



**NATIONAL CENTER FOR HYDROLOGY AND METEOROLOGY
CONTINUING SERVICE DELIVERY (CSD) PLAN
AND
STANDARD OPERATING PROCEDURE (SOP)
FOR
COVID19 LOCKDOWN**

**NATIONAL CENTER FOR HYDROLOGY AND METEOROLOGY
ROYAL GOVERNMENT OF BHUTAN
THIMPHU: BHUTAN
AUGUST 2020**

Acronyms

12 FYP	Twelfth Five Year Plan
AWLS	Automatic Water Level Station
AWS	Automatic Weather Station
CSD	Continuing Service Delivery
CSD	Cryosphere Services Division
DDM	Department of Disaster Management
EWS	Early Warning System
FMCR	Flood Monitoring and Command Room
FWS	Flood Warning Section
GLOF	Glacier Lake Outburst Flood
GMOG	GLOF EWS Management and Overseeing Group
GoI	Government of India
HOID	Hydro-met Operation and Infrastructure Division
HQ	Head Quarter
HWRSD	Hydrology and Water Resources Services Division
ICT	Information Communication Technology
MoHCA	Ministry of Home and Cultural Affairs
NCHM	National Center for Hydrology and Meteorology
NWFWC	National Weather Flood and Warning Centre
OEM	Original Equipment Manufacturer
PHPA-I	Punatsangchhu Hydropower Project Authority- I
PHPA-II	Punatsangchhu Hydropower Project Authority- II
R&D	Research and Development
RCSC	Royal Civil Service Commission
RGoB	Royal Government of Bhutan
SOP	Standard Operating Procedure
UNDP	United Nation Development Programmed
WCSD	Weather and Climate Services Division
WFCR	Weather Forecasting and Command Room
WMO	World Meteorological Organization

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NCHM Continuing Service Delivery Plan and SOP for COVID19 Lockdown

1 Background

The Government enforced the national-wide lockdown effective from 11 August 2020. Considering that the continuous hydro-met data collection and weather and flood warning services delivery are important for long term planning and disaster preparedness, the Center is working in accordance with the NCHM COVID19 Continuing Services Delivery Plan (CSD) submitted to the RCSC in March 2020. To provide clarity NCHM COVID19 Continuing Services Delivery Plan (CSD) updated as the NCHM Continuing Services Delivery (CSD) Plan and Standard Operating Procedure (SOP) for COVID19 Lockdown. The Center is implementing this CSD plan and SOP in close coordination with COVID Task force at the Central and local government level.

2 Agency Services Coordination Team (ASCT)

The Agency Services Coordination Team (ASCT) of NCHM constituted in March is fully operational with the following responsibilities:

- a. Overall coordination of NCHM services during COVID 19 lock down;
- b. Review and validate the categorization of services;
- c. Provide overall guidance and direction for effective delivery of services during the emergency;
- d. Review and approve the emergency procurements;
- e. Allocate resources and manpower based on the needs during emergency;
- f. Spearhead all activities that ensure the delivery of critical services of the Agency.
- g. Draw-up a business continuity plan that:
 - Ensure the provision of essential services to the public during the emergency such as the COVID-19 outbreak continues;
 - Work towards stimulus and recovery plans of the Government; and
 - Provide for the safety and support for all its employees in the Agency.
- h. Responsible for all communication responsibilities
- i. Review complaints and announce/publish on the website and other communication platforms for the information of the general public.
- j. Work to provide reassurance and confidence amongst their employees
- k. Collect all the contact details of the employees
- l. Set-up communication platforms using social apps like WhatsApp for easier, faster and reliable communication.
- m. Develop and implement a staff rotation roster for physical presence of staff and also limiting exposure of key staff to reduce risks of them being unavailable at the same time.
- n. Rationalize services that could be provided remotely and give task-based assignments with proper accountability
- o. Rationalize government properties like computers to support those that require urgent assignments to be delivered from home.
- p. Ensure to provide sufficient sanitization of the work-place for the safety of those delivering physical presence service delivery.
- q. Coordinate with law enforcing Agencies shall ensure to provide travel pass to the employees from home to work-place in the event it is required.
- r. Ensure that mechanisms are put in place to protect all Government properties.
- s. Carry out any other task given by the Government and RCSC related to managing the COVID-19 situation.

Table 1: NCHM ASCT

Sl. No.	Name	Role	Responsibilities	Contact Address (Mobile/Email)
1	Mr. Karma Dupchu, Director,	Team Leader	Oversee and provide direction for effective service delivery, Provide reassurance and confidence amongst employees	17629918 kdupchu@nchm.gov.bt
2	Mr. Karma, Specialist	Dy. Team Leader	Oversee and provide direction for effective service delivery; Provide reassurance and confidence amongst employees	17602050 karma@nchm.gov.bt
3	Mr. Singay Dorji, Chief, Weather and Climate Services	Member	Coordinate delivery of weather and climate services; Provide reassurance and confidence amongst their employees	17709253 sdorji@nchm.gov.bt
4	Mr. Tayba Buddha Tamang, Chief, Hydrology and Water Resources (HWRSD)	Member	Coordinate delivery of hydrological and flood/GLOF warning services; Provide reassurance and confidence amongst their employees	17666639 tbtamang@nchm.gov.bt
5	Mr. Pashu Pati Sharma, Offtg. Chief/Principal Engineer	Member	Coordinate effective monitoring, collection and transmission of hydro-met data for effective weather and climate, hydrological and flood/GLOF warning services; Provide reassurance and confidence amongst their employees	17548945 ppsharma@nchm.gov.bt
6	Ms. Chhimi Wangmo, Dy. Chief Finance Officer (DCFO)	Member	Effective delivery of administration and financial services	17584184 cwangmo@nchm.gov.bt
7	Ms. Ugyen Tshomo, Human Resources Officer	Member	Effective Human Resources Management; Collect all the contact details of the employees, Facilitate communication with RCSC	17674693 utshomo@nchm.gov.bt
8	Mr. Shacha Chap, Program Officer	Member Secretary	Overall coordination and facilitation; Complaint Management Officer; Facilitate communication with relevant authorities for issues of PASS for movement of staff and vehicles, MTO	17740541 schap@nchm.gov.bt

