



**STANDARD OPERATING PROCEDURE (SOP)
ON
WEATHER FORECASTING
AND
DISSEMINATION OF FORECAST
PRODUCTS AND SERVICES
Version 2.0**

**Weather and Climate Services Division
National Center for Hydrology and Meteorology
March 2020**

**STANDARD OPERATING PROCEDURE (SOP)
ON
WEATHER FORECASTING
AND
DISSEMINATION OF FORECAST
PRODUCTS AND SERVICES
Version 2.0**



**Weather and Climate Services Division
National Center for Hydrology and Meteorology
March 2020**

Table of Contents

Table of Figures	iii
Table of Tables	iv
List of Abbreviations	v
1. Introduction	1
2. Scope of the Standard Operating Procedure (SOP)	1
3. Weather Forecasting	1
3.1. Background	1
3.2. Weather Observation and Analysis	2
3.2.1. Climatological data	2
3.2.2. Near real time observation	2
3.2.2.1. Automatic Weather Stations (AWS)	2
3.2.2.2. Agrometeorological stations (Class A)	2
3.2.3. Global Telecommunication System (GTS)	3
3.2.4. Himawari Satellite System	4
3.2.5. Websites	4
3.3. Weather Forecast	5
3.3.1. Weather Research and Forecasting Model (WRF)	5
3.3.2. Websites	6
4. Weather Forecast Formats and Dissemination	6
4.1. Daily 24 hrs. Weather Forecast	7
4.2. Daily Weather Analysis and Report, and Weather Update	8
Figure 4.6: Format for daily weather update	10
Table 4.3: Email addresses for daily weather analysis and report, and weather update dissemination	11
4.3. 72 hrs. weather forecast	11
4.4. Weather Advisories	11
4.4.1. Operation	11
4.5. Weather Information upload on NCHM website and Facebook page	14
4.5.1. Weather Information upload on NCHM website	15
4.5.1.1. Daily weather updates	15

4.5.1.2. Weather Advisories	16
4.5.1.3. Weather Remarks	17
4.5.1.4. Weather Alert Messages	18
4.5.2. Weather Information upload on NCHM Facebook page	19
4.5.2.1. Weather Advisories	19
4.5.2.2. Weather Remarks	20
4.6. Weather Forecast to World Meteorological Organization	21
4.6.1. Weather forecast upload to WWIS from GTS	21
4.6.2. Weather forecast upload to WWIS from email	22
4.7. Weather Forecast on Request	23
4.7.1. Format	23
4.7.2. Operation	24
5. Weather Briefing	25
5.1. Format	26
5.2. Operation	26
6. Weather Forecasting Center Room Shift Schedule	27
6.1. Shift Schedule for Weather Forecasting	28
6.1.1 Time for Shift Duty	28
6.1.2 Shift Schedule Management	28
6.2. Shift Schedule for Weather Briefing	29
7. Weather Forecasting Center Room Official WeChat Groups	30
7.1. Weather Forecasting official WeChat group	30
7.2. Weather Info Center official WeChat group	30
Annexure 1: WWIS Weather Icon Table	31

Table of Figures

Figure 3.1: Near real time Class A Google spreadsheet	3
Figure 3.2: GTS; temperature chart (left), GLOF EWS display (right)	4
Figure 3.3: Himawari satellite images; visible channel (left), infrared channel (right)	4
Figure 3.4: WRF; inner domain (left), outer domain (right)	6
Figure 4.1: Signature of official group email address wfcra@nchm.gov.bt	7
Figure 4.2: Format for weather forecast dissemination email subject	7
Figure 4.3: Format for weather forecast dissemination email content	7
Figure 4.4: Format for daily 24 hrs. weather forecast	8
Figure 4.5: Format for daily weather analysis and report	9
Figure 4.6: Format for daily weather update	10
Figure 4.7: Format for weather advisories	12
Figure 4.8: NCHM website (left) and Facebook page (right)	15
Figure 4.9: Daily 24 hrs. weather forecast, weather analysis and report, and weather update on the NCHM website	16
Figure 4.10: Format for weather advisories upload on NCHM website sentence	16
Figure 4.11: Weather advisories upload on NCHM website	17
Figure 4.12: Format for weather remarks upload on NCHM website	18
Figure 4.13: Weather remarks upload on NCHM website	18
Figure 4.14: Format for weather alert messages upload on NCHM website	19
Figure 4.15: Weather alert messages upload on NCHM website	19
Figure 4.16: Format for weather advisories upload on NCHM Facebook page	19
Figure 4.17: Weather advisories upload on NCHM Facebook page	20
Figure 4.18: Weather remarks upload on NCHM Facebook page	20
Figure 4.19: Format for GTS header for WWIS	21
Figure 4.20: Format for weather forecast upload to WWIS from GTS	22
Figure 4.21: Format for weather forecast upload to WWIS from email	23
Figure 4.22: Weather forecast upload to WWIS	23
Figure 4.23: Format for weather forecast on request	24
Figure 4.24: Format for details recordings of weather forecast on request	24
Figure 4.25: Weather forecast on request details sharing within WFCR Email	25
Figure 5.1: Weather briefing format	26
Figure 5.2: Format for weather briefing email content	27

Table of Tables

Table 4.1: Email addressed for daily 24 hrs. weather update dissemination	8
Table 4.2: Time of issue for daily weather update dissemination	9
Table 4.3: Email addresses for daily weather analysis and report, and weather update dissemination	11
Table 4.4: Email addresses for weather advisories dissemination	14
Table 4.5: Time of issue for daily 24 hrs. weather forecast, weather analysis and report, and weather update on the NCHM website	16
Table 4.6: Time of issue for 72 hrs. weather forecast update to the WWIS	21
Table 4.7: WWIS email subject, to and from address	22
Table 4.8: Weather forecast on Request dissemination email addresses	25
Table 5.1: Weather briefing dissemination email addresses	27
Table 6.1: Time of shift duty for weather forecasters	28
Table 6.2: Shift schedule for weather forecasting	28
Table 6.3: Shift schedule for weather briefing	29

List of Abbreviations

AWLS	Automatic Water Level Stations
AWS	Automatic Weather Stations
BBS	Bhutan Broadcasting Services
BST	Bhutan Standard Time
EWS	Early Warning System
FMCR	Flood Monitoring and Command Room
GLOF	Glacier Lake Outburst Flood
GTS	Global Telecommunication System
HOID	Hydromet Operations and Infrastructure Division
ICT	Information and Communication Technologies
IMS	Integrated Management System
NAS	Network-Attached Storage
NCHM	National Center for Hydrology and Meteorology
NWFWC	National Weather and Flood Warning Center
SOP	Standard Operating Procedure
WCSD	Weather and Climate Services Division
WFCR	Weather Forecasting Center Room
WFS	Weather Forecasting Section
WMO	World Meteorological Organization
WRF	Weather Research and Forecasting
WWIS	World Meteorological Organization Weather Information System

1. Introduction

The National Center for Hydrology and Meteorology (NCHM) is an autonomous scientific and technical organization of the Royal Government of Bhutan responsible for understanding the behaviors of the atmosphere, its interaction with cryosphere and water bodies, the weather and climate, and distribution of the country's water resources. It is the nodal agency responsible for generation of information and delivery of products and services on weather, climate, cryosphere and water resources in Bhutan.

The Weather and Climate Services Division (WCSD) under the Center is mandated to study and provide public weather services, severe weather warnings, meteorological data management, aviation, agro-met and climate change information and services. The Weather Forecasting Section (WFS) is responsible for preparing and providing weather forecast information.

In 2015, the National Weather and Flood Warning Center (NFWFC) was inaugurated to accommodate the various systems and servers of the Center for weather forecasting under Weather Forecasting Center Room (WFCR) and flood forecasting under Flood Warning and Command Room (FMCR).

2. Scope of the Standard Operating Procedure (SOP)

With advancements in weather and climate knowledge and information there is an increasing demand of these services. Therefore, in order to provide accurate, reliable, timely and consistent weather information there is a need for an SOP.

