STANDARD OPERATING PROCEDURE (SOP)
HYDROLOGY AND WATER RESOURCES SERVICES DIVISION

National Center for Hydrology and Meteorology
Royal Government of Bhutan
2020

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TABLE OF CONTENT

1. Standard Operating Procedure (SOP) for HWRSD

1.1 Title

Standard Operating Procedure for Hydrology and Water Resources Services Division (HWRSD), hereafter referred as **SOP 2020 for HWRSD**.

1.2 Objective

The SOP provides the operating procedures for the HWRSD to fulfill the vision, mandates and functions of the Center. It provides standardized linkages and approaches amongst the sections within the Division including the management and technical support.

1.3 Effective

The SOP 2020 for HWRSD will be implemented with effect from 1st July 2020.

2. HWRSD mandate, function and structure

2.1 Mandate of HWRSD

Hydrology and Water Resources Services Division is mandated to provide the hydrological information and services including water resources assessment, forecasting, data management, monitor and early warning services related to flood and GLOF.

2.2 Functions of HWRSD

a. Followings are the functions of the Division:
b. Prepare and provide hydrological services
c. Monitor and operation of National Hydrological Database
d. Research and development in the field of hydrology, water resources, flooding and climate change impacts on water resources
e. Hydrological modelling for flow and flood forecasting
f. Water Resources Assessment using surface water modelling
g. Maintain River Information System (RIS) of major river basin
h. Provision of tailor-made services related to hydrology and water resources
i. Hydrological data processing, analysis, archival and dissemination to end users.
j. Prepare hydrological risk assessment and flood hazard mapping
k. Liaise with other divisions pertaining to data requirement for flood forecasting and warning
l. Operation of the Flood Monitoring and Command Room (FMCR) of National Weather and Flood Warming Center (NWFWC) 24/7 in coordination with the basin flood warning Control Rooms and Weather Forecasting Section of WCSD
m. Issue flood/GLOF early warning during the severe weather conditions
n. Coordinate with the National Emergency Operation Center (NEOC)/DDM, Hydropower Plants and others for the inter-agencies flood forecasting and warning
o. Publish statistical data relating to surface water and its information relating to water resources

p. Publish hydrological data and reports.

q. Publish scientific papers on hydrology and water resources related studies

r. Coordinate and organize national, regional and international hydrological and water resources forums.

s. Represent the Center and collaborate with relevant national, regional and international organizations related to hydrology and water resources activities

t. Education, advocacy and awareness on hydrology and Flood/GLOF EWS

2.3 Structure of HWRSD

HWRSD has three services sections for catering the hydrological related services.

a. Forecasting and Warning Services (FWS)

b. Hydrology & Water Information Services (HWIS)

c. Research & Analysis Services (RAS)

Following is the structure of HWRSD.