3 Technical Coordination Team

Considering the technical nature of job and specialized skills and knowledge required for delivery of critical services during the lockdown, the following two Technical Coordination Teams are constituted in March 2020 are fully operational.

3.1 Weather Services Coordination Team (WSCT)

The Weather Services Coordination Team (WSCT) is operational within the NCHM with following members to coordinate and oversee the effective delivery of weather services. WSCT team provides overall guidance and technical backstopping services remotely and at the sites based on the needs for the 24/7 operation of the Weather Forecasting Center Room (WFCR) of the National Weather and Flood Warning Center (NWFWC), HQ, Thimphu. The WSCT team reports to ASCT.

Table 2: Weather Services Coordination Team

Sl. No.	Name	Role	Responsibilities	Contact Address (Mobile/Email)
1	Mr. Singay Dorji, Chief, Weather and Climate Services	Team Leader	Oversee and coordinate delivery of weather and climate services	17709253 sdorji@nchm.gov.bt
2	Mr. Tshencho Dorji, Executive Engineer	Dy. Team Leader	Technical backstopping	77292379 tshenchod@nchm.gov.bt
3	Mr. Sonam Rabten, Sr. Hydromet Officer	Member	Coordination, monitoring for timely delivery of aviation weather services	17576162 srabten@nchm.gov.bt
4	Mr. Kuenzang Dorji, ICT Officer	Member	Technical backstopping for ICT system	17691407 kdorji@nchm.gov.bt
5	Mr. Jangchup Choephyel Dorji, Hydro Met Officer	Member	Coordination with Site staff	17887396 jcdorji@nchm.gov.bt
6	Ms. Pema Sylton, Met Hydro Officer	Member Secretary	Coordination, monitoring for timely delivery of weather and climate services	17332909 psylton@nchm.gov.bt

Strategy for WSCT:

- a. Team member to provide technical backstopping and services from home.
- b. Based on the physical presence required, a relevant team member may visit the office to facilitate service delivery during the emergency based on the approval by COVID Task Force/Competent authorities.
- c. Center to facilitate pick and drop by pool vehicle (with movement pass issued by Competent Authority)
- d. Any other tasks assigned by NCHM during the lockdown.

3.2 Flood Warning Services Coordination Team (FWSCT)

The Flood Warning Services Coordination Team (FWSCT) is operational within the NCHM with following members to coordinate and oversee effective delivery of flood/GLOF early warning services during the emergency. FWSCT team provides an overall guidance and technical backstopping services remotely and on sites/office based on the needs for 24/7 operation of the Flood Monitoring and Command Room (FMCM) of the National Weather and Flood Warning Center (NWFWC), HQ, Thimphu. FWSCT team reports to ASCT.

Table 3: Flood Warning Services Coordination Team

Sl. No.	Name	Role	Responsibilities	Contact Address (Mobile/Email)
1	Mr. Tayba Buddha Tamang, Chief, HWRSD	Team Leader	Oversee and coordinate delivery of hydrology and GLOF EWS services	17666639 tbtamang@nchm.gov.bt
2	Mr. Phuntsho Tshering, Exe. Geologist	Dy. Team Leader	Technical backstopping	17319947 ptshering@nchm.gov.bt
3	Mr. Tandin Wangchuk Dy. Exe. Engineer	Member	Coordination and oversee monitoring for delivery of flood/GLOF EWS	17563060 tandinw@nchm.gov.bt
4	Mr. Trashi Namgyal, Dy. Exe. Engineer, HOID	Member	Coordinate with regional office and site offices	17492942 tnamgyal@nchm.gov.bt >
5	Mr. Kunzang, AE, FWS, HOID	Member	Technical backstopping communication	17699141 kuenzang@nchm.gov.bt
6	Mr. Kuenzang Dorji, ICT	Member	Technical backstopping for ICT system	17691407 kdorji@nchm.gov.bt
7	Mr. Sangay Tenzin	Member Secretary	Coordination and oversee monitoring for delivery of flood/GLOF EWS	17711753 sangaytenzin@nchm.gov.bt

Strategy for FWSCT:

- a. Team member to provide technical backstopping and services from home.
- b. Based on the physical presence required, a relevant team member may visit the office to facilitate service delivery during the emergency based on approval from COVID Task Force/Competent authorities.
- c. Center to facilitate pick and drop by pool vehicle (with movement pass issued by Component Authority);
- d. Any other tasks assigned by NCHM during the lockdown.

4 Types of Services

NCHM as the technical and scientific agency is responsible for generation of information and delivery of products and services on weather, climate, cryosphere and water resources in Bhutan. Continuous monitoring and data collection from more than 250 hydro-met stations (Manual + automatic) has to be continued. Flood/GLOF warning stations have to be monitored 24 hours during the monsoon. The National Weather and Flood Warning Center (NFWFC) in Thimphu (HQ) and GLOF Early Warning System (EWS) Control Room of Wangdi (Punatsangchhu), Tongsa (Mangdechhu) and Kurjey, Bumthang (Chamkarchhu) have to be operated 24/7 to deliver 24 hours' services.

