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National Center for Hydrology and Meteorology
Royal Government of Bhutan

Country Report
National Centre for Hydrology and Meteorology in Bhutan

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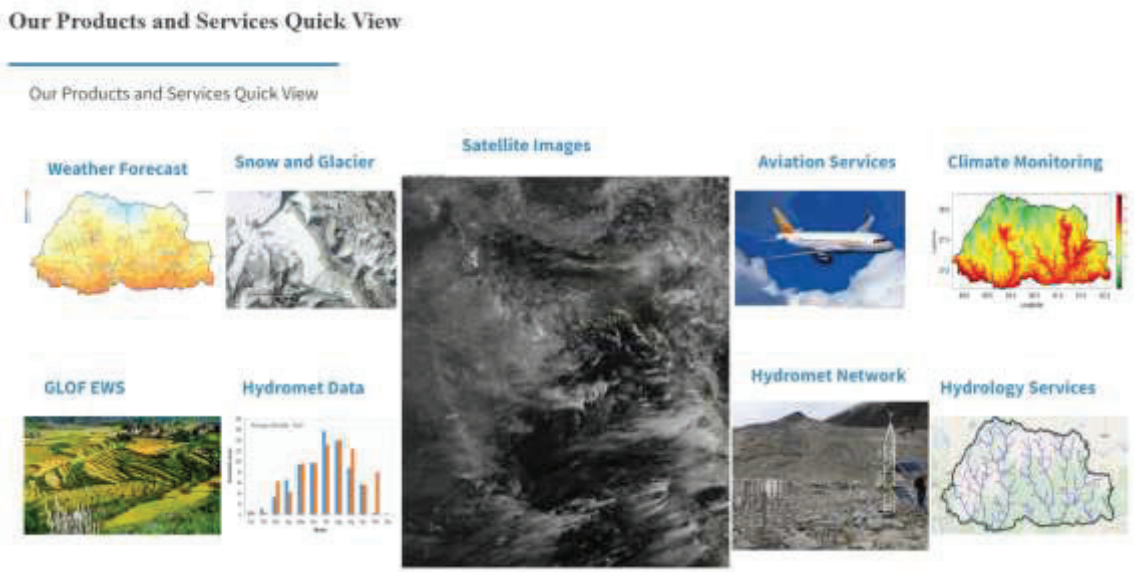
Meteorological Services Division

JMA WIS Workshop
November 2025



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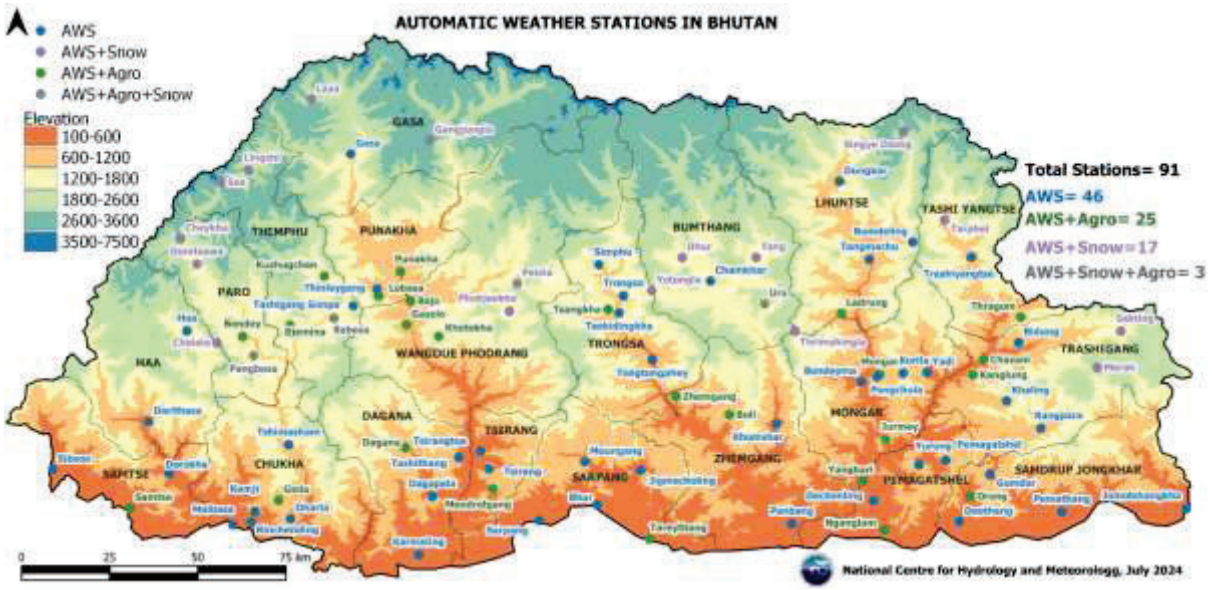
1. Status of system/network configuration