This SOP deals with the following operations at the WFCR;

- A. Weather forecasting
- B. Dissemination of weather forecast information
- C. Weather briefing
- D. Weather Forecasting Center Room Shift schedules
- E. Weather Forecasting Center Room Official WeChat groups

3. Weather Forecasting

3.1. Background

The weather forecasting services in Bhutan started in 2007. Currently the Center has the capacity for 3 days' short range weather forecast which comprises an outlook with maximum and minimum temperature. The Center monitors and analyzes the weather 24x7 hrs. It provides daily 24 hrs. weather forecasts and updates to the nation and forecasts on requests from government agencies, corporate organizations, private sectors and the general public.

The Center prepares and issues advisories during extreme weather events to the nation. The forecast information is shared to the users through various means through emails, mobile and satellite messages, media such as Bhutan Broadcasting Services (BBS), Kuensel, etc., NCHM website and social media, etc.

3.2. Weather Observation and Analysis

Understanding the past and the initial conditions are crucial to analyze the weather. Therefore, the Center observes these conditions of the atmosphere through various services. For preparing weather forecast, the forecasters on duty shall check the following observations;

3.2.1. Climatological data

The climatological information will provide a guidance of the climatic conditions in spatial and temporal resolutions. The forecasters on duty shall input the following climatological data from the following stations.

Climatological data;

- Maximum and minimum temperature in °C
- 24 hour accumulated rainfall in mm

3.2.2. Near real time observation

The Center operates Automatic Weather Stations in addition to the 20 Agrometeorological stations.

3.2.2.1. Automatic Weather Stations (AWS)

NCHM receives near real time data from AWS which are spread over the country. WFCR accesses these data from various platforms.

The forecasters on duty shall input the observation analysis from the following platforms;

- a. Data Management System
- b. NAS Storage Server
- c. IMS Server
- d. Bhutan GLOF Control Center

3.2.2.2. Agrometeorological stations (Class A)

WFCR receives near real time data from the Class A stations which are located at the 20 dzongkhags manned by the Hydromet observers of Hydromet Operations and Infrastructure Division (HOID). The observers transmit data to the WFCR twice a day at 9:00 am and 3:00 pm BST through telephone and the official WeChat group. The forecasters on duty receive the data and inputs in the google spreadsheet *Class A_Near_Instant Data Input* which shall be shared with the Chief of WCSD and among the members of WFS, FMCR and 1 staff of Research and Analysis Services Section under WCSD. WFCR receives the following data from Class A stations;

- a. Maximum and minimum temperature in °C
- b. 24 hour accumulated rainfall in mm
- c. Present cloud oktas

Date	Thimphu				Pano				Nasa				
	0900_Near Real Time		1500_Instat Time		0900_Near Real Time		1500_Instat Time		0900_Near Real Time		1500_Instat Time		
	Max	Min	Rain	Time	Max	www	Time	Max	Min	Rain	Time	Max	www
1-Aug-18	25.0	15.0	10.1		29.0	667		22.0	14.0	3.0		20.0	688
2-Aug-18	25.0	14.0	4.4		29.0	777		24.0	13.5	6.0		22.0	680
3-Aug-18	26.5	14.5	0.0		26.5	745		24.0	14.0	0.0		24.0	560
4-Aug-18	25.0	15.5	2.7		29.0	790		25.0	13.5	16.6		26.5	480
5-Aug-18	20.0	16.0	4.2		29.0	670		21.5	14.5	0.0		24.5	457
6-Aug-18	26.5	14.5	9.2		29.0	670		25.0	14.5	4.4		24.0	685
7-Aug-18	28.5	13.0	0.0		29.0	453		27.5	14.0	1.0		26.5	544
8-Aug-18	27.5	13.0	2.2		27.0	367		27.0	13.5	0.2		26.0	555
9-Aug-18	29.5	16.0	0.0		29.5	344		27.0	14.0	0.0		26.0	455
10-Aug-18	30.0	16.0	0.2		30.0	756		24.5	14.0	0.2		23.0	686
11-Aug-18	29.0	16.0	0.0		29.0	676		24.5	14.0	0.0		24.5	455
12-Aug-18	26.0	15.5	0.3		27.5	790		24.0	14.0	3.0		25.0	655
13-Aug-18	30.0	16.0	0.1		30.0	756		22.0	14.5	1.2		22.0	686
14-Aug-18	29.0	17.0	44.0		29.0	677		24.5	14.0	5.2		24.0	686
15-Aug-18	26.5	15.0	3.2		29.0	334		27.0	14.0	4.6		27.0	444
16-Aug-18	30.5	14.0	0.0		30.5	322		25.0	14.0	0.0		26.5	544
17-Aug-18	31.0	16.0	5.2		31.0	536		27.0	15.0	2.4		27.5	335
18-Aug-18	31.5	16.5	0.8		31.5	433		28.0	0.0	0		27.0	326
19-Aug-18	30.0	17.0	1.0		30.0	456		28.0	13.5	0.0		26.0	556
20-Aug-18	29.0	14.0	1.2		29.0	650		25.0	14.0	0.0		26.0	580
21-Aug-18	20.5	14.5	0.0		29.0	347		26.0	14.5	0.0		26.0	480
22-Aug-18	30.5	16.0	0.0		30.5	596		25.0	14.0	0.4		24.0	605
23-Aug-18	29.5	15.0	5.2		29.5	757		26.0	14.0	1.0		24.5	680
24-Aug-18	30.0	16.0	21.2		30.5	798		25.0	14.0	1.6		25.0	556
25-Aug-18	27.0	14.0	2.7		27.0	787		23.0	14.0	0.0		23.0	655
26-Aug-18	28.0	15.0	1.6		27.5	788		24.0	14.0	4.6		23.0	687
27-Aug-18	29.0	16.0	1.2		29.0	657		24.5	14.5	0.2		25.0	555
28-Aug-18	26.0	16.5	0.0		26.0	877		21.5	14.5	4.4		22.0	766

Figure 3.1: Near real time Class A Google spreadsheet

The forecasters on duty shall input the analysis from near real time observation from the Class A stations.

3.2.3. Global Telecommunication System (GTS)

WFCR operates the GTS which is a coordinated global system of telecommunication facilities and arrangements for the rapid collection, exchange and distribution of observations and processed information within the framework of the World Weather Watch. The GTS is designed as an integrated network for the collection, exchange and distribution of Meteorological information on a world-wide basis in timely, reliably and ensuring compatibility based on the WMO standard formats and protocols.

The Center receives global Hydromet data and operates 4 Automatic Water Level Stations (AWLS): Jongthang, Bjizam, Kurjey, Kagthang, and 1 AWS: Tsampa with the GTS under the Glacier Lake Outburst Flood Early Warning System (GLOF EWS) in Chamkharchu and Mangduechu basins. WFCR transmits 1 station data: Tsampa AWS, to the GTS twice a day at 6:00 pm BST and 6:00 am BST.

The forecasters on duty shall input the observation analysis from the following;

- a. Global and regional Hydromet data
- b. Chamkharchu and Mangduechu GLOF EWS



Figure 3.2: GTS; temperature chart (left), GLOF EWS display (right)

3.2.4. Himawari Satellite System

WFCR operates the Himawari-8 which is a Geostationary Meteorological Satellite which carries an imaging sensor and captures earth images from space over the Western Pacific region day and night continually.

The forecasters on duty shall input the analysis from Himawari Satellite System.