Hydro-met Services of NCHM are categorized into three types as discussed below:

4.1 Critical services requiring physical presence

- a. 24/7 Operation of National Weather and Flood Warning Center (NFWFC) at Thimphu;
- b. 24/7 Operation of GLOF EWS Control room Punatsangchhu basin at Wangdi;
- c. 24/7 Operation of GLOF EWS Control room Mangdechhu basin at Trongsa;
- d. 24/7 Operation of GLOF EWS Control room Chamkarchhu basin at Kurjey, Bumthang;
- e. Aviation meteorological and weather for airports for air navigation;
- f. Hydro-met data collection and transmission from hydromet network stations covering the whole Bhutan and
- g. Sediment Sample Collection and Analysis in Laboratory

Detail services requiring the physical presence are given in Annexure-I.

Brief write up of each services and proposed strategy are discussed below:

4.1.1 24/7 Operation of National Weather and Flood Warning Center

The National Weather and Flood Warning Center (NFWFC) in Thimphu is the supervisory and command centre of NCHM for monitoring and dissemination of hydromet services and products. The NFWFC is equipped with state-of-the-art ICT equipment linked with Global Telecommunication System (GTS) and satellite receiving facilities that facilitate monitoring of extreme weather and flood/GLOF. NFWFC is linked with the National Emergency Operation Center (NEOC) operated by the Department of Disaster Management (DDM), MoHCA. The NFWFC is operated by technical staff on 24/7 on shift basis. NFWFC has two main offices:

a. Weather Forecasting Center Room (WFCR):

WFCR is responsible for monitoring weather and producing weather forecasts. Daily weather forecasts and extreme weather advisories are prepared and issued by WFCR. It is also responsible for receiving and uploading meteorological data to the Global Telecommunication System (GTS) of the World Meteorological Organization (WMO) 2 times in 24 hours. A minimum of 2 technical staff is required to be physically present in WFCR for monitoring, preparing and issuing daily weather forecasts, issuing extreme weather advisories and special services to sectors based on needs. These services are more critical during the monsoon. The following technical staff of Weather and Climate Services is required to be physically working in WFCR to deliver the weather services on shift basis (2 staff on 8 hours shift).

Table 4: Staff list of Weather Forecasting Center Room, NWFWC, Thimphu

Sl. No.	Name	Designation	Mobile No.	Email address
1	WFCR Office Contact /Hotline	02-339673/02-335578/77452632		wfcr@nchm.gov.bt
2	Mr. Karma Tenzin	Hydromet Technician	17617926	karmatenzin@nchm.gov.bt
3	Mr. Ranjit Tamang	Hydromet Technician	17858241	Mr. rtamang@nchm.gov.bt
4	Mr. Phurba	Hydromet Technician	17615337	phurba@nchm.gov.bt
5	Mr. Sonam Tashi	Hydromet Technician	77634940	sonamtashi@nchm.gov.bt
6	Mr. Tshering Peljor	Hydromet Technician	77634558	tpeljor@nchm.gov.bt
7	Mr. Tshering Wangchuk	Hydromet Technician	17634176	tsheringwangchuk@nchm.gov.bt
8	Mr. Pema Dorji	Hydromet Technician	17517925	pemadorji@nchm.gov.bt

Strategy for WFCR, NWFWC:

- a. Since the physical presence of Technical Staff will be required for 24/7 operation of NWFWC, the designate emergency personnel are deputed to carry out 24/7 functions.
- b. To reduce the movement, the designated staff will stay, work in the control room for a period from 1 to 2 weeks;
- c. The Center to facilitate and provide loge, essential food items and cooking facilities for the people working the shift.
- d. The Center to facilitate to process necessary Movement PASS for staff and vehicles from the concerned authority for mobility during the lockdown.
- e. Center to facilitate pick and drop by approved movement of pool vehicle, during the lockdown.
- f. Restrict public and unauthorized people to visit the WFCR, NWFWC with immediate effect;
- g. Center to provide necessary consumable cleaning kits, soap and sanitizers to maintain cleanness and hygiene of NWFWC and washrooms;
- h. Provide necessary gears such as masks, gloves based on the need as per the Ministry of Health recommendations.

[In case of complete lockdown, a dedicated team authorized by Center will operate the FMCR, NWFWC where they will be stationed in the NWFWC. The essentials food items with cooking facilities and accommodation shall be arranged and provided by the Center. MoEA Day Center (ground floor) of NWFWC building will be used as accommodation]

b. Flood Monitoring and Command Room (FMCR)

FMCR is responsible for monitoring the floods and GLOF EWS. Daily river level status and flood advisories are prepared and issued by FMCR. FMCR is also responsible for collection of hourly data from all the hydrological stations during the monsoon season for monitoring and warning. A minimum of 2 technical staff has to be physically present in FMCR for monitoring, preparing and issuing flood warnings and advisories during the extreme weather/flood events. This GLOF monitoring is more critical during the monsoon season due to the rise in air temperature and most of the rainfall happens during this season. The following technical staff of FMCR of the Hydrology and Water Resources Services Division, NCHM will be physically working in NWFWC to deliver the flood and GLOF EWS services on shift basis (2 staff on 8 hours shift).

