border rivers between Bhutan and India.

The JTT team also conducted joint field visits to selected sites, reaffirming shared commitment to strengthening technical cooperation and institutional coordination in flood management.



Figure 111: Photos from the 9th Joint Technical Team (JTT) Meeting of Flood Management between Bhutan and India

19.14 2nd Scientific and Technical Advisory Council (STAC) Meeting

The NCHM 2nd STAC meeting was held on August 15, 2025. The meeting was chaired by Mr. Karma P. Dorji, Director General of the Department of Energy (MoENR). The meeting was attended by council members representing key stakeholders, including the Department of Energy (MoENR), Department of Public Health (MoH), Department of Local Governance and Disaster Management (MoHA), Department of Human Settlement (MoIT), the College of Science and Technology (RUB), and NCHM



Figure 112: : Photos from the 2nd STAC Meeting held on 15 August 2025

The meeting reviewed & approved the following

- a. Infrastructure & Mitigation: Reviewed engineering designs for the Thorthormi Lake siphon mitigation pilot project, the new NCHM Headquarters and National

Weather and Flood Warning Centre at Yusipang (Thimphu), and the Upper Air Observation facilities at Tsirang.

- b. Quality Management: Evaluated the Quality Management System (QMS) status for aviation meteorological services.
- c. Operational Manuals: Endorsed five major 2025 technical operational manuals covering meteorological and hydrological observations, instrumentation, and weather forecasting services.
- d. Official Launches: Formally launched the NCHM Annual Report (FY 2024–2025) and the Bhutan Flood Hazard Atlas (2025).

19.15 3rd Scientific and Technical Advisory Council (STAC) Meeting

The 3rd meeting of the Scientific and Technical Advisory Council (STAC) of the National Centre for Hydrology and Meteorology (NCHM) was convened on 26 June 2026.

The meeting was chaired by Mr. Karma P. Dorji, STAC Chair and Director General, Department of Energy, and attended by Council Members including the Director General, Department of Local Governance and Disaster Management (MoHA); Director, Department of Public Health (MoH); Director, Department of Human Settlement (MoIT); President, College of Science and Technology (RUB); and Director General, NCHM.



Figure 113: Photos from the 3rd STAC meeting on 26 June 2026

Key discussions and endorsements included:

- a. NCHM Operational Support Plan for Aviation Meteorological Services at Gelephu International Airport (GLU).
- b. Quality Management System (QMS) for Aviation Meteorological Services and endorsement of SOPs for TREND Services at Paro -International Airport (PIA) and Gelephu International Airport (GLU)
- c. Review of Pilot Testing of the Siphon Method for Thorthormi Lake mitigation (September–November 2025) and endorsement of site assessment and design for testing Siphon Method for Thorthormi Lake, an alternative site as a research project in September–October 2026. Given the criticality of Thorthormi lake, STAC further directed NCHM to explore additional mitigation options in coordination with the Department of Local Governance and Disaster Management, other technical agencies, and the College of Science and Technology.

The Centre also launched the NCHM Annual Report for FY 2025–2026 during the meeting. STAC commended NCHM’s initiatives and congratulated the Centre for receiving the Civil Service Innovation Award 2026 and the Leadership Excellence Award at the Civil Service Innovation Day 2026

19.16 Aviation Meteorological Services Provider for Gelephu International Airport

The NCHM is appointed as Aviation Meteorological Services at the upcoming Gelephu International Airport (GLU) by the Gelephu Mindfulness City Authority vide letter no. GMC/CD/Gelephu/2025-2026/216 dated May 12, 2026.



GMC/CD/Gelephu/2025-2026/216

Director General
National Centre for Hydrology and Meteorology

Subject: Appointment for Aviation Support Services - Meteorological Services

Dear Dasho,

The City Development Office, Gelephu Mindfulness City Authority (GMCA), would like to kindly bring to your attention that during the recent GMCA Strategic Development Committee meeting held on 23 April 2026, the Committee deliberated on the appointment of companies and organisations for the provision of aviation support services for the upcoming Gelephu International Airport (GLU).

Following careful consideration, GMCA is pleased to appoint the National Centre for Hydrology and Meteorology (NCHM) as the aviation support service provider for meteorological services at GLU, in recognition of NCHM's experience and expertise in operating such services in Bhutan.

In connection with this appointment, we respectfully request NCHM to submit a comprehensive manpower recruitment, training, and deployment plan addressing the following areas:

1. How NCHM will support GLU in:
 - Providing aviation meteorological services in compliance with ICAO Standards and Recommended Practices, including ICAO Annex 3 – Meteorological Service for International Air Navigation, ICAO Doc 8896 – Manual of Aeronautical Meteorological Practice, and ICAO Doc 10157 – Procedures for Air Navigation Services – Meteorology (PANS-MET);
 - Operating the technical infrastructure selected for GLU, which has already been communicated to NCHM at the working level, and
 - Ensuring safe airport operations.
2. The deployment plan should take into account the potential for GLU to operate as a 24-hour airport, depending on future market demand.
3. The meteorological services function should be fully staffed and operational at GLU at least six months before the planned first calibration flight, in preparation for the airport opening scheduled for December 2029.