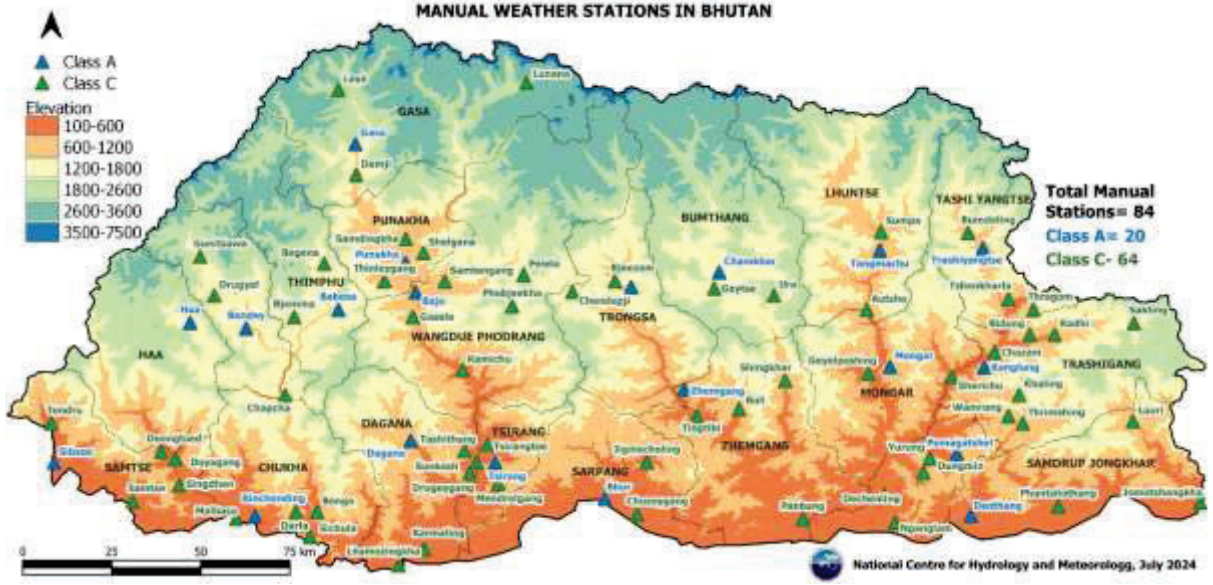
Data Collection and Processing Systems

1. Ground observation

Automatic Weather Stations

- 91 AWS stations in Bhutan
- 84 Manual stations
- 6 AWS stations shared on GTS and every 3 hours
- Data Logger types – M/s Microstep MIS Slovakia made and Orie Inc Company Japanese made
- Cryosphere stations 20
- Hydrological stations 59