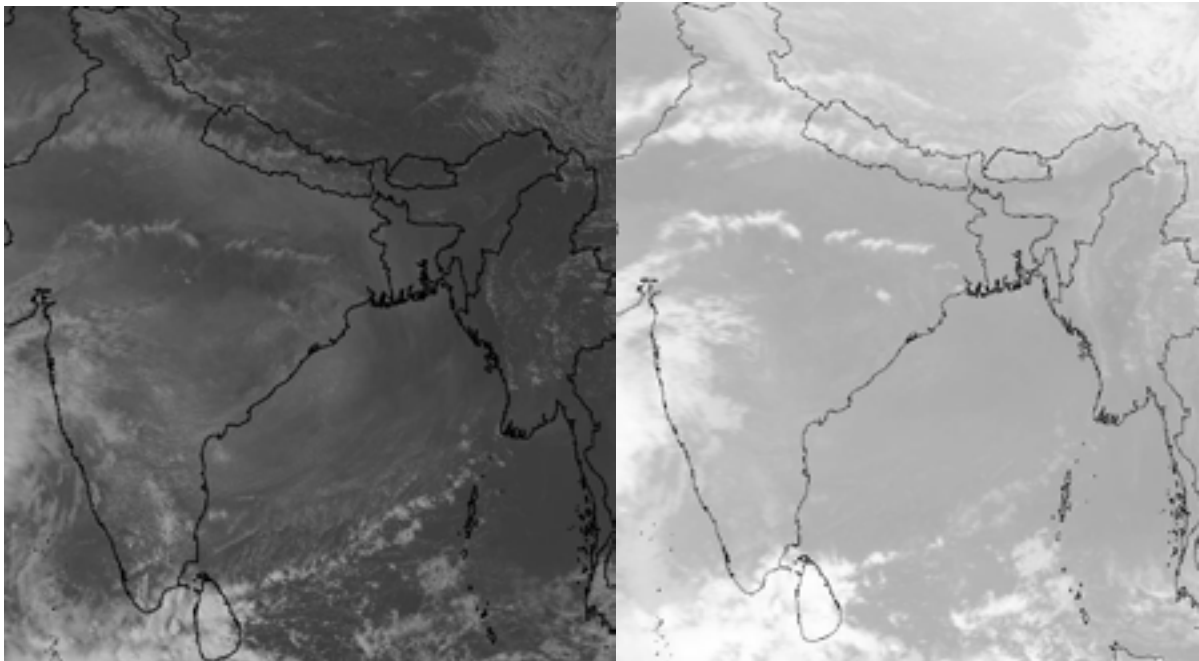


Figure 3.3: Himawari satellite images; visible channel (left), infrared channel (right)

3.2.5. Websites

The Center makes analysis from a number of open and access allowed hydrometeorological websites.

The forecasters on duty shall input the information from the following websites;

1. India Meteorological Department; www.imd.gov.in
2. Indian Monsoon data Regional output; www.monsoondata.org
3. National Center for Medium Range Weather Forecasting; www.ncmrwf.gov.in
4. Severe Weather Forecast Project; <http://nwp.imd.gov.in/mme/fdp-bob/login.php>
5. Thai Meteorological Department; www.tmd.go.th
6. Japan Meteorological Agency; www.jma.go.jp
7. Korea Meteorological Administration; www.kma.go.kr
8. China Meteorological Administration; rsapp.nsmc.org.cn/geofy/en/
9. European Center for Medium Range Weather Forecast; www.ecmwf.int/en/forecasts/charts
10. MetGIS; www.metgis.com
11. Meteoblue; www.meteoblue.com
12. Windy.com; www.windy.com
13. South Asian Flash Flood Guidance: https://103.215.208.77/SASIAFFG_CONSOLE/index.php?region=0

3.3. Weather Forecast

With the information on the past and current conditions, it provides the basis to weather forecasting. The forecast is prepared through the analysis of a number of platforms.

3.3.1. Weather Research and Forecasting Model (WRF)

WRF is a Local Area Model which is used for downscaling of the weather forecast information to a finer grid using the boundary condition from the Global Model with coarser grid information. The Model at the Center is set up in two domains: inner (3 km resolution) and outer (15 km resolution) domain.

The forecasters on duty shall input the analysis from WRF.

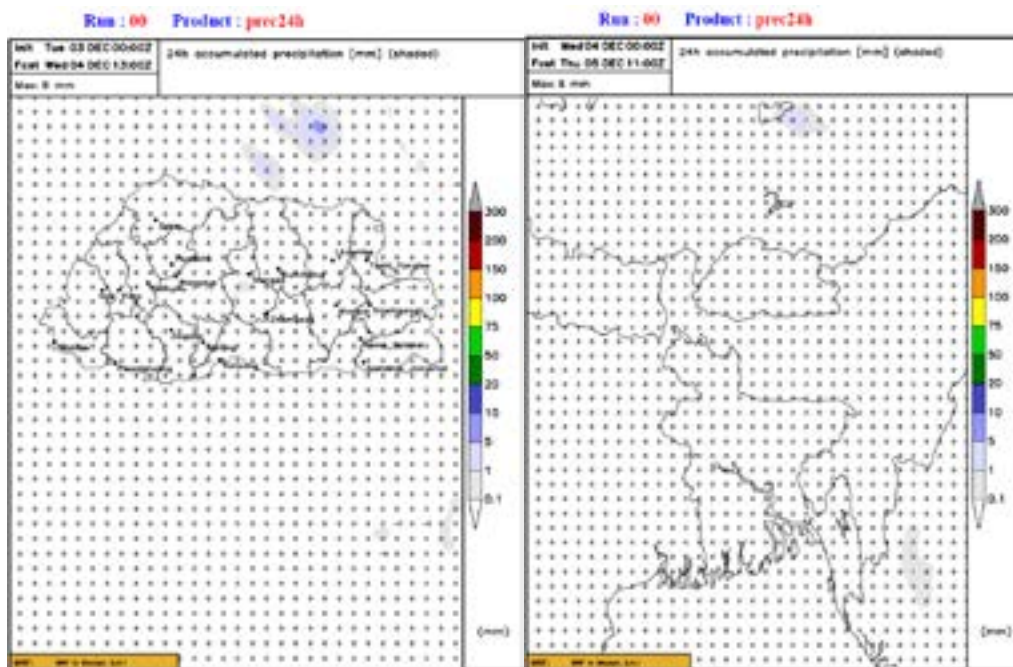


Figure 3.4: WRF; inner domain (left), outer domain (right)

3.3.2. Websites

The websites mentioned in 3.2.5. *Websites* provide information also on forecast.

The forecasters on duty shall input the information from all the above mentioned websites.

4. Weather Forecast Formats and Dissemination

WFCR provides daily 24 hrs. weather forecasts and updates to the nation and forecasts on request from the government agencies, corporate organizations, private sectors and the general public. The Center prepares and issues advisories during extreme weather events to the nation.

All weather forecasts shall be prepared in the shared formatted google spreadsheet and docs. The forecast reports shall be downloaded as a PDF file and archived in respective folders in SmartMet1 and SmartMet2 workstations. Weather forecast reports shall be disseminated only as a PDF file. The PDF file shall be named as YYYYMMDD_Agency name (*ex: 20191209_Druk Green Power Corporation Ltd*).

All the forecast dissemination shall be sent from the official group email address of WFCR, wfcr@nchm.gov.bt. The official group email address shall be linked to all the staff of WFS and the Chief of WCSD. All the members of wfcr@nchm.gov.bt shall have the same signature as follows;

Weather Forecasting Center Room
National Center for Hydrology and Meteorology
Email: wfcr@nchm.gov.bt
Telephone: 02 335578, 02 339673, 77452632



This email and any files transmitted with it are confidential and intended solely for the use of the individual or entity to whom they are addressed. If you have received this email in error please notify the administrator. Please note that any views or opinions presented in this email are solely those of the author and do not necessarily represent those of the organization he/she works for. Finally, the recipient should check this email and any attachments for the presence of viruses. The company accepts no liability for any damage caused by any virus transmitted by this email

Figure 4.1: Signature of official group email address wfcrc@nchm.gov.bt

All forecast dissemination shall be sent with the following email subject format;

(issued date subject: Weather Forecast, Weather Advisory): DD MM YYYY_Weather Forecast (ex: 12 December 2019_Weather Forecast)

Figure 4.2: Format for weather forecast dissemination email subject

All forecast dissemination shall be sent with the following email content format;

Dear Sirs/Madams,

Please find attached the *(subject: daily 24 hr weather forecast, weather analysis and report, weather update, 3 days weather forecast, weather advisory on rainfall/snowfall)* issued today on DD MM YYYY *(ex: 12 December 2019)*.