Further, NCHM is expected to bear all costs related to manpower recruitment, training, and deployment. Following the opening of GLU, NCHM is also expected to bear the operational and maintenance costs associated with the continued provision of meteorological services at the airport. We kindly request NCHM to seek the necessary budget approvals from the Royal Government of Bhutan accordingly.

GMCA would also appreciate it if NCHM could nominate an officer to serve as the Overall-in-Charge (OIC) for coordination and liaison with GMCA on this matter. Additional details and requirements will be communicated through the designated OIC.

Gelephu Mindfulness City
City Development Office
110 North Lam SE,
Thimphu
Kingdom of Bhutan

May 12, 2026



Gelephu Mindfulness City
City Development Office
110 North Lam SE,
Thimphu
Kingdom of Bhutan

We thank NCHM for your continued cooperation and support, and we look forward to working closely together on this important initiative.

Sincerely,

Tashi Penjor
City Development
Gelephu Mindfulness City Authority

Copy to:

1. Dasho Gyalpoi Zimpon, Office of Gyalpoi Zimpon, His Majesty's Secretariat, Tashichho Dzong, for your kind information.
2. Dasho Governor, GMCA, for your kind information
3. Dasho Secretary, MoENR, for your kind information
4. Chief of Staff, CEO's Office, for your kind information

20 PUBLICATIONS

The National Center for Hydrology and Meteorology (NCHM) is one of the designated “National Centres” mandated to conduct scientific studies and foster a culture of research and innovation to support government agencies and the public. During FY 2025–2026, NCHM undertook several studies and research initiatives in the fields of hydrology, water resources, meteorology, climatology, and the cryosphere. These publications are available on the Center’s official website: www.nchm.gov.bt Key reports for FY 2025-2026 include:

- a. *State of the Climate Report 2025*: Provides an overview of the climatic conditions and trends within the country.
- b. *Climate Atlas of Bhutan (1996–2025)*: A comprehensive climatology of temperature and rainfall patterns over nearly three decades.
- c. *Inventory of Freshwater Lakes in Bhutan 2025*: A detailed mapping and assessment of the country's freshwater lake resources.
- d. *Bhutan Glacier Inventory (2026)*: An updated inventory of glaciers developed using advanced machine learning and deep learning techniques.
- e. *Bhutan Glacier Lake Inventory (2026)*: An updated assessment of glacial lakes to support hazard monitoring and water resource planning.
- f. *Bhutan HydroMet Journal (Volume IV)*: A collection of scientific articles and research findings from the Centre.
- g. *Testing Natural Siphon Technology for GLOF Hazard Reduction: Lessons from Thorthormi Glacial Lake (2025)*: A technical report documenting the pilot siphon testing conducted to mitigate GLOF risks