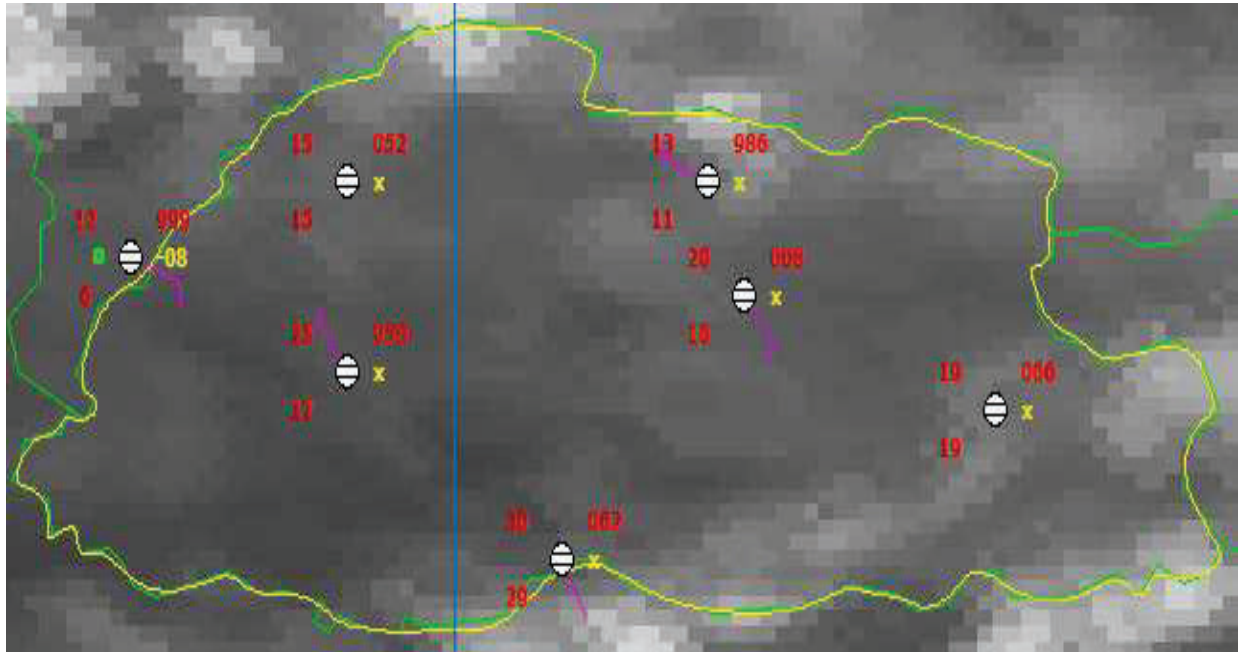


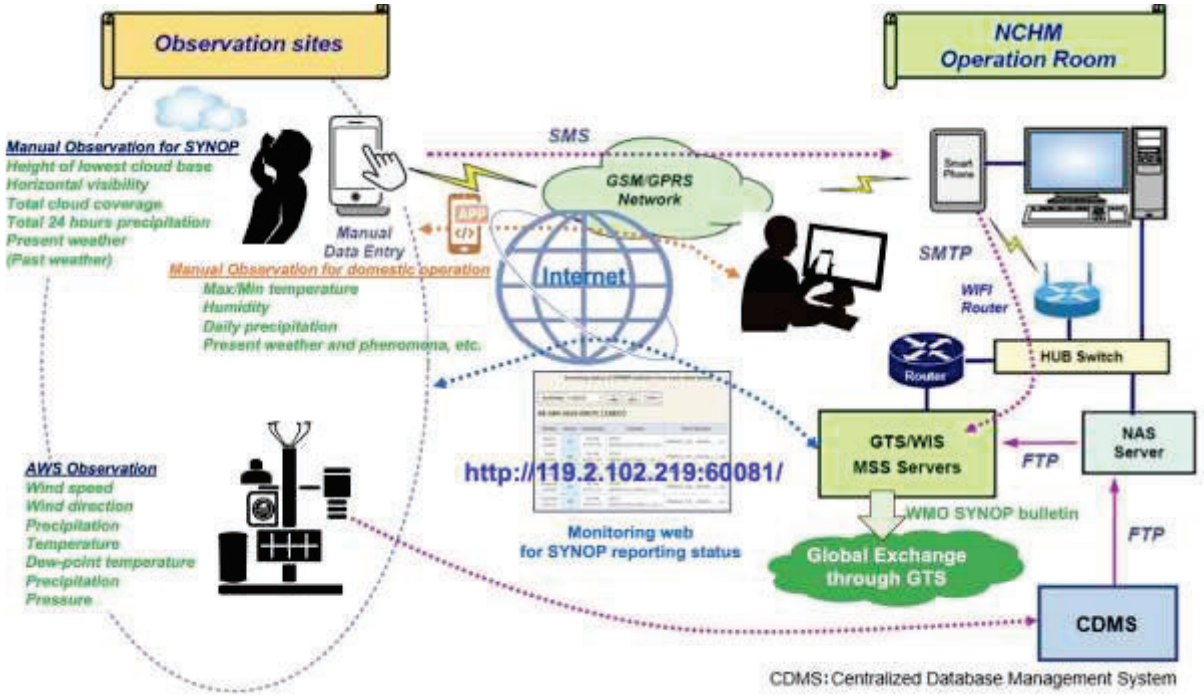


1. Status of system/network configuration

2. Synoptic stations

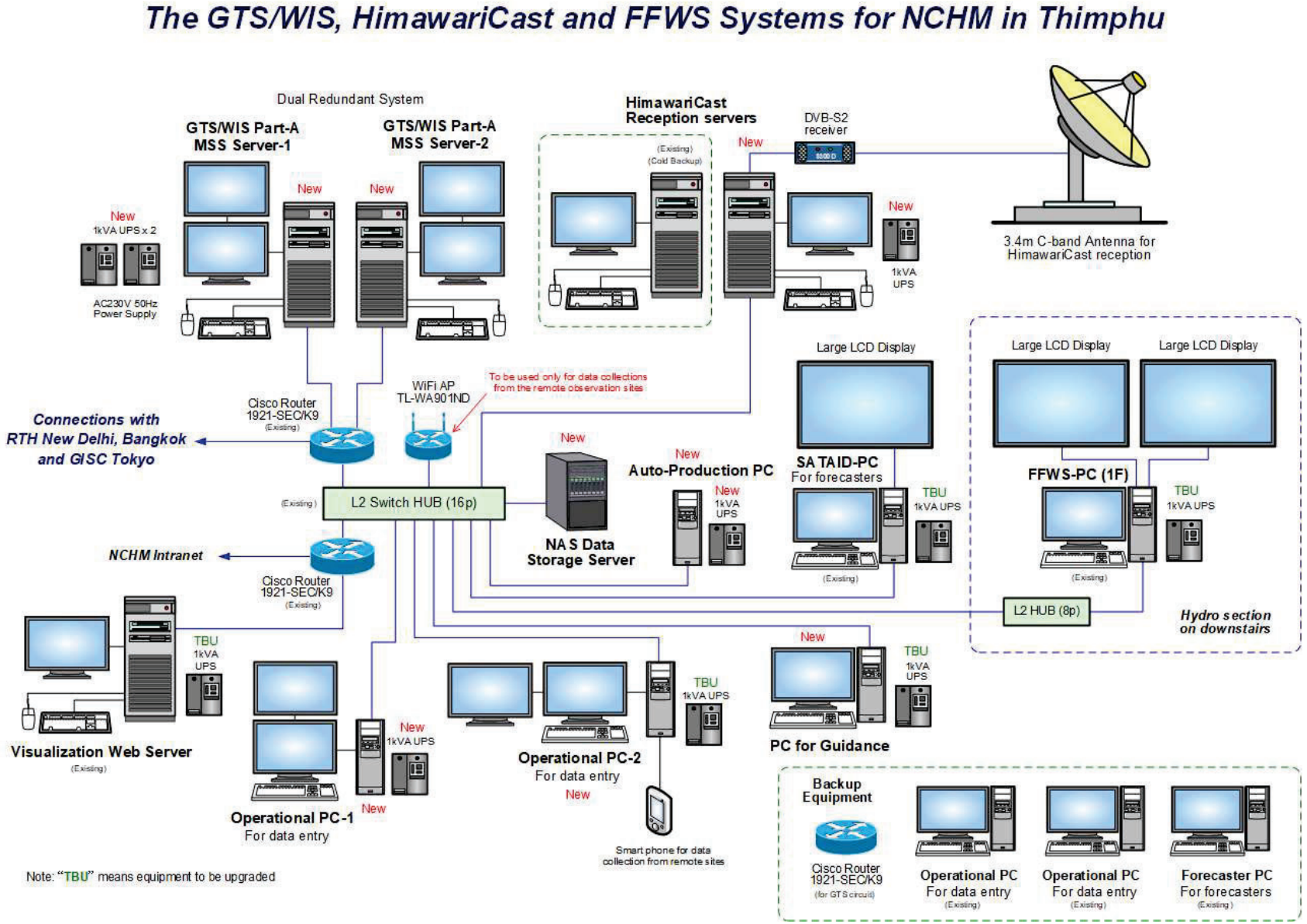
- 6 Synoptic stations: Dekiling, Tsampa, Chamkhar, Babesa, Kanglung, Gasa
- Data shared every 3 hour from all 6 AWS. Manual station observations are incorporated only 2 times a day at 9 and 3 (UTC+6) with the AWS.
- Data is shared in SYNOP FM12, BUFR FM94 and BUFR CSV