Table 5: Staff list of Flood Monitoring and Command Room, NWFWC, Thimphu

Sl. No.	Name	Designation	Mobile No.	Email address
	FMCR Office Contact/Hotline	02-338442/17128052		fmcr@nchm.gov.bt
1	Mr. Jigme Wangdi	Hydromet Technician	17628951	jzangpo51@gmail.com
2	Mr. Pema Dorji	Hydromet Technician	17980717	pemadorji613@gmail.com
3	Mr. Wangdi	Hydromet Technician	17588639	wangdi8117@gmail.com
4	Mr. Aita Singh Tamang	Hydromet Technician	77396048	aitasingh1993@gmail.com
5	Mr. Sangay Wangmo	Hydromet Technician	17474707	wangmos74@gmail.com

Strategy for FMRC, NWFWC:

- Since the physical presence of Technical Staff will be required for 24/7 operation of NWFWC, the designate emergency personnel are deputed to carry out 24/7 functions.*
- To reduce the movement, the designated staff will stay, work in the control room for a period from 1 to 2 weeks before the next shift.*
- The Center to facilitate and provide loge, essential food items and cooking facilities for the people working the shift.*
- The Center to facilitate to process necessary Movement PASS for staff and vehicles from the concerned authority for mobility during the lockdown.*
- Center to facilitate pick and drop by approved movement of pool vehicle, during the lockdown.*
- Restrict public and unauthorized people to visit the WFCR, NWFWC with immediate effect;*
- Center to provide necessary consumable cleaning kits, soap and sanitizers to maintain cleanness and hygiene of NWFWC and washrooms;*
- Provide necessary gears such as masks, gloves based on the need as per the Ministry of Health recommendations.*

[Under the complete lockdown, a dedicated team authorized by Center operate the FMCR, NWFWC where they will be stationed in the NWFWC. The essentials food items with cooking facilities and accommodation shall be arranged and provided by the Center. MoEA Day Center (ground floor) of NWFWC building will be used as accommodation]

4.1.2 24/7 Operation of GLOF EWS Control Rooms in River basin

NCHM has installed and operating the Glacier Lake Outburst (GLOF) Early Warning Systems on Punatsangchhu, Mangdechhu and Chamkharchhu, where most of potentially dangerous lakes located in the head water. Each basin has a GLOF EWS Control Room equipped with ICT facilities to monitoring weather and flood in real time including the activation of sirens. GLOF EWS Control Room is located at Wangdue for Punatsangchhu basin, Trongsa (MHPA Dam colony) for Mangdechhu and Kurjey (Bumthang) for Chamkharchhu. It is monitored and operated 24/7 by regular staff on shift for delivery warning services during the GLOF events. The following staff are engaged for 24/7 operation of GLOF EWS Control Room.

Table 6: Staff of GLOF EWS Control Room at Wangdue

Sl. No.	Name	Phone No.	Mobile No	Email
	Control Room, Wangdi Office Number	02-481369/17126175		glofewsinfo@gmail.com
1	Mr. Purna Kumar Poudel	Technician (In-charge)	17669575	purnakumarpoudel@gmail.com
2	Mr. Sangay Tshering	Technician	17693263	stshering1979@gmail.com
3	Mr. Dawa Yangchen	Technician	17617030	yangchendawa2010@gmail.com
4	Mr. Sonam Tashi	Technician	17773801	Sonamtashi770@gmail.com
5	Mr. Tshering Choden	Technician	17994926	Chodentshering366@gmail.com
6	Mr. Pempa Dorji	Technician	17979381	semmukda23@gmail.com

Table 7: Staff list of GLOF EWS Control Room, MHPA Colony, Trongsa

Sl. No.	Name	Phone No.	Mobile No.	Email
	Control Room Office, Trongsa, Contact Number	03-521618/17128053		glofewstrongsa@gmail.com
1	Ms. Sangay Choden	Technician (In-charge)	17468703	Sangaychoden2nchm@gmail.com
2	Mr. Sangay Norbu	Technician	17633898	Sangaynorbu514@gmail.com
3	Mr, Kinzang Chopfel	Technician	17967249	kinchofel@gmail.com
4	Ms. Chimi Pema	Technician	17598682	Cpema1982@gmail.com

Table 8: Staff of GLOF EWS Control Room at Kurjey, Bumthang

Sl. No.	Name	Phone No.	Mobile No.	Email
	Control Room, Kurjey Contact Number	03-631963/17128054		glofewsbumthang@gmail.com
1	Mr. Dungchu Wangdi	Technician (In-charge)	17707103	Dungchuwangdi596@gmail.com
2	Mr. Ugyen Thinley	Technician	17731750	ugyenthinley.nchm@gmail.com
3	Mr. Ugyen Dorji	Technician	17597545	ud@education.gov.bt
4	Ms. Yangchen Lhamo	Technician	17572065	Yanglhamo2019@gmail.com
5	Mr. Tashi Tenzin	Technician	17733676	
6	Mr. Sonam Lhamo	Technician	17716229	Sonam.ljinp505@gmail.com

Strategy GLOF EWS Control Room:

- a. Physical presence of Technical Staff will be required for 24/7 monitoring and operation GLOF EWS Control during the emergency. Since most of the staff are staying in the staff quarters near the GLOF EWS Control Room, it is proposed to continue functioning as per the normal shift system with precautionary as advised by the Ministry of Health.
- b. Center restrict public and unauthorized people visiting the Control Rooms,
- c. Center to provide necessary consumable cleaning kits, soap and sanitizers to maintain cleanness and hygiene of Control Rooms and washrooms.
- d. Center to provide necessary gears such as masks, gloves based on the need as per the Ministry of Health recommendations.