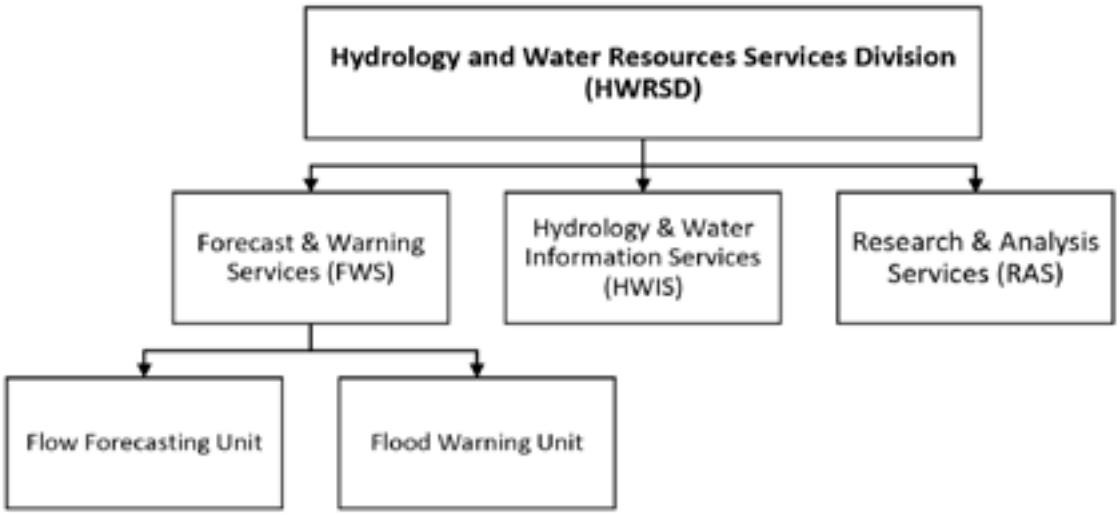

Figure 1: Structure of HWRSD

3. SOP for Forecast and Warning Section (FWS)

Forecast and Warning Services (FWS) under HWRSD is responsible for various services on the flow/flood forecasting and warning services, following are the SOP for FWS

3.1 Flood/GLOF Early Warning Services & Operation of FMCR

FWS actions	Time Frame	Operator	Output/Result
1. Monitoring of Flood/GLOF EWS. - Monitoring AWS and manual hydrological station data - Report on non-reception/failed data transmission	- Daily data is collected - Report non-reception of data to HOID within 24 hours.	Control Room Operators and designated officials	- Daily status of Flood/GLOF EWS station data is updated - Resolved the issues of non-reception of data with HOID
2. Monitor and issue flood warning/advisories/press release	Monitor flow 24/7 and issue flood warning/advisories right after the detection (Rainstorm flood and GLOF EWS)	Flood Forecasters and EWS officials	● Siren activated after confirming flood/GLOF event ● Prepare and issue warning/advisories to stakeholders for safety ● Prepare and issue report of the event
3. Operate Flood Monitoring and Command Room (FMCR)	Daily	Designated officials	● FMCR is operational 24/7 ● Maintained coordination between basin control rooms and FMCR
4. Provide public education awareness on the Flood/GLOF EWS	As per the requirement	Designated officials	● Conduct education awareness programs. ● Public and Relevant stakeholders are made aware of the flooding risk and EWS.
5. Coordinate with the NEOC/DDM and others relevant agencies during the emergencies ● Media briefing ● Provide timely flood information ● Coordinate with DDM in-case of flood emergency ● Coordinate and organize emergency meeting during extreme events	In event of Flood/GLOF	Designated officials	● Well coordination between line agencies during flood emergencies ● Timely flood information provided to relevant stakeholders

3.2 Flow/flood Forecasting Services			
FWS actions	**Time Frame**	**Operator**	**Output/Result**
1. Monitor, prepare and provide daily river flow status services	Monitor flow on 24/7 and issue river status daily	Flood forecasters and officials	Daily flow status is issued
2. Prepare and issue daily flow forecast/outlook	Monitor and issue daily flow forecast/outlook before 5pm	Flood forecasters and officials	Daily flow outlook/forecast is issued
3. Publication of annual hydrological extreme event bulletin	Yearly	Flood forecasters and officials	Flood events are archived and annual report generated
4. Setup, run and validate hydrological model ● Flow forecasting services ● Water resource management	As per the requirement and watershed area	Designated officials	- Flood/flow forecast model is setup and calibrated - Report in water resource assessment (surface runoff) is issued

3.3 Flood modelling and hazard map services			
FWS actions	**Time Frame**	**Operator**	**Output/Result**
1. Field survey (Aerial and surface) data collection and processing	As per the requirement and watershed area	Designated officials	- Field survey report is issued - DEM, river cross section and flow data, etc. generated
2. Setup, run and simulate Hydrological and hydro-dynamic model services for hazard mapping	As per the requirement and watershed area	Designated officials	Model is setup and simulated/calibrated
3. Prepare and provide flood hazard maps services	As per the requirement and watershed area	Designated officials	Flood hazard map is prepared and disseminated