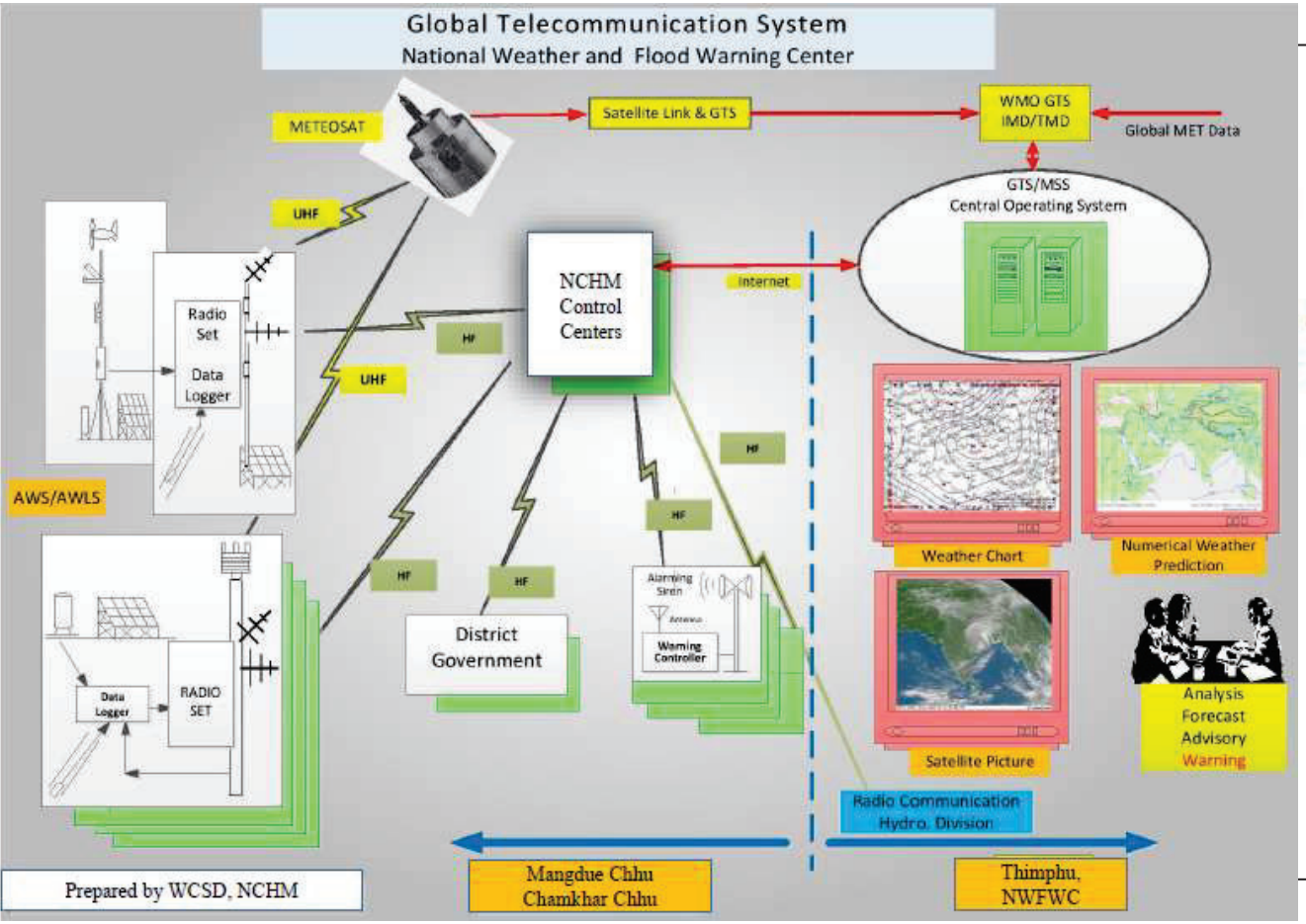


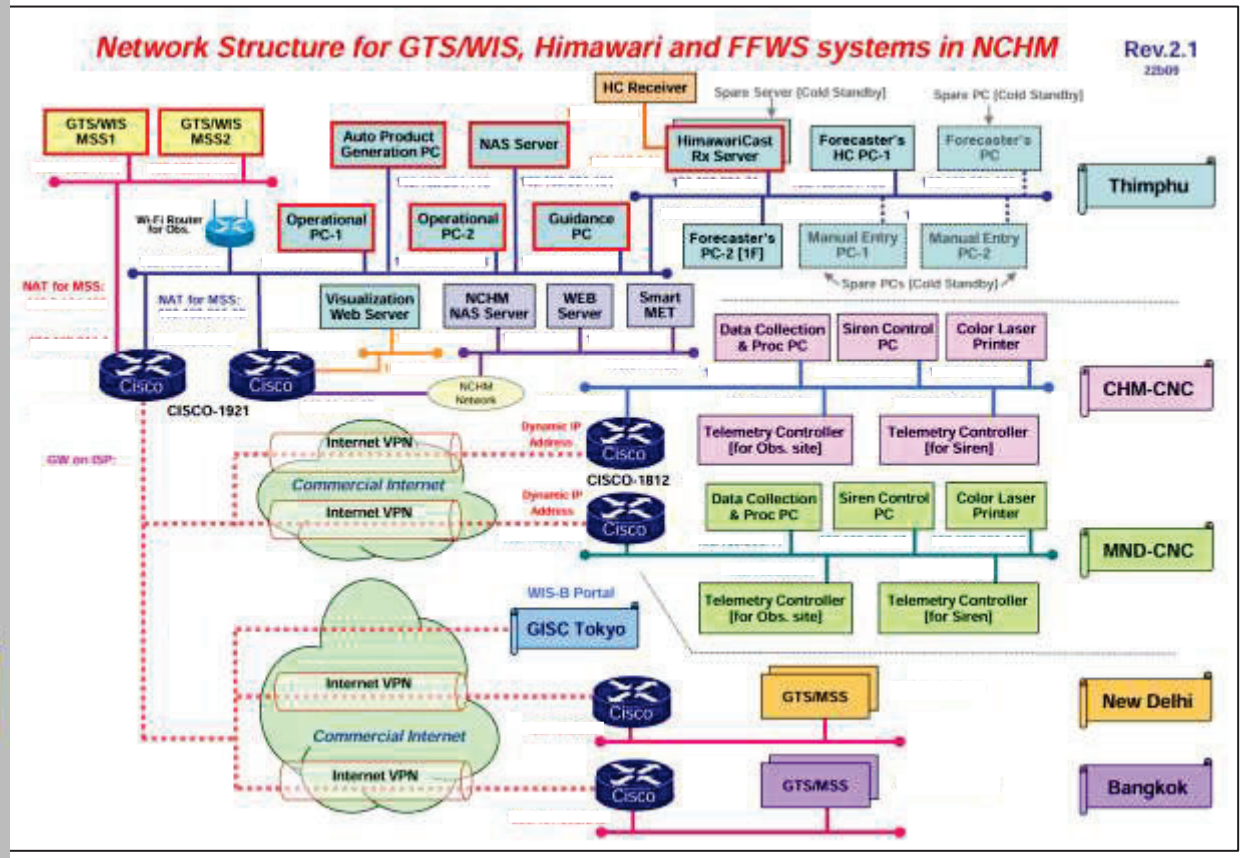
1. Status of system/network configuration