4.1.3 Aviation Meteorological Services for Air Navigation

NCHM is the Aeronautical Meteorological Service Provider (AMSP) within Bhutan for effective delivery of meteorological services for Air Navigation. Aviation Meteorology Office (AMO) is located within the Air Traffic Services (ATS) building inside the Paro International Airport. Aviation Met Office is co-located with the Air Traffic Control room of all the three domestic airports. AMO is required to provide updated weather information to ATS Staff for communication with airline pilots before departure and on arrival of all the airports.

AMO at Paro international airport and Domestic airport are equipped with weather monitoring and communication systems. The physical presence of staff is required for monitoring, preparing the Meteorological Aerodrome Routine Reports to the Air Traffic Service based on the flight schedule. The following Staff of the Aviation Met Office will be required to present at their office in the airport on shift based on flight operation during the emergency.

Table 9: Aviation Meteorology Office Staff at Paro International Airport

Sl. No.	Name	Designation	Mobile No.	Email address
	Aviation Met Office Contact number, Paro Airport	02-323703 /335578/ 17576162		
1	Mr. Tshering Nima	Sr. Technician	17632535	tnima@nchm.gov.bt
2	Mr. Tashi Gyeltshen	Technician	17879652	tgyaltshen@nchm.gov.bt
3	Ms, Sonam Lhamo	Technician	17602863	sonamlhamo@nchm.gov.bt
4	Ms. Pem Dem	Technician	17522121	pdem@nchm.gov.bt
5	Ms. Puspa Katwal	Technician	17643110	pkatwal@nchm.gov.bt

Table 10: Aviation Meteorology Office Staff at Bumthang Domestic Airport

Sl. No.	Name	Designation	Mobile No.	Email address
1	Ms. Koksel Dema	Technician	17702497	kdema@nchm.gov.bt
2	Ms. Kuenzang Lhadom	Technician	17279628	klhadon@nchm.gov.bt

Table 11: Aviation Meteorology Office Staff at Gelephu Domestic Airport

Sl. No.	Name	Designation	Mobile No.	Email address
1	Ms. Manisha Tamang	Technician	17825767	mtamang@nchm.gov.bt
2	Mr. Namgay Wangchuk	Technician	17811347	nwangchuk@nchm.gov.bt

Table 12: Aviation Meteorology Office Staff at Yonphula Domestic Airport

Sl. No.	Name	Designation	Mobile No.	Email address
1	Ms. Tshering Choden	Technician	17882837	tchoden@nchm.gov.bt
2	Ms. Sonam Choden	Technician	17485664	schoden@nchm.gov.bt

Strategy for Aviation Met Office, Airports:

- a. Since the physical presence of above Technical Staff will be required at airport office based on the flight operation, it is proposed to designate them as emergency personnel category to provide mobility from their home to office as per shift system;*
- b. Aviation Met Office to liaise with DoAT and BCCA for movement during the lock down to airport;*
- c. Center restrict public and unauthorized people visiting the office,*
- d. Center to provide necessary consumable cleaning kits, soap and sanitizers to maintain cleanness and hygiene of Control Rooms and washrooms.*
- e. Center to provide necessary gears such as masks, gloves based on the need as per the Ministry of Health recommendations.*

4.1.4 Hydro-met Data Collection and Transmission (Site Office)

NCHM has more than 250 hydro-met stations (Manual + Automatic) covering the whole Bhutan. More than 100 regular staff (Technicians) are responsible for data collection and transmission to the National Weather and Flood Warning Center (NWFWC), HQ Thimphu for data archival as well as for weather and flood forecasting. During the summer the Hydrological and Flood Warning stations have to collect river level data on an hourly basis. The Flood Warning Station (33 sites) have to transmit data HQ and Indian States of Assam and West Bengal as per the data transmission schedule. Therefore, the physical presence of staff at the sites is necessary for data collection and transmission to maintain data continuity.

Strategy for Hydro-met Data Collection and Transmission (Site Offices)

- a. The physical presence of above technicians will be required at all the manual hydro-met stations for data collection and transmission even during the emergency for weather and flood warning services delivery and to maintain data continuity.*
- b. Since most hydro-met monitoring stations are located in the isolated remote areas and staff are staying in the government quarters near the stations it is proposed all the site staff to continue routine functions with precautionary measures as advised by the Ministry of Health.*
- c. The Center to facilitate and request COVID 19 Task force/Component Authorities/Dzongkhags for issuance of movement pass of staff and vehicles under lock down.*
- d. All the staff to follow the Ministry of Health COVID19 Guideline; COVID19 Central and local Task force protocol.*

4.1.5 Sediment Sample Collection and Analysis in Laboratory

Sediment samples are collected daily by the site staff from the Sediment sampling stations of Pachhu, Thimphu and Wangchu every after 20 days to Thimphu Sediment Lab for analysis. There are two lab assistants who carry out daily sediment sample analysis in the laboratory. As per the technical requirement the samples collected from the sites have to be complete lab analysis before 20 days. In order to maintain data continuity samples collection and lab analysis have to be continued. The physical presence of technical staff at the sediment lab is required for sample

analysis to maintain data integrity during the emergency as well as collocation of samples from the field.