Thank you
Weather Forecasting Center Room

Figure 4.3: Format for weather forecast dissemination email content

4.1. Daily 24 hrs. Weather Forecast

WFCR provides daily 24 hrs. weather forecast to the nation through the national television BBS. The forecasters on duty shall prepare the daily 24 hrs. weather forecast and issue at 4:00 pm BST.

The daily 24 hrs. weather forecast shall be provided in the following format unless otherwise instructed by the Director of NCHM or Chief of WCSD. The google spreadsheet *1. Format_Daily 24 hrs. Weather Forecast* shall be shared among the members of WFS. Any changes shall be informed to all the members.

WEATHER FORECAST FOR 06/12/2019			
Forecasting point	Temperature (C) (24 hours)		Cloud
	Max	Min	
Thimphu	18	-1	Partly cloudy
Paro	15	0.5	Partly cloudy
Itan	11	-5	Partly cloudy
Gasa	9	-2	Partly cloudy
Bharkhang Chankhar	13	1	Partly cloudy
Yongye	15	2	Partly cloudy
Selwang Dhangra	16	6	Partly cloudy
Wangdue	21	10	Partly cloudy
Punakha	24	11	Partly cloudy
Digana	18	9	Partly cloudy
Zhonggang	15	5	Partly cloudy
4 Sakti	18	7	Partly cloudy
Trokhigang/Kanglung	18	5	Partly cloudy
Idang	18	4	Partly cloudy
Troche Yangpa	18	1	Partly cloudy
Lhasa	21	8	Partly cloudy
Blor - Yarpang	24	17	Partly cloudy
Bharkhang Chankhar	22	12	Partly cloudy
Saastel/Saastel	23	15	Partly cloudy

Figure 4.4: Format for daily 24 hrs. weather forecast

The forecast shall be disseminated to the following email addresses unless otherwise instructed by the Director of NCHM or Chief of WCSD. The Google spreadsheet *Forecast_dissemination_email_addresses* shall be shared with the Director of NCHM, Chief of WCSD and within WFS. Any changes shall be informed to all the members.

TO		
Sl no	Agency	Email
1	His Majesty's Secretariat	tenzinj@mowhs.gov.bt
2	Prime Minister's Secretariat	chokiwangdi15@gmail.com
3	Director, National Center for Hydrology and Meteorology	kdupchu@nchm.gov.bt
4	Bhutan Broadcasting Services (TV news)	tvnewsbbs@gmail.com bbsgraphics@gmail.com
5	Kuensel	editorkuensel@gmail.com
6	Kuensel	layoutnews2017@gmail.com
CC		
Sl no	Agency	Email
1	Head of Division, National Center for Hydrology and Meteorology	hod@nchm.gov.bt
2	Weather and Climate Services Division, National Center for Hydrology and Meteorology	wcsd@nchm.gov.bt
3	Weather Forecasting Center Room, National Center for Hydrology and Meteorology	wfcr@nchm.gov.bt
4	Flood Monitoring and Command Room, National Center for Hydrology and Meteorology	fmcr@nchm.gov.bt
5	Aviation Met Section, National Center for Hydrology and Meteorology	aviationmet@nchm.gov.bt
FROM		
Sl no	Agency	Email
1	Weather Forecasting Center Room, National Center for Hydrology and Meteorology	wfcr@nchm.gov.bt

Table 4.1: Email addressed for daily 24 hrs. weather update dissemination

4.2. Daily Weather Analysis and Report, and Weather Update

The Center issues 24 hrs. weather updates every 8 hourly in the 3 shifts. The forecasters on duty shall prepare and issue the updates at the following time:

Title	Shift	Time of issue (BST)
Weather Analysis and Report	Morning	12:00 pm
Weather Update	Evening	8:00 pm
Weather Update	Night	4:00 am

Table 4.2: Time of issue for daily weather update dissemination

The daily weather update shall be provided in the following format unless otherwise instructed by the Director of NCHM or Chief of WCSD. The google document 2. *Format_Weather analysis and report* and 3. *Format_Weather update* shall be shared among the members of WFS. Any changes shall be informed to all the members.

The screenshot shows a Google Document titled "2. Format_Weather analysis and report" from the National Centre for Hydrology and Meteorology, Thiruvananthapuram. The document is dated 4 December 2021 at 12:00 PM. It contains a table titled "General 3 Days Weather Forecast" with columns for "Date", "1 December", "2 December", and "3 December". The rows list various locations and their corresponding weather conditions for each day.

Date	1 December	2 December	3 December
Thiruvananthapuram	Partly cloudy	Mostly sunny	Mostly sunny
Trivandrum	Partly cloudy	Mostly sunny	Mostly sunny
Alappuzha	Partly cloudy	Mostly sunny	Mostly sunny
Kannur	Partly cloudy with light rain	Mostly sunny	Mostly sunny
Kozhikode	Partly cloudy	Mostly sunny	Mostly sunny
Malappuram	Partly cloudy with light rain	Mostly sunny	Mostly sunny
Wayanad	Partly cloudy	Mostly sunny	Mostly sunny
Idukki	Partly cloudy with light rain	Mostly sunny	Mostly sunny
Ernakulam	Partly cloudy	Mostly sunny	Mostly sunny
Thiruvananthapuram	Partly cloudy	Mostly sunny	Mostly sunny
Thiruvananthapuram	Partly cloudy	Mostly sunny	Mostly sunny
Thiruvananthapuram	Partly cloudy	Mostly sunny	Mostly sunny
Thiruvananthapuram	Partly cloudy	Mostly sunny	Mostly sunny
Thiruvananthapuram	Partly cloudy with light rain	Partly cloudy	Mostly sunny
Thiruvananthapuram	Partly cloudy with light rain	Partly cloudy	Mostly sunny
Thiruvananthapuram	Partly cloudy	Mostly sunny	Mostly sunny

Figure 4.5: Format for daily weather analysis and report



Figure 4.6: Format for daily weather update

The forecast shall be provided to the following email addresses unless otherwise instructed by the Director of NCHM or Chief of WCSD. The Google spreadsheet *Forecast_dissemination_email_addresses* shall be shared with the Director of NCHM, Chief of WCSD and among the members of WFS. Any changes shall be informed to all the members.

TO		
Sl no	Agency	Email
1	His Majesty's Office	wangdi@royaloffice.bt
2	Royal Office	gelay@royaloffice.bt
3	Prime Minister's Office	chokiwangdi15@gmail.com
4	Cabinet Office	chencho@cabinet.gov.bt
5	Cabinet Office	kwangmo@cabinet.gov.bt
6	Department of Disaster Management, Ministry of Home and Cultural Affairs	ddmo@mohca.gov.bt
7	Department of Disaster Management, Ministry of Home and Cultural Affairs	dwangchuk1@mohca.gov.bt
9	Agriculture Research and Development Center, Ministry of Agriculture and Forest	kpradhan@moaf.gov.bt
10	Royal Bhutan Heli Services	heli-operations@rbhsl.bt
11	Army Disaster Response cell	adrcdq@gmail.com
12	Director, National Center for Hydrology and Meteorology	kdupchu@nchm.gov.bt
13	Flood Warning Section, National Center for Hydrology and Meteorology	tmofws@gmail.com
CC		
Sl no	Agency	Email
1	Head of Division, National Center for Hydrology	hod@nchm.gov.bt

	and Meteorology	
2	Weather and Climate Services Division, National Center for Hydrology and Meteorology	wcsd@nchm.gov.bt
3	Weather Forecasting Center Room, National Center for Hydrology and Meteorology	wfcr@nchm.gov.bt
4	Flood Monitoring and Command Room, National Center for Hydrology and Meteorology	fmcr@nchm.gov.bt
5	Aviation Met Section, National Center for Hydrology and Meteorology	aviationmet@nchm.gov.bt
FROM		
Sl no	Agency	Email
1	Weather Forecasting Center Room, National Center for Hydrology and Meteorology	wfcr@nchm.gov.bt

Table 4.3: Email addresses for daily weather analysis and report, and weather update dissemination

4.3. 72 hrs. weather forecast

The Center operates SmartMet which is a software for visualizing and editing meteorological data that provides a tool to include the forecaster's knowledge and expertise to the numerical weather forecast model so that this expertise is available for all weather information users. The forecasters on duty shall prepare and issue the forecast from SmartMet to the NCHM website at 4:00 pm BST.