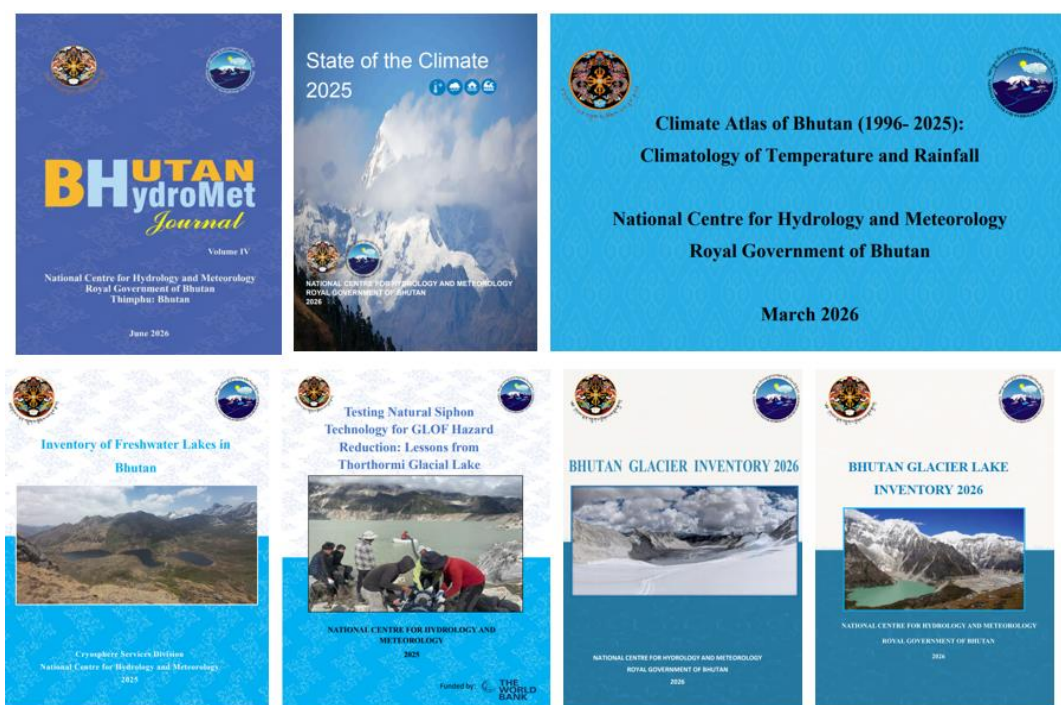


Figure 114: NCHM Publications for the FY 2025-2026

21 OBSERVATION OF MONTHLY ZERO WATER HOUR

Since its national launch by Her Majesty the Gyaltsuen on 2 June 2019, commemorating the Coronation Day of His Majesty the Fourth Druk Gyalpo, the Centre has observed the 2nd day of every month as ***Zero Waste Hour***. As part of this noble initiative, headquarters, site, and regional offices conduct regular cleaning and maintenance of office premises and hydro-meteorological stations nationwide.

This monthly observance reinforces environmental responsibility, workplace hygiene, and sustainable waste management, reflecting the collective commitment of employees to preserving Bhutan's clean environment while ensuring hydro-met stations remain safe, organized, and conducive to effective service delivery.



Figure 115: NCHM Observes Zero Waste Hour every month

22 WELLBEING OF EMPLOYEES

22.1 NCHM Staff Welfare Fund

To strengthen solidarity among the staff and provide financial support in times of need, the Center established a Staff Welfare Scheme in 2017 with monthly contributions from the members. The membership is open to all the staff of NCHM voluntarily. The Welfare Scheme is managed by the Committee nominated by the members during the Annual General Meeting.

22.2 Farewell to Outgoing Staff

1. Mr. Purna Kumar Poudel (served for 38 years 6 months and 4 days), Superannuation
2. Mr. Khemraj Sanyasi (served for 35 years 8 months), Superannuation
3. Mr. Pashupati Sharma (served 37 years 8 months 11 days), Superannuation

The NCHM family bids farewell to 15 employees on superannuation, voluntary resignations and transfers for FY 2025-2026. The Centre has organized farewell events to honour and recognize their contributions, dedication, and impacts that they have made during their tenure in the Centre. It also facilitates knowledge and experience sharing with the remaining team, fostering a smooth exit by officially marking their departure.

22.3 NCHM Monthly Potluck Lunch

To promote friendship and solidarity among staff, the NCHM continued its tradition of organizing a monthly potluck lunch on the last Friday of each month during FY 2024-2025. Employees from various Divisions/Sections come together in the Conference Hall to share home-cooked meals in a warm and inclusive setting. The initiative successfully fostered a sense of team building, cooperation and enhanced interpersonal relationships amongst the staff, reinforcing a positive working culture in the Centre.



Figure 116: Photos from Monthly Potluck Events

23 CHALLENGES AND ISSUES

Being a technical and scientific agency with a nationwide presence and a large workforce deployed across the country, the Centre continues to face several operational and institutional challenges:

- a. **Inadequate office space and scientific facilities:** The current office infrastructure and scientific facilities are insufficient to accommodate the growing workforce and expanding technical mandates of the Centre. Limited workspace, laboratory facilities, and specialized operational areas constrain efficiency and the delivery of scientific services. However, this challenge is expected to be addressed upon the completion of the new facilities planned under the 13th FYP.
- b. **Shortage of skilled and experienced technical professionals:** The Centre faces difficulties in maintaining adequate technical expertise due to ad-hoc staff separations, transfers, and employees availing long-term leave. These gaps affect institutional memory, continuity of operations, and the timely delivery of specialized services, particularly in highly technical areas that require years of experience and training.
- c. **Absence of a dedicated ICT Officer:** The Centre currently lacks a dedicated ICT Officer to oversee and manage its growing ICT infrastructure. As a result, responsibilities related to network administration, cybersecurity, system maintenance, data management, software support, and digital transformation initiatives are managed on an ad-hoc basis, posing challenges to the efficient operation and security of critical information systems.
- d. **Increasing demand for specialized services:** With the growing need for weather, climate, hydrological, and cryospheric information across sectors, the Centre faces increasing pressure to expand its services while operating within existing human and technical resource constraints. This places additional demands on staff and infrastructure, affecting service delivery and innovation efforts.

**NATIONAL CENTRE FOR HYDROLOGY AND METEOROLOGY ROYAL GOVERNMENT OF
BHUTAN**

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