3. GTS/WIS



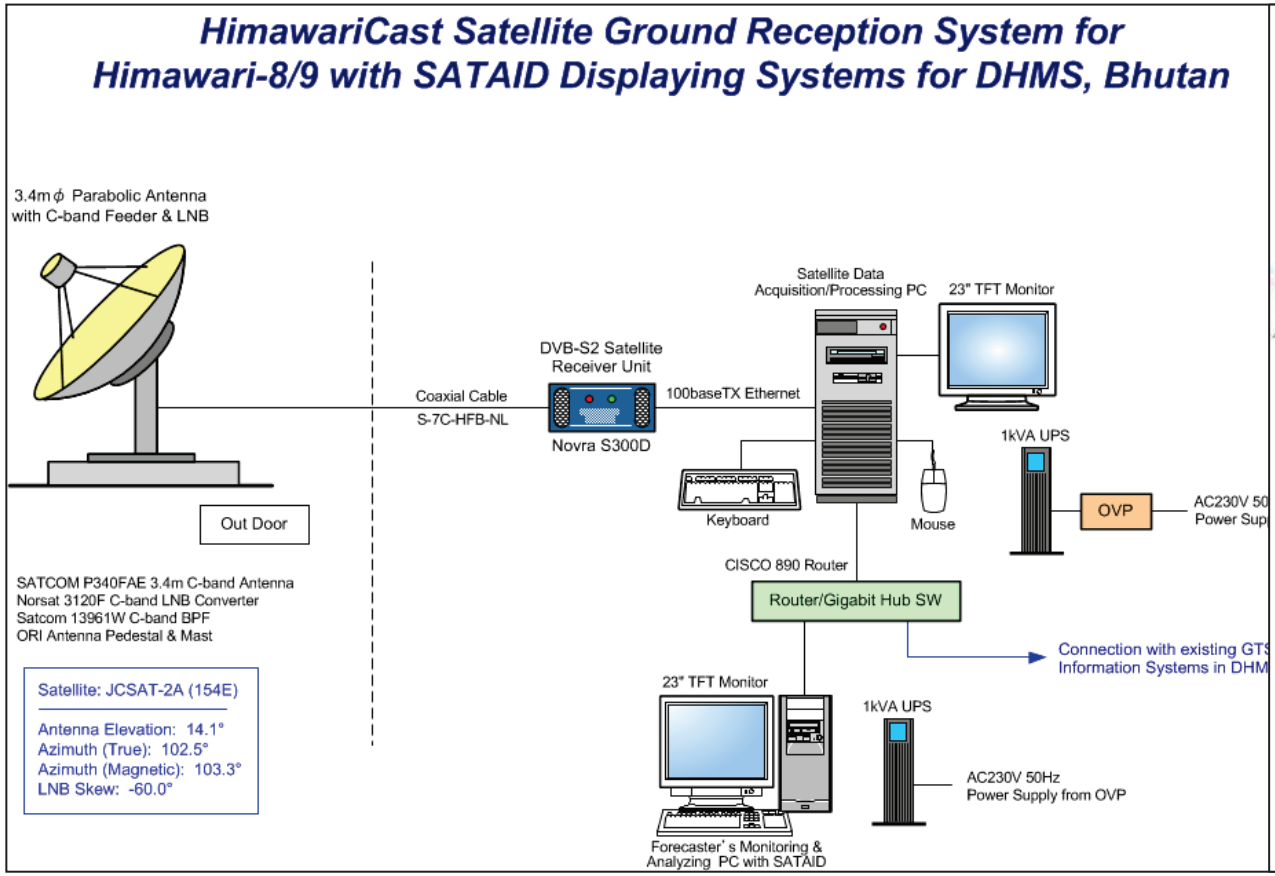
1. Status of system/network configuration