4.4. Weather Advisories

During extreme weather events as mentioned below, which will impact Bhutan, the Center issues weather advisories and updates if there are any significant changes to the systems.

Extreme weather conditions:

1. Moderate to heavy rainfall
2. Tropical cyclones in the northeastern Arabian Sea
3. Tropical cyclones in northern Bay of Bengal
4. Snowfall
5. Gusty Wind

4.4.1. Operation

The forecasters and officer on duty responsible for weather briefing indicated in 5. *Weather Briefing* along with the head of the section shall make the decision for the requirement of the advisory. Weather advisory can be initiated on the advice of the Director, Chief of WCSD or higher authorities.

In case of a requirement of the weather advisory, the officer on duty shall perform the protocols of 5.2. *Operation* under weather briefing. The forecasters and officer on duty with the head of the section shall draft the advisory and get consent from the Chief of WCSD. The forecasters on duty shall disseminate the weather advisory to all platforms.

The weather advisories shall be provided in the following format unless otherwise instructed by the Director of NCHM or Chief of WCSD. The google document 4. *Format_Weather advisories*

shall be shared with the Chief of WCSD and among the members of WFS. Any changes shall be informed to all the members.



Figure 4.7: Format for weather advisories

The forecast shall be provided to the following email addresses unless otherwise instructed by the Director of NCHM or Chief of WCSD. The google spreadsheet *Forecast_dissemination_email_addresses* shall be shared with the Director of NCHM, Chief of WCSD and among WFS. Any changes shall be informed to all the members.

TO		
Sl no	Agency	Email
1	His Majesty's Office	wangdi@royaloffice.bt
2	His Majesty's Office	karmaips@gmail.com
3	Royal office of Media	gelay@royaloffice.bt
4	Prime Minister	lotaytshering@cabinet.gov.bt
5	Minister, Ministry of Economic Affairs	lsharma@moea.gov.bt
6	Minister, Ministry of Works and Human Settlement	dorjit@mowhs.gov.bt
7	Minister, Ministry of Health	dwangmo@health.gov.bt
8	Minister, Ministry of Foreign Affairs	tandidorji@mfa.gov.bt
9	Minister, Ministry of Home & Cultural Affairs	sgyeltshen@mohca.gov.bt
10	Minister, Ministry of Agriculture and Forests	ypenjor@moaf.gov.bt
11	Minister, Ministry of Information and Communications	karmadwangdi@moic.gov.bt
12	Minister, Ministry of Finance	namgayt@mof.gov.bt
13	Minister, Ministry of Education	minister@moe.gov.bt
14	Minister, Ministry of Labor and Human	ugyendorji@molhr.gov.bt

	Resources	
15	Cabinet Secretariat, National Assembly of Bhutan	ntshering@cabinet.gov.bt
16	Cabinet Secretary, National Assembly of Bhutan	kesangwangdi@cabinet.gov.bt
17	Cabinet Director, National Assembly of Bhutan	kpemba@cabinet.gov.bt
18	Secretary, National Environment Commission	spwangdi@nec.gov.bt
19	Director General, Department of Disaster Management, Ministry of Home and Cultural Affairs	jtnamgyal@mohca.gov.bt
20	Department of Disaster Management, Ministry of Home and Cultural Affairs	ddm@mohca.gov.bt
21	Department of Disaster Management, Ministry of Home and Cultural Affairs	ddmo@mohca.gov.bt
22	Department of Disaster Management, Ministry of Home and Cultural Affairs	tpenjore@mohca.gov.bt
23	Department of Disaster Management, Ministry of Home and Cultural Affairs	psingye@mohca.gov.bt
24	Agriculture Research and Development Center, Ministry of Agriculture and Forest	kpradhan@moaf.gov.bt
25	Renewable Natural Resource Center, Ministry of Agriculture and Forest	lhapdorji@moaf.gov.bt
26	Renewable Natural Resource Center, Ministry of Agriculture and Forest	ngawang@moaf.gov.bt
27	Chief Transport Officer, Safety and Regulatory Division, Road Safety and Transport Authority, Ministry of Information and Communication	pstamang@rsta.gov.bt
28	Chief Transport Officer, Transport Management Division, Road Safety and Transport Authority, Ministry of Information and Communication	kwangdi@rsta.gov.bt
29	Director, Department of Roads, Ministry of Work and Human Settlement	tenzin@mowhs.gov.bt
30	Chief Engineer, Maintenance Division, Department of Roads, Ministry of Work and Human Settlement	dgyeltshen@mowhs.gov.bt
31	Chief, Road Safety and Transport Authority, Ministry of Information and Communication	ppadhikari@rsta.gov.bt
32	Army Disaster Response cell	adrcdq@gmail.com
33	Royal Bhutan Army	dcomhelpline999@gmail.com
34	Royal Bhutan Heli Services	heli-operations@rbhsl.bt
35	All dzongdags	dzongdag@gov.bt
36	Dzongdag, Sarpang Dzongkhag	kgalay@sarpang.gov.bt
37	Dzongdag, Chhukha Dzongkhag	mdorji@chhukha.gov.bt
38	Director, NCHM	kdupchu@nchm.gov.bt
39	FWS, NCHM	tmofws@gmail.com

40	BBS(TV news)	tvnewsbbs@gmail.com, bbsgraphics@gmail.com, editorondesk@gmail.com, samtendlkr404@gmail.com
41	Kuensel	editorkuensel@gmail.com
42	Kuzoo FM Radio	kuzoofm@gmail.com
CC		
Sl no	Agency	Email
1	Head of Divisions, National Center for Hydrology and Meteorology	hod@nchm.gov.bt
2	Weather and Climate Services Division, National Center for Hydrology and Meteorology	wcsd@nchm.gov.bt
3	Cryosphere Services Division, National Center for Hydrology and Meteorology	csd@nchm.gov.bt
4	Hydrology and Water Resources Services Division, National Center for Hydrology and Meteorology	hwrsd@nchm.gov.bt
5	Hydromet Operations and Infrastructure Division, National Center for Hydrology and Meteorology	hoid@nchm.gov.bt
6	Weather Forecasting Center Room, National Center for Hydrology and Meteorology	wfcr@nchm.gov.bt
7	Flood Monitoring and Command Room, National Center for Hydrology and Meteorology	fmcr@nchm.gov.bt
8	Aviation Met Section, National Center for Hydrology and Meteorology	aviationmet@nchm.gov.bt
FROM		
Sl no	Agency	Email
1	Weather Forecasting Center Room, National Center for Hydrology and Meteorology	wfcr@nchm.gov.bt

Table 4.4: Email addresses for weather advisories dissemination

4.5. Weather Information upload on NCHM website and Facebook page

For wider effective and efficient sharing of weather information the Center operates an official website www.nchm.gov.bt and official Facebook page www.facebook.com/NationalCenterforHydrologyandMeteorology. All members of WFS has credentials to the NCHM website. However only 2 officers and 1 forecaster have access to the Facebook page. The forecasters shall update the weather information to the website on their respective duties. Information uploaded on the Facebook page shall be done by the 2 officers or the 1 forecaster.