Table 13: Sediment Lab Assistant, Thimphu

Sl. No.	Name	Designation	Mobile No.	Email address
1	Ms. Renuka Kumari Thapa	Lab Assistant	17668211	thaparenu973@gmail.com
2	Ms. Sonam Zangmo	Lab Assistant	17389193	szangmo@nchm.gov.bt

Strategy Sediment Lab operation, Thimphu

- a. The physical presence of Technicians will be required at Sediment lab for sample analysis to maintain data continuity.*
- b. The Center to facilitate and request necessary MOVEMNET PASS from the competent authorities from their home to Office to perform the work;*
- c. Center to facilitate and provide pick and drop facilities by approved pool vehicle, during the lockdown.*
- d. Center to provide necessary consumable cleaning kits, soap and sanitizers to maintain cleanness and hygiene of Control Rooms and washrooms.*

[Sediment lab may not be fully operational during the complete lock down, as the vehicle movement is restricted to different stations to collect the samples for analysis]

4.2 Delivery of Essential and Routine Services Home and/or Remote

4.2.1 Full Delivery of Services from Home/Remote working

Most of the Administration, Finance, Human Resources management support and planning services can be delivered from home or remote working such as:

- a. Human resource management and development services including HRC meeting and approvals EXCEPT trainings, recruitment and selection
- b. Administrative and financial matter
- c. Programs and Planning (APT Monitoring, input into the GPMS)

4.2.2 Partial Delivery of Services from Home/Remote Working

The following technical services and products can be delivered via partially from home and/or remote working:

- a. Seasonal forecast (Summer and Winter)
- b. Monthly climate summary
- c. Extended Range Prediction
- d. Annual climate summary
- e. Technical report on weather and climate
- f. Climate projection information and data based on request
- g. Flood Modelling and forecasting
- h. Data Processing and analysis (monthly flow and dissemination)
- i. Report writing
- j. Planning and implementation of GCF project activities

4.2.3 Partial Delivery of Services Visiting office

1. ICT Officer

Most of the data of Weather and Hydrology are transmitted automatically across the country. An ICT Officer is the member of two technical teams to provide onsite and the technical backstopping of the ICT system as per the needs and during the emergencies. Also facilitate online services delivery with updates of websites and other requirements.

Details of the NCHM services that can be provided through remote working is given in the Annexure-II.

Strategy Sediment Lab operation, Thimphu

- a. *Based on the urgency and needs of the hydro-met services delivery such as data/information and reports by the sectors, a relevant technical staff may visit the office to provide data and services with approval from the Competent authorities.*
- b. *In the event, when ICT Server or System error, ICT officer and related technical staff may visit the office to resolve the issues based on the approval by the Competent Authority.*
- c. *The Center to facilitate and provide pool vehicle as approved by the Competent authority to pick up and drop the staff*

4.3 Field Work and Travel

NCHM being the technical agency extensive travel by technical staff are required throughout the country for the following:

- a. For running and maintenance of national hydro-met network and flood/GLOF EWS system
- b. Time series monitoring of glacier and glacier lakes in the head waters of different river basins including glacier mass balance research work on the bench marked glaciers based on season (A copy of strategy for Cryosphere Services Division attached as Annexure-IV)
- c. Implementation of projects and other planned activities like construction of site office, laboratories, installation of hydro-met stations.

Considering the seasonal nature of work and to avoid missing data for 2020, support from relevant central and local governments would be necessary to implement the field works.

Strategy for field work and Travel

- a. *Relevant Divisions to make plan including the number of staff who will be travelling for the field work in consultation with concerned local government;*
- b. *The Center to request approval from the competent authorities for movement of staff and vehicles;*
- c. *The Center to facilitate issues with relevant competent authorities.*

4.4 Services that can be deferred

Most of planned activities for the FY 2020-2020 are in the planning stage for implementation like construction and procurement of plants and equipment. However, if the lockdown continued, some of the capital works might have to be cancelled or spill over to the next fiscal year 2021-2020.

The following planned activities and services can be deferred:

- a. HRM activities like Recruitment and selection
- b. HRD activities like Ex-country and in-country travels (training/meetings/seminars, etc..)
- c. Consultation workshops/meetings for data collection and awareness on weather and climate services under the GCF project

5 Distribution of Staff by Working mode

The list of employees by category type based on working mode is given in the table.

Table 14: List of Staff by Working Mode

Staff Category	Directorate/ Secretariat	CSD	WCSD	HWRSD	HOID	Total
a. Physical Present in the office	1		16	5	22	46
b. Partially Working remotely	1	2	5	5	100	112
c. Fully Working remotely	11	4	9	2		25
d. Staying at home (Pregnant, sick etc.)			2	0		2
Total	13	6	32	12	122	183

6 Annexure

The following are annexures prepared as per the RCSC guidelines and submitted to RCSC.

- 6.1 Annexure I: NCHM Critical Services that requires physical presence
- 6.2 Annexure II: NCHM services that can be provided through remote working
- 6.3 Annexure III: NCHM Services that can be deferred
- 6.4 Annexure IV: Strategy for Cryosphere Services Division