4. SOP for Functions of Hydrology Information Management Section (HIMS)

4.1 National Hydrological Database Management Services

Actions of HIMS	Time Frame	Operator	Outcome/result
1. Receive raw data from manual stations through HOID ● Verify and cross check raw data ● Data processing, analysis and quality check ● Archival of data to database (Hy-data).	Within 2 weeks after receiving from HOID	Data manager	Manual station hydrological data is updated and available for users.
2. Verify and quality check of real time station data (AWLS) and report the status to HOID	Daily	Data manager and designated officials	AWLS data are quality checked and available.
3. AWLS data transmission failed and non-reception of manual station data.	Inform HOID within the next 3 days of AWLS problem.	Data manager and designated officials	AWLS and manual data problem are resolved
4. Receive sediment data from sediment station via Sediment Lab, HOID ● Data processing, analysis and archival of data to database (CDAT).	Within 1 weeks after receiving from HOID	Data manager	Sediment data is updated and available for users
5. Report on non-reception of sediment data	- Report non-reception of Monthly data to HOID	Data manager	Resolved the issues of non-reception of data with HOID

4.2 Publication of Hydrological, Sediment Data and River Basin Information

Actions of HIMS	Time Frame	Operator	Output/Result
1. Prepare and issue monthly flow monitoring of selected station	Monthly	Designated official	Monthly flow status issued (website)
2. Publication of hydrological data book	Yearly	Data Manager and designated official	Yearly hydrological data book is published

4.3 Dissemination of Hydrological, Sediment Data and River Basin Information			
Actions of HIMS	**Time Frame**	**Operator**	**Output/Result**
1. Prepare and issue ad-hoc historical data analysis report	As per the request	Data manager and designated official	Historical data analysis Report is issued
2. Provide historical hydrological, sediment data and river basin information to user	Within 5 days after the receipt of data requisition	Data manager	Historical data disseminated to users

5. SOP for Functions of Research and Analysis Services (RAS)

5.1 Hydrological & Water Resources related research and Analysis Services			
Actions of RAS	**Time Frame**	**Operator**	**Result/Remarks**
1. Historical hydrological flow data analysis and report publication including (flow duration curves, statistical distribution and trend analysis, extreme value analysis (floods and droughts)).	Station wise	RAS	Analyzed time series data available
2. Study on the Automatic Station vs the manual station reading	Station wise	RAS	Data compared and report is issued.
3. Conduct research/collaborative studies on hydrology and water related with other sectors and user agencies	Annually/ as and when required	Designated official	- Report printed/published - Collaborated studies done with other sectors
4. Carry out research on the hydrological modelling and verification	As per the requirement	Designated official	- Hydrological model is validated

6. SOP for Common Services under the HWRSD.

6.1 Budget, Five Year Plan, APT and others.			
Action	**Time Frame**	**Operator**	**Outcome/result**
a) Division budget works (proposal, monitoring and follow ups)	Yearly	Budget focal	Budget status is maintained up to date
b) Plan and prepare APT for division in coordination with program officer.	1-2 weeks	APT focal	Division APT is on track

6.2 Tendering and procurements (e-government procurement)			
Action	**Time Frame**	**Operator**	**Outcome/result**
a. Procurement of works in consultation with Procurement officer, NCHM - Preparation of design and estimation of the work - Tendering and awarding the contract	As per the need	Designated official	Procurement of work is done
b. Procurement of goods in consultation with Procurement Officer, NCHM - Preparation of specification and estimation of the goods - Tendering and awarding the contract	As per the procurement rules	Designated official	Procurement of goods is done
6.3 Maintain stocks, scientific equipment and goods under HWRSD			
Action	**Time Frame**	**Operator**	**Outcome/result**
a) Maintain stock ledger for consumable & fixed assets for delivered stocks and issue good receipt notes for further payments(s).	Routine work	Designated official	Stock ledger and good receipt note maintained up to date in coordination with center's store incharge
b) Maintain inventory for HWRSD equipment, gear, survey tools and machineries.	Routine work	Designated official	Maintained inventories up to date.
c) Issue requested equipment with proper handing-taking upon approval for hiring of equipment.	As and when required	Designated official	Equipment issued with proper hand-taking.
d) Check and charge rechargeable batteries (9V& 12 V)	Regularly	Designated official	Keep batteries healthy.

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Printed at United Printing Press