Figure 4.8: NCHM website (left) and Facebook page (right)

4.5.1. Weather Information upload on NCHM website

The following weather information shall be uploaded on the NCHM website:

1. Daily 24 hrs. weather forecast
2. Weather analysis and report
3. Weather updates
4. 72 hrs. weather forecast
5. Weather advisories
6. Weather remarks
7. Weather alert messages

4.5.1.1. Daily weather updates

The daily weather updates includes the following:

1. Daily 24 hrs. weather forecast
2. Weather analysis and report
3. Weather updates
4. 72 hrs weather forecast

The forecasters on duty shall daily update the 4.1. *Daily 24 hr Weather Forecast* and 4.2. *Daily Weather Analysis and Report, and Weather Update* on the NCHM website under *Public Weather Service>Weather>Area Forecast*; and 4.3. *72 hrs weather forecast* under *Public Weather Service>Weather> Maps*. The forecast shall be updated at the website at the following times:

Title	Shift	Time of issue (BST)
Weather Analysis and Report	Morning	12:00 pm
Daily 24 hrs. Weather Forecast	Morning	4:00 pm
72 hrs. Weather Forecast	Morning	4:00 pm
Weather Update	Evening	8:00 pm
Weather Update	Night	4:00 am

Table 4.5: Time of issue for daily 24 hrs. weather forecast, weather analysis and report, and weather update on the NCHM website

The daily weather reports format shall be according to the format mentioned in 4.1. *Daily 24 hr Weather Forecast* and 4.2. *Daily Weather Analysis and Report, and Weather Update* unless otherwise instructed by the Director of NCHM or Chief of WCSD. Any changes shall be informed to all the members.



Figure 4.9: Daily 24 hrs. weather forecast, weather analysis and report, and weather update on the NCHM website

4.5.1.2. Weather Advisories

The forecasters on duty shall upload and update the weather advisories as and when issued on the NCHM website under *Advisories & Warnings*.

The weather advisories upload shall be according to the format mentioned in 4.3. *Weather Advisories* unless otherwise instructed by the Director of NCHM or Chief of WCSD. The written sentence upload format shall be as below. The google document *1. WFCR_mailing & file formats* shall be shared among the members of WFS. Any changes shall be informed to all the members.

Weather Advisory on subject (ex: Cyclone FANI)
Date of Issue: 2 May 2019
Time of Issue: 2:00 PM

"Brief summary (ex: *Bhutan is very likely to receive heavy to very heavy rainfall over the southern, eastern and isolated places of central parts of the country while the rest of the country is likely to receive moderate to heavy rain from 3rd May to 5th May*)"

[Please click here to download the advisory](#)

Figure 4.10: Format for weather advisories upload on NCHM website sentence



Figure 4.11: Weather advisories upload on NCHM website

4.5.1.3. Weather Remarks

In the event of any unusual weather conditions as mentioned below, that might concern the public, the forecasters on duty shall upload the weather remarks as and when required with consent from the Head of WFS or the Chief of WCSO on the NCHM website under *Advisories&Warnings*.

Weather conditions:

1. Mostly cloudy with rainy days for more than 3 days
2. Sudden cold and hot days
3. Deep Depression in the northeastern Arabian Sea
4. Deep Depression in northern and central Bay of Bengal

The weather remarks upload format shall be as below unless otherwise instructed by the Director of NCHM or the Chief of WCSO. The google document *1. WFCR_mailing & file formats* shall be shared among the members of WFS. Any changes shall be informed to all the members.

Weather Remarks on subject (ex: *The Very Severe Cyclonic Storm “BULBUL”*)

Date of Issue: 8 November 2019

Time of Issue: 4:00 PM

“Remarks (ex: *“The Very Severe Cyclonic Storm “BULBUL” lies over Central Bay of Bengal. It is very likely to move northwards during the next 72 hours.*

Direct impact of the system to Bhutan is unlikely. However, southern and eastern parts of the country are likely to receive light rain on 10th and 11th November.

Gusty wind is also likely at isolated places over this region during the same period.”)

Updates will be issued if there are any significant changes to the forecast.

Please contact 77452632/335578 for more information.

Figure 4.12: Format for weather remarks upload on NCHM website



Figure 4.13: Weather remarks upload on NCHM website

4.5.1.4. Weather Alert Messages

During the issue of weather advisories and weather remarks, forecasters on duty shall upload and update alert messages on the NCHM website.

The weather remarks upload format shall be as below unless otherwise instructed by the Director of NCHM or the Chief of WCSO. The google document *1. WFCR_mailing & file formats* shall be shared among the members of WFS. Any changes shall be informed to all the members.

Weather subject (ex: advisory/remarks) on subject (ex: *The Very Severe Cyclonic Storm "BULBUL"*) issued on 8 November 2019 at 4:00PM. Message: (ex: "*The Very Severe Cyclonic Storm "BULBUL"* lies over Central Bay of Bengal. Direct impact of the system to Bhutan is unlikely. However, southern and eastern parts of the country are likely to receive light rain on 10th and 11th November. Gusty wind is also likely at isolated places over this region during the same period.").

Figure 4.14: Format for weather alert messages upload on NCHM website



Figure 4.15: Weather alert messages upload on NCHM website

4.5.2. Weather Information upload on NCHM Facebook page

The following weather information shall be uploaded on the NCHM Facebook page:

1. Weather advisories
2. Weather remarks

4.5.2.1. Weather Advisories

Any of the 2 officers or the 1 forecaster shall upload and update the weather advisories as and when issued on the NCHM Facebook page.

The weather advisories upload shall be according to the format mentioned in 4.3. *Weather Advisories* unless otherwise instructed by the Director of NCHM or Chief of WCSD. The written sentence upload format shall be as below. The google document *1. WFCR_mailing & file formats* shall be shared among the members of WFS. Any changes shall be informed to all the members.

Weather Advisory on subject (ex: Cyclone FANI)

Date of Issue: 2 May 2019

Time of Issue: 2:00 PM

"Brief summary (ex: *Bhutan is very likely to receive heavy to very heavy rainfall over the southern, eastern and isolated places of central parts of the country while the rest of the country is likely to receive moderate to heavy rain from 3rd May to 5th May*)"

Figure 4.16: Format for weather advisories upload on NCHM Facebook page



Figure 4.17: Weather advisories upload on NCHM Facebook page

4.5.2.2. Weather Remarks

Any of the 2 officers or the 1 forecaster shall upload and update the weather remarks as and when issued on the NCHM Facebook page.

The weather remarks upload shall be according to the format mentioned in 4.5.1.3. *Weather Remarks* unless otherwise instructed by the Director of NCHM or Chief of WCSD. The written sentence upload format shall be as below. The google document *1. WFCR_mailing & file formats* shall be shared among the members of WFS. Any changes shall be informed to all the members.



Figure 4.18: Weather remarks upload on NCHM Facebook page

4.6. Weather Forecast to World Meteorological Organization

The Center shall provide weather forecasts of the 8 identified dzongkhags to the World Meteorological Organization’s Weather Information System (WWIS) through the GTS and email. The forecasters on duty shall disseminate the 72 hrs. forecast every 8 hourly at the following time;

Shift	Time of issue (BST)
Morning	12:00 pm
Evening	8:00 pm
Night	4:00 am

Table 4.6: Time of issue for 72 hrs. weather forecast update to the WWIS

4.6.1. Weather forecast upload to WWIS from GTS

The weather forecast for WWIS from GTS shall have the following header. The google document *1. WFCR_mailing & file formats* shall be shared among the members of WFS. Any changes shall be informed to all the members. Refer to Annex 1 for Information on Weather forecast to WWIS and Annexure 2 for Weather Icon Code.

FPA1A2ii CCCC YYGGgg	
Designator	Meaning
F	Indicating a forecast message
P	Message designated for public and be in text format
A1A2	Two-letter country or territory designators, for example, BT = Bhutan
ii	01-19 for global distribution. This two-digit number should be chosen by originating WMO Members
CCCC	Four-letter location indicator of the station originating or compiling the bulletin
YYGGgg	International date-time group in UTC: YY - day of the month GGgg - time of compilation

Figure 4.19: Format for GTS header for WWIS

The weather forecast for WWIS from GTS shall be provided in the following format. The google document *6. Format_WWIS* shall be shared among the members of WFS. Any changes shall be informed to all the members.