Annexure –I: NCHM Critical Services that requires physical presence

Division/Section	Services	Nos. of Staff Involved	Remarks
Weather and Climate Services	a. 8 hourly weather updates b. Daily weather forecasts c. Daily weather analysis report d. Special Weather Forecast based on request from users	7	The National Weather and Flood Warning Center (NFWFC), Thimphu is operational 24/7 to prepare weather products and services which are disseminated to stakeholders, TV, Radio, print media, NCHM website and social media. Therefore, physical presence is required to monitor and analyse the weather systems and produce the weather products and services.
	Extreme Weather Advisories	2	Physical presence is required at NFWFC to monitor and analyse the weather systems to prepare and issue weather extreme weather advisories during extreme weather events.
	Climate information services	2	Physical presence is required to operate Climate Database Management System for data processing and dissemination of climatological data to users.
Aviation meteorological services	Meteorological Aerodrome Reports (METAR/SPECI) - Weather briefing and consultation	11	The physical presence of an observer is required for monitoring, preparing and disseminating Meteorological Aerodrome Reports (METAR/SPECI). Prepare and disseminate Weather briefing and consultation with the flight dispatch office.
Hydrology and Water Resource Services	Flood Monitoring and Command Room, NFWFC, Thimphu	5	The physical presence of staff is required on the shift for 24/7 monitoring and operation of FMCR, NFWFC, Thimphu. Overall monitoring of the EWS for Punatsangchu, Mangdechu and Chamkharchu basin
	GLOF EWS advisories and warning	2	In the case of GLOF event, NCHM follows the SOP for monitoring and dissemination of information. As per the SOP the relevant officers has to be present in the Office for further discussion and information dissemination
Secretariat Services	Internet connection	1	Internet connection and keeping systems up and running is critical for all NCHM employees to provide individual Division's services.
	System and Application Monitoring	1	
	Sweeper	1	In order to keep the NFWFC clean, sweeper must visit once a week to clean and dump waste.
Hydromet Operation and Infrastructure Division	Real time Data Receive and monitor and communicating with important stations	2	
	FWS Wireless Operator for real time data receiving and passing on to Indian counterparts	2	
	Control Room at Wangdue, Mangdechu, Chamkhar Chu to remain operational	9 (3 from each CR)	GLOF/rainstorm flood EWS are installed in three river basins; Punatsangchu, Mangdechu and Chamkharchu. The physical presence of staff on shifts are required for 24/7 monitoring and operation of the GLOF EWS Control Rooms
	FWS sites Kurichu, Dorokha, Chazam, Pangzam, Shershong and Pangbang to remain Operational	12 (2 from each sites)	24 hours monitoring is required for data transmission to India (Assam and West Bengal) and HQ as per the routine scheduled
	Lunana and Thanza Flood Warning Office to remain operational	4 (2 from each place)	Physical monitoring of lakes and GLOF EWS backup

	Dodeyna Flood Warning Station on Wangchhu to remain operational	1	Physical monitoring and data transmission of flood to Lingkana Palace
	Sediment Sample Collection and Analysis in Laboratory	2	Sediment samples are collected daily by the site staff from the Sediment sampling stations of Pachhu, Thimphu and Wangchu every after 20 days to Thimphu Sediment Lab for analysis. There are two lab assistants who carry out daily sediment sample analysis in the laboratory.

Annexure – II: NCHM services that can be provided through remote working

Division/Section	Services	Nos. of Staff	Remarks
Weather and Climate Services (WCSD)	Seasonal forecast (Summer and Winter)	1	NCHM annually prepares and disseminates seasonal forecasts for summer monsoon outlook (June, July, August, September) and winter monsoon outlook (December, January, February). This can be performed remotely from the office by telecommunicating with colleagues to produce the output.
	Monthly climate summary	1	NCHM prepares and disseminates climate summary monthly. This can be performed remotely from the office by telecommunicating with colleagues to produce the output.
	Extended Range Prediction	1	NCHM prepares and disseminates extended range prediction every week. This can be performed remotely from the office by telecommunicating with colleagues to produce the output.
	Annual climate summary	4	NCHM prepares and disseminates climate summary annually. This can be performed remotely from the office by telecommunicating with colleagues to produce the output.
	Various reports on weather and climate	18	Reports can be prepared remotely from office and disseminated through internet
	Climate Projection information based on request	1	NCHM prepares and shares climate projection information. This can be performed remotely from the office by telecommunicating with colleagues to produce the output.
	GCF project management for NCHM	2	NCHM is one of the leading technical agencies for the implementation of GCF project for the agriculture sector in Bhutan. NCHM has to develop climate and weather services for agriculture through the support of the project. Meetings and other reporting can be done remotely.
Hydrology and Water Resource Services	Flood Forecasting and warning	2	The model products for flood forecasting is available via the internet, flood forecasting can be prepared from remote. In case of extreme flood forecast, officials have to be present in the FMCR, NWFWC for issuance of forecast warnings.
	Monthly flow monitoring and dissemination	2	The monthly flow monitoring can be prepared and updated on the website via the internet.

	Dissemination of historical data based on the users request	2	Since most of the request for data are made via email, the data dissemination can be done via email as per the user request
HRS, Secretariat	All human resource management and development services including HRC meeting and approvals EXCEPT trainings, recruitment and selection	3	Any HR approvals can be sought through online from the HRC members. HR issues/matters/proposals can be discussed and deliberate vide email, by using G suites and sharing scanned copies. HR online system (CSIS) is accessible from anywhere. Any office orders can be printed, signed and scanned from home
Administration and Finance Section, Secretariat	All financial matter	2	Services can be provided online (e-pems & myrb) with internet connection and scanned papers
	Administrative Services	1	Any urgent management issues can be discussed online; email, official WeChat group, and WhatsApp group.
	Programs and Planning (APT Monitoring, input into the GPMS)	1	

Annexure- III: NCHM Services that can be deferred

Division/Section	Service	No Staff	Remarks
HRS, Secretariat	Recruitment and selection	3	Any recruitment and selection can be withheld for time being. Heads involved can be applicants, panel members in addition to HR staffs
	Ex-country and in-country travels (trainings/meetings/seminars, etc..)	3	As advised by the Government, any training, meetings, seminars and workshops (Ex/In-country) can be withheld for time being on priority basis. The party involved will be all the employees under NCHM who would be attending the trainings/seminars/workshops and the organizers