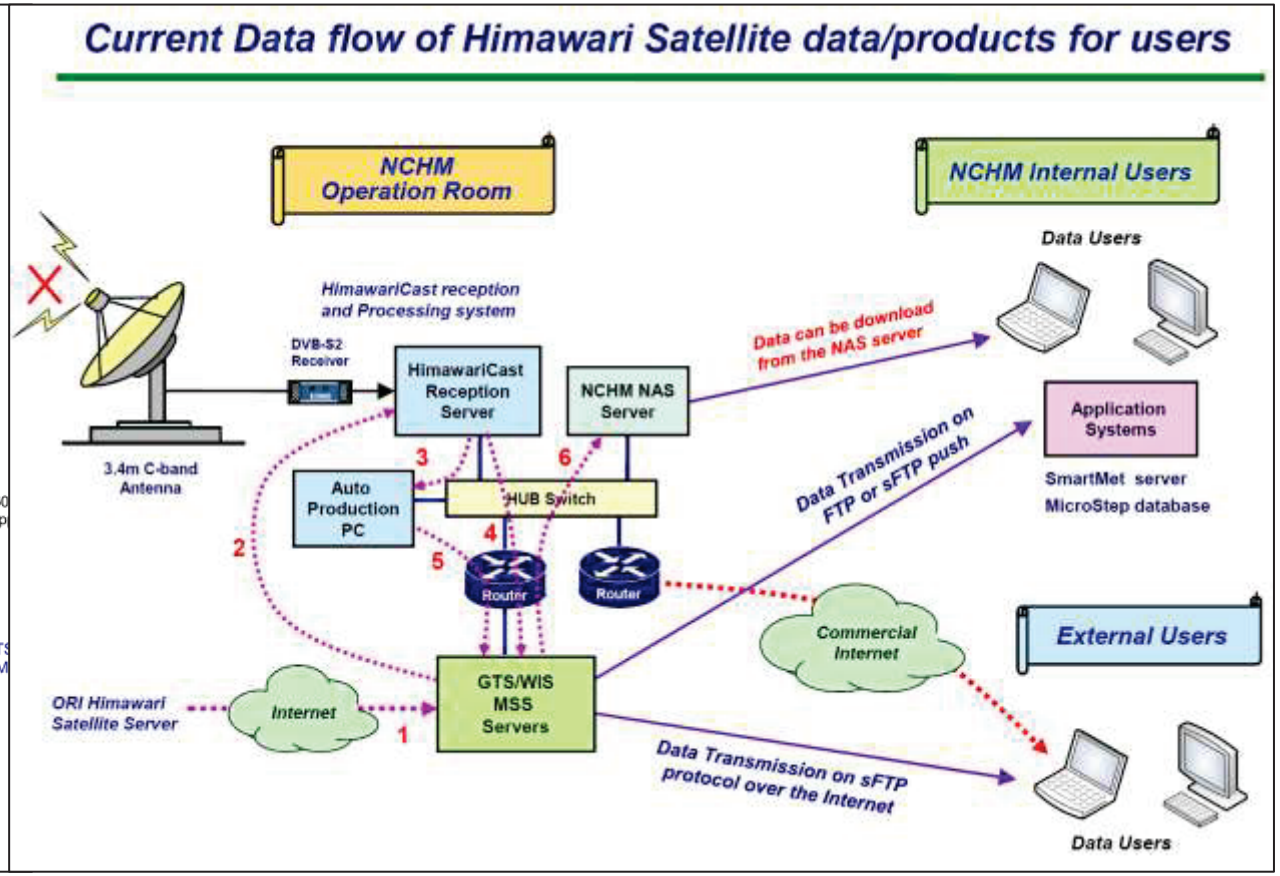




1. Status of system/network configuration

4. Himawari





1. Status of system/network configuration

Year	Activity
August, 2015 (JICA Phase I Project)	The National Center for Hydrology and Meteorology (NCHM) first installed the GTS infrastructure and Satellite Animation and Interactive Diagnosis, SATAID version 3.00. through which the Himawari satellite images were downloaded from the WMO Information System, WIS portal
March, 2016 (JICA Phase I Project)	• Commenced the GTS data reception • An independent reception antenna was installed which enabled the Center to download the images directly from the satellite
June, 2016 (JICA Phase I Project)	• Commenced transmission of local data (AWS Tsampa) at 00 UTC and 12 UTC manually • Quick guide to SATAID and weather analysis using SATAID were provided by experts from Japan Meteorological Agency at the Center in Thimphu. Few members from the agency also travelled to JMA for further capacity enhancement. OJT were provided on GTS operation and maintenance.

1. Status of system/network configuration

Year	Activity
1 March, 2018	• The SATAID version was upgraded to version 3.2.0.4. With the new version of SATAID, we were equipped with the features of RGB color interpretation display function with the existing applications of NWP which the Center utilized for daily weather forecasting.
October, 2022 (JICA Phase II Project)	• GTS integrated with GTS/WIS • SYNOP data transmission preparation • The old Himawari servers were replaced with new servers. SATAID version was upgraded to version 3.3.0.1
November 2024	• Commencement of 5 SYNOP data transmission through GTS/WIS

1. Status of system/network configuration

SYNOP (FM-12) Contents	Timestamp	Download File
SMBT01 BTBH 060600 AAXX 06061 44500 13/// /0903 10201 20010 37689 40019 5//// 60005 7//// 8////= 44504 13/// ///// 10160 20001 37227 40039 5//// 60005 7//// 8////= 44508 13/// ///// 10212 20118 38012 40059 5//// 6///5 7//// 8////= 44509 13/// /1601 10288 20240 39746 40100 5//// 60005 7//// 8////= 44517 16/// /3203 10102 21071 36522 40011 5//// 60004 7//// 8////= 44519 NIL=	06-NOV 06:20 UTC	SYNOP (FM-12) BUFR (FM-94) BUFR-CSV

GISC:

New Delhi, India

Tokyo, Japan

2. Challenges of current system/network

1. Technical Infrastructure Challenges

- Limited national backbone: Bhutan's domestic ICT infrastructure is still developing. High-speed, redundant connectivity is required to reliably transmit GTS/WIS data to regional/global centers.
- Dependence on external links: Bhutan is landlocked and relies on international connections via India for global data exchange. Outages or bandwidth limitations on these links can disrupt timely data transmission.
- Equipment and software maintenance: WIS/GTS nodes require specialized servers, satellite terminals, and data relay systems. Maintaining and upgrading these systems demands technical expertise and stable funding.

2. Human Resources and Capacity

- Skilled personnel shortage: Running WIS/GTS nodes requires trained meteorologists and ICT professionals familiar with WMO standards, data formats and cybersecurity protocols.
- Training and retention: Continuous training is needed due to frequent updates in WMO systems, but small national meteorological services often struggle to retain trained staff.

2. Challenges of current system/network

3. Financial and Operational Limitations

- High cost of global connectivity: GTS circuits and WIS node maintenance require IT infrastructure costs. For a small country like Bhutan, budget constraints can limit system redundancy or upgrades.
- Procurement delays: Specialized meteorological ICT equipment is often imported, and procurement cycles can be long, delaying system upgrades.