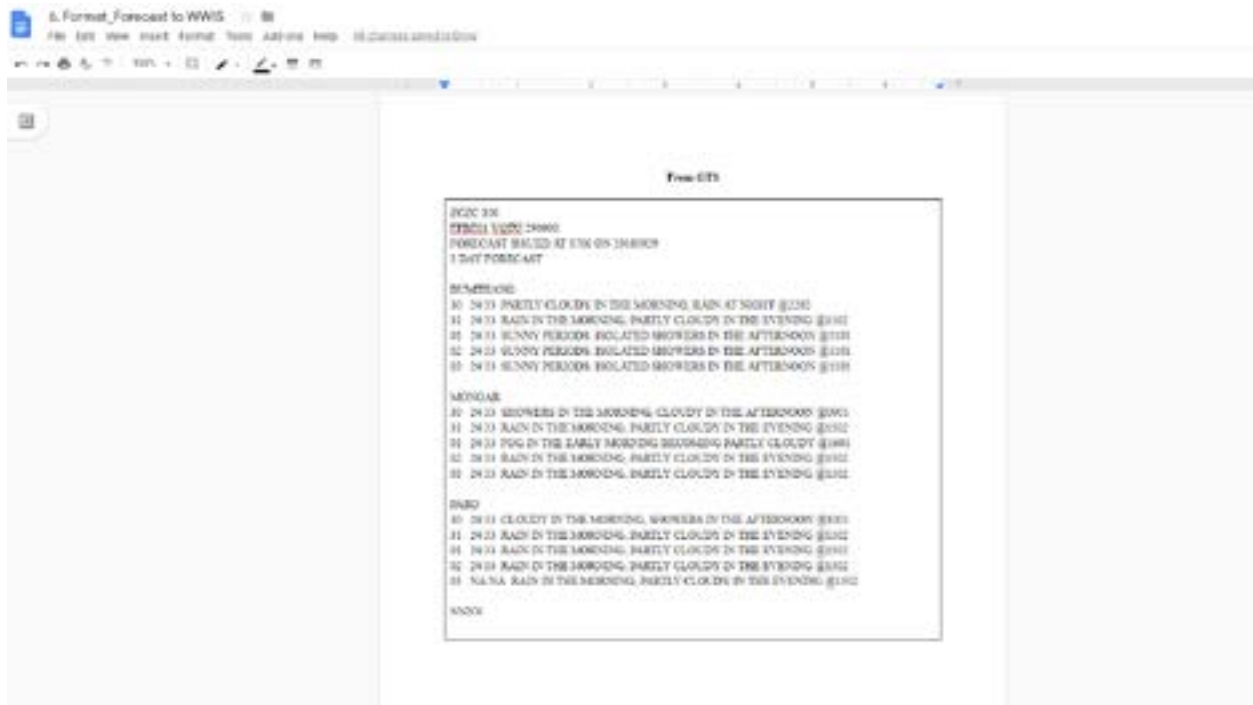


Figure 4.20: Format for weather forecast upload to WWIS from GTS

4.6.2. Weather forecast upload to WWIS from email

The weather forecast for WWIS from email shall be sent with the following subject and sent to the following email address. The google document *1. WFCR_mailing & file formats* shall be shared among the members of WFS. Any changes shall be informed to all the members.

Subject: city forecasts of Bhutan
Email address to: submitforecast@worldweather.org
Sender: wfcr@nchm.gov.bt

Table 4.7: WWIS email subject, to and from address

The weather forecast for WWIS from email shall be provided in the following format. The google document. *6. Format_Forecast to WWIS* shall be shared among the members of WFS. Any changes shall be informed to all the members.

Forecast on Request shall be shared with the Chief of WCSD and among the members of WFS. Any changes shall be informed to all the members.



Figure 4.23: Format for weather forecast on request

4.7.2. Operation

Upon receiving the request for forecast, the forecasters on duty shall inform the Head of WFS and the Chief of WCSD. The forecasters on duty notes the following details;

<p>To: <i>(email address)</i></p> <p>Forecast days: <i>(ex: 3 days forecast, 1 day forecast)</i></p> <p>Forecast update: <i>(ex: daily update, every alternate days)</i></p> <p>Start and end date: <i>(ex: From 12 December- 30 December 2019)</i></p> <p>Location: <i>(ex: Bumthang, Thimphu)</i></p>

Figure 4.24: Format for details recordings of weather forecast on request

The forecasters on duty then share the information to other staff of WFCR through sharing the google document *7. Format_Weather Forecast on Request* for preparing the particular forecast. The google document shall share the following information. The google document *1. WFCR_mailing & file formats* shall be shared among the members of WFS. Any changes shall be informed to all the members.

<p>Dear all,</p>

We have to provide weather forecast to (*subject: PA to Minister of Economic Affairs*).
Please find the following details;

To: (*email address*)

Forecast days: (*ex: 3 days forecast, 1 day forecast*)

Forecast update: (*ex: daily update, every alternate days*)

Start and end date: (*ex: From 12 December- 30 December 2019*)

Thank you

Weather Forecasting Center Room

Figure 4.25: Weather forecast on request details sharing within WFCR Email

The forecast shall be sent to the following email addresses unless otherwise instructed by the Director of NCHM or Chief of WCSD. Any chances shall be informed to all the members.

TO		
Sl no	Name/ Agency	Email
1	(<i>ex: Madam Dechen, Director, Ministry of XXX</i>)	(XXXXXX)
CC		
1	Chief, Weather and Climate Services Division	sdorji@nchm.gov.bt
2	Weather Forecasting Center Room, National Center for Hydrology and Meteorology	wfcr@nchm.gov.bt
FROM		
Sl no	Agency	Email
1	Weather Forecasting Center Room, National Center for Hydrology and Meteorology	wfcr@nchm.gov.bt

Table 4.8: Weather forecast on Request dissemination email addresses

5. Weather Briefing

The Center prepares weather briefing every weekday to understand the severe or unusual weather at that particular time. Depending on the severity briefing is conducted to the Center. After the briefing, the weather advisories are prepared and disseminated accordingly as indicated in 4.3. *Weather Advisories*.

5.1. Format

The weather briefing shall be provided in the following format unless otherwise instructed by the Director of NCHM or Chief of WCSD. The google document *8. Format_Weather Briefing* shall be shared among the members of WFS. Any changes shall be informed to all the members.



Figure 5.1: Weather briefing format

5.2. Operation

Weather briefing shall be prepared by the two officers of WFCR on weekly shifts on weekdays, and during weekends and holidays as and when required. If the officer on duty is out of office (on leave, training, workshops) the second officer shall prepare the briefing. If both the officers are out of office, then the head of WFS shall prepare the briefing, otherwise the forecasters on duty shall prepare the briefing. The officer and the forecasters on duty along with the head of WFS shall make the decision for the requirement of the briefing to the Center.

In case of a requirement of the weather briefing, the officer and head of WFS shall inform and brief the Chief of WCSD. Upon consent from the Chief, the officer shall send the following email to the following email addresses informing all the staff of NCHM Headquarters on the weather briefing, unless otherwise instructed by the Director of NCHM or Chief of WCSD. The google spreadsheet *Forecast_dissemination_email_addresses* should be shared with the Director, Chief of WCSD and among the members of WFS. Any changes shall be informed to all the members. The officer on duty shall present the weather briefing to the Center.

Dear all,

There will be weather briefing on (*subject: ex: cyclone FANI, cold weekends*) today.

Date: DD MM YYYY (ex: 12 December 2019)
Time: TT:TT (ex: 15:20 (winter season) 16:20 (summer season))
Venue: Weather Forecasting Center Room, National Weather and Flood Warning Center

Therefore all are invited for the weather briefing.