Annexure- IV: Strategy on the implementation of field activities of Cryosphere Service Division for the Fiscal Year 2020-21

Background

Cryosphere service Division has proposed for 5 field activities in the FY 2020-21. However, due to budgetary constraints after receiving the approved budget from the government, the divisions has reprioritized the activities into 4 field activities under 2 field programs as follows:

Field Program 1: Monitoring of annual glacier mass balance on bench marked glacier (Thana)

Thana glacier located in the headwaters of Chamkhar Chu is identified as one of the bench mark glaciers in Bhutan for long term monitoring. It is being monitored for a mass balance record for which the data were collected on an annual basis. The following are the plan activities to be carried out on this glacier on an annual basis.

- a. Geodetic survey using GNSS to estimate the geodetic mass balance on the glacier
- b. UAS survey using drone to compliment on the result from geodetic survey using GNSS.
- c. Replacement of bamboo stakes on the glacier
- d. Reading and recording stake measurement for calculation of mass balance using glaciological method,
- e. Ice radar survey for measurement of ice thickness;

Field Program 2: Monitoring of annual glacier mass balance at Ganjula, Lunana and Zanam

3 field activities (monitoring of annual glacier mass balance on bench marked Gangju la glacier, Time series monitoring of glacial lakes for GLOF risk in Lunana and time series monitoring of glacial lake for GLOF hazard in Zanam) for this FY are clubbed under this program after reprioritization of activities due to budgetary constraint. The following activities are proposed to be carried out in the field under this field program.

- a. Geodetic survey using GNSS on Gangju la glacier;
- b. GNSS survey for terminus status on Gangju la glacier;
- c. Data recovery and stake measurement for glaciological method of mass balance;
- d. Stability study on the slopes surrounding glacial lakes in Lunana including changes taking place on the outlet of the lakes.
- e. Bathymetry survey on the lakes in Lunana and Zanam to assess the probable GLOF volume.

Options and alternatives to conduct the field activities.

Both these field programs were planned to be implemented in the first week of September 2020. Requests for arrangement of transportation to these high-altitude areas were also made to dzongkhag administration, Bumthang and dzongkhag administration, Gasa respectively. However, due to the sudden lockdown of the country, the programs planned earlier could not be implemented as per schedule. As these field programs are felt to be very important from data continuity perspective which is the core mandate of National Center for Hydrology and Meteorology, the division would like to propose for alternatives and options to carry out the field activities based on the covid-19 situation in the country within this fiscal year 2020-2021.

Rescheduled field programs are shown in the following table based on the COVID19 situation in the country.

Sl.No	Option/ Alternatives	Field Programs	Re-schedule proposed date of implementation and duration	Intervention required if nationwide lockdown continues except for Green 2.0
1	Option 1	Both field programs will be carried out with all activities as plan in the initial work plan	Starting Mid-September 2020 Field duration: 30 days for program 1 45 days for program 2	<ul style="list-style-type: none"> a. Required approval from national COVID19 task force; b. Facilitation of logistic arrangement with the concern Dzonkhags (Bumthang & Gasa); c. Facilitation in getting necessary permits from RBA to pass through the army post.
2	Option 2	Both field programs to be implemented. However, works on Ganjula glacier will only be carried out under field program 2. Works on glacial lakes in Lunana and Zanam will not be possible because of the extreme cold season by then.	Starting early October 2020 Field duration: 30 days for program 1 30 days for program 2	<ul style="list-style-type: none"> a. Required approval from national COVID19 task force; b. Facilitation of logistic arrangement with the concern Dzonkhags (Bumthang & Gasa); c. Facilitation in getting necessary permits from RBA to pass through the army post.

3	Option 3	Both field programs to be implemented. However, works on Ganjula glacier will only be carried out under field program 2. Works on glacial lakes in Lunana and Zanam will not be possible because of inaccessibility to the sites over high mountain passes.	March – April 2021 Field duration: 30 days for program 1 30 days for program 2	<ul style="list-style-type: none"> a. Required approval from national COVID19 task force; b. Facilitation of logistic arrangement with the concern Dzonkhags (Bumthang & Gasa); c. Facilitation in getting necessary permits from RBA to pass through the army post.
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Note: ** interventions refers to any higher/ concern authorities who can facilitate the necessary arrangements indicated in the table.

The whole plan is to carry out the field program based on above options and alternatives. If option 1 fails due to a limited time frame or any other reason option 2 will be taken up. If both option 1 and 2 fails due to various reasons then the option 3 will be taken up.

Number of people involved in each field program.

Sl.No	Field Program	From NCHM	Total No. of people involved in each field program
1	Monitoring of annual glacier mass balance on bench marked glacier (Thana), Chamcharchhu	<ul style="list-style-type: none"> a. Mr. Tshering Tashi, HydroMet Officer; b. Mr. Wangchuk Namgay, Geologist; c. Mr. Tseten Namgay, Technician 	10 in total including helpers and horsemen from the concerned dzongkhags.
2	Monitoring of annual glacier mass balance at Ganjula, Lunana and Zanam	<ul style="list-style-type: none"> a. Mr, Phuntsho Tshering, Exe. Geologist; b. Mr. Tshering Duba, HydroMet Officer 	10 in total including helpers and horsemen from concerned dzongkhags.