Thank you
Weather Forecasting Center Room

Figure 5.2: Format for weather briefing email content

TO		
Sl no	Agency	Email
1	Head of Divisions, National Center for Hydrology and Meteorology	hod@nchm.gov.bt
2	Weather and Climate Services Division, National Center for Hydrology and Meteorology	wcsd@nchm.gov.bt
3	Cryosphere Services Division, National Center for Hydrology and Meteorology	csd@nchm.gov.bt
4	Hydrology and Water Resources Services Division, National Center for Hydrology and Meteorology	hwrsd@nchm.gov.bt
5	Hydromet Operations and Infrastructure Division, National Center for Hydrology and Meteorology	hoid@nchm.gov.bt
6	Weather Forecasting Center Room, National Center for Hydrology and Meteorology	wfcr@nchm.gov.bt
7	Flood Monitoring and Command Room, National Center for Hydrology and Meteorology	fmcrr@nchm.gov.bt
FROM		
Sl no	Agency	Email
1	Weather Forecasting Center Room, National Center for Hydrology and Meteorology	wfcr@nchm.gov.bt

Table 5.1: Weather briefing dissemination email addresses

6. Weather Forecasting Center Room Shift Schedule

Weather forecasting and briefing are operated on shifts. Weather forecasting is operated by the 7 forecasters of WFS. Weather briefing is operated by the 2 officers of WFS. Both the shift schedules are prepared by the designated officer of WFS.

6.1. Shift Schedule for Weather Forecasting

6.1.1 Time for Shift Duty

Weather forecasting is operated by the 7 forecasters of WFS at the following time;

Shift	Time of duty (BST)
Morning	8:00 am- 4:00 pm
Evening	4:00 pm- 11:00 pm
Night	11:00 pm- 8:00 am

Table 6.1: Time of shift duty for weather forecasters

6.1.2 Shift Schedule Management

The designated officer of WFS manages and adjusts the shift in the google spreadsheet *Weather Forecasting Shift Schedule* which shall be shared with the Chief of WCSD and among the members of WFS. The shift shall be adjustment as follows;

- A. During normal operations when all the 7 forecasters are at office the shift shall be as follows;

Day	Date	Morning Shift (8 a.m-4 p.m)	Evening Shift (4 p.m-11 p.m)	Night Shift (11 p.m-8 a.m)	Off Duty
Wednesday	DDMMYYYY	AB	C	DE	FG
Thursday	DDMMYYYY	AB	C	DE	FG
Friday	DDMMYYYY	FG	A	BC	DE
Saturday	DDMMYYYY	FG	A	BC	DE
Sunday	DDMMYYYY	DE	F	GA	BC
Monday	DDMMYYYY	DE	F	GA	BC
Tuesday	DDMMYYYY	BC	D	EF	GA
Wednesday	DDMMYYYY	BC	D	EF	GA
Thursday	DDMMYYYY	GA	B	CD	EF
Friday	DDMMYYYY	GA	B	CD	EF
Saturday	DDMMYYYY	EF	G	AB	CD
Sunday	DDMMYYYY	EF	G	AB	CD
Monday	DDMMYYYY	CD	E	FG	AB
Tuesday	DDMMYYYY	CD	E	FG	AB

Table 6.2: Shift schedule for weather forecasting

- B. When one or more forecasters are out of office, then the shift shall be adjusted with the following conditions;
- Morning shifts shall as much as possible have 2 forecasters on duty.
 - Shift adjustments shall be made in alphabetical order.

- c. Forecasters on night shifts shall make the adjustments.
- d. Forecasters on off duty shall make the adjustments.
- e. Due to adjustments if there are continuous two shifts, then the designated officer with the head of the WFS shall find proper adjustments.
- f. If all the forecasters have to attend workshop, seminar or training during office hours (summer: 9:00 am- 5:00 pm and winter: 9:00 am- 4:00 pm), then the forecasters on evening and night shifts shall only disseminate the forecasts.
- g. If there are only 2 forecasters at office, morning and night shifts shall be operated. Night shift shall also only disseminate the evening forecasts.

6.2. Shift Schedule for Weather Briefing

Weather briefing shall be prepared by the 2 officers of WFS on weekly shifts on weekdays, and during weekends and holidays as and when required. The designated officer of WFS manages and adjusts the shift in the google spreadsheet *Weather Briefing Shift Schedule* which shall be shared with the Chief of WCSD and among the members of WFS.

A. The shift shall be as follows;

Day	Date	Officers on Duty
Monday	DDMMYYYY	A
Tuesday	DDMMYYYY	A
Wednesday	DDMMYYYY	A
Thursday	DDMMYYYY	A
Friday	DDMMYYYY	A
Saturday	DDMMYYYY	
Sunday	DDMMYYYY	
Monday	DDMMYYYY	B
Tuesday	DDMMYYYY	B
Wednesday	DDMMYYYY	B
Thursday	DDMMYYYY	B
Friday	DDMMYYYY	B

Table 6.3: Shift schedule for weather briefing

- B. If the officer on duty is out of office the second officer shall prepare the briefing. If both the officers are out of office, then the head of the section shall prepare the briefing, otherwise the forecasters on duty shall prepare the briefing.

7. Weather Forecasting Center Room Official WeChat Groups

For effective and efficient communication between WFS, official WeChat group *Forecasters and GTS* has been created. The Hydromet observers of HOID at the Class A stations also communicate daily data to WFCR through the official WeChat group *Weather Info Center*.

7.1. Weather Forecasting official WeChat group

The existing *Forecasters and GTS* official WeChat group shall be renamed as *Weather Forecasting Center Room*. The group shall be solely used for official purposes. The admin shall be the Head of WFS, who will be responsible for member management. The following shall be the members of the *Weather Forecasting Center Room* official WeChat group;

- a. Chief of WCSD
- b. Staff of WFS

Any changes to the members shall be from the consent of the Chief of WCSD.

















7.2. Weather Info Center official WeChat group




















The *Weather Info Center* official WeChat group has been created for transmitting daily Class A data and other related weather information as and when required. The group shall be solely used for official purposes. The admin shall be the Head of WFS, who will be responsible for member management. The following shall be the members of the *Weather Info Center* official WeChat group;

- a. Chief of WCSD
- b. Chief of HOID
- c. Staff of WFS
- d. 20 Class A Hydromet observers

Any changes to the members shall be from the consent of the Chief of WCSD and Chief of HOID.

Annexure 1: WWIS Weather Icon Table

Icon Number	Weather	Icon
0101	Sandstorm	
0102	Duststorm	
0103	Sand	
0104	Dust	
0201	Thunderstorms	
0202	Thundershowers	
0203	Storm	
0204	Lightning	
0301	Hail	
0401	Blowing Snow	
0402	Blizzard	
0403	Snowdrift	
0404	Snowstorm	
0501	Snow Showers	
0502	Flurries	
0601	Snow	
0602	Heavy Snow	
0603	Snowfall	
0701	Light Snow	
0801	Sleet	
0901	Showers	
0902	Heavy Showers	
0903	Rainshower	
1001	Occasional Showers	
1002	Scattered Showers	
1101	Isolated Showers	
1201	Light Showers	
1301	Freezing Rain	
1401	Rain	
1501	Drizzle	
1502	Light Rain	
1601	Fog	

1701	Mist	
1801	Smoke	
1901	Haze	
2001	Overcast	
2101	Sunny Intervals	
2102	No Rain	
2103	Clearing	
2201	Sunny Periods	
2202	Partly Cloudy	
2203	Partly Bright	
2204	Mild	
2301	Cloudy	
2302	Mostly Cloudy	
2401	Bright	
2402	Sunny	
2403	Fair	
2501	Fine	
2502	Clear	
2601	Windy	
2602	Squall	
2603	Stormy	
2604	Gale	
2701	Wet	
2702	Humid	
2801	Dry	
2901	Freezing	
3001	Frost	
3101	Hot	
3201	Cold	
3202	Chilly	
3301	Warm	
3401	Cool	
3501	Volcanic Ash	



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

www.nchm.gov.bt

Tel: +975 2 323703

Fax: +975 2 335578

Printed at United Printing Press