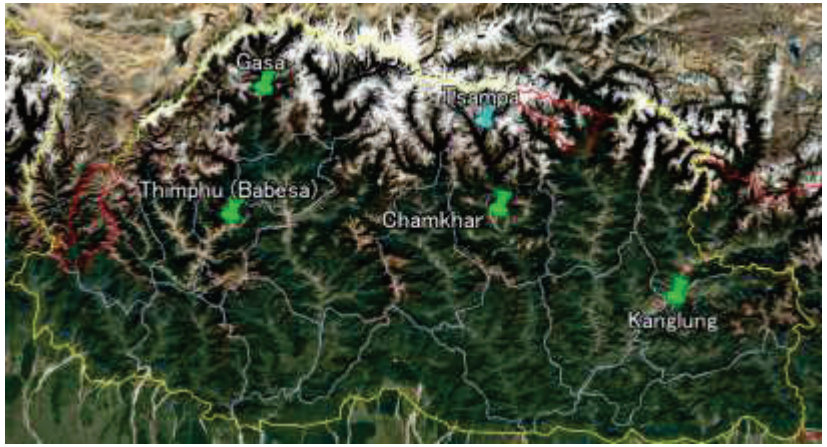
4. Data Management and Exchange Challenges

- Timeliness of data: WIS/GTS depends on real-time or near-real-time data exchange for weather forecasts and disaster warnings. Any delay in Bhutan's data input can reduce the value of regional/global forecasts.
- Data completeness and quality: Incomplete or inaccurate observational data from remote stations can affect the quality of global forecasts.

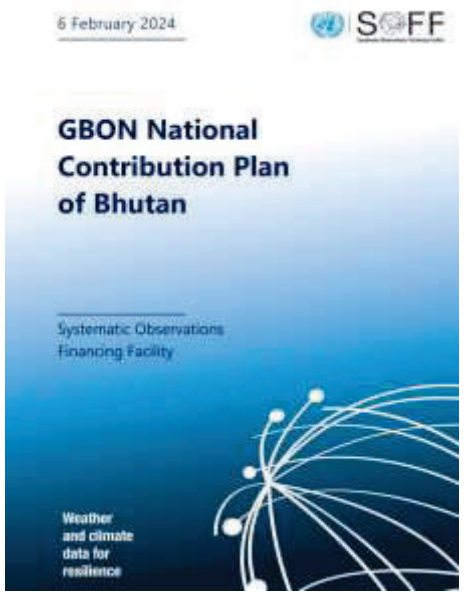
4. Coordination with regional WMO centers: Timely reporting requires coordination with the RA II (Asia) WMO Regional Telecommunication Hub, requiring consistent communication and operational alignment.

3. Status of WIS2.0

- NCHM is working to strengthen its observation, data sharing and international connectivity capacity; for example, in November 2024 Bhutan began SYNOP reporting globally via GTS from multiple stations.



- A national gap assessment for Bhutan notes: Bhutan currently has only one surface station sharing via GTS internationally; the report flags “the lack of the WIS 2.0 capable interface” as a main gap
- The GBON (Global Basic Observing Network) national contribution plan for Bhutan also highlights the requirement to adopt a WIS 2.0 interface (e.g., WIS2-capable software such as “WIS2Box”) to support global data exchange from more stations.



3. Status of WIS2.0

- NCHM, Bhutan is implementing the Systematic Observation and Financing Facility (SOFF) project under the UNEP.
- The project will contribute to 1 upper air observation and 1 ground observation station, with GBON compliance.
- The data transmission will be through the WIS2.0, which will be implemented through this project.
- **Training is proposed to NCHM staff in May 2026, on the implementation of the WIS2.0 to Bhutan- requesting support from JMA for this training**

4. Challenges of the WIS2.0 of system

- Infrastructure and interface readiness: Bhutan will need to deploy a WIS 2.0 Node or equivalent interface so that NCHM can publish data/metadata in the WIS 2.0 architecture. (The national plan mentions using “WIS2Box” or similar).
- Capacity building and training: Technical staff need training on WIS 2.0 standards (metadata, topics hierarchy, node registration) and on modern web-technologies for data sharing.
- Policy and data sharing guidelines: Bhutan must ensure its national policies and data-sharing practices align with the WMO guidelines so that data is exchanged with appropriate licensing, access control, metadata.
- Connectivity and redundancy: Because Bhutan is mountainous and remote, ensuring reliable connectivity is important for real-time data sharing.
- Budget and maintenance: Procuring, installing, maintaining WIS 2.0 compliant nodes, metadata catalogues, and observation systems will demand resources.

Planned Actions and Roadmap for Bhutan's WIS 2.0 Readiness

- Through SOFF project, NCHM is establishing a new facility including automatic weather station + upper-air system (radiosondes) in Tsirang which would feed into international exchange.
- Increase the number of stations participating in international data exchange: Move from one station to many surface and upper-air stations. The diagnostics emphasize taking advantage of WIS 2.0's capability for "all existing stations" once interface installed.
- Implementation of WIS 2.0 interface (node registration, metadata catalogue, publish/subscribe etc). The diagnostics refer to "WIS2.0 interface implemented in SOFF could be utilised with reasonable effort".
- Strengthen policy and data sharing frameworks: aligning with the World Meteorological Organization (WMO) data policy/unified data policy, legislate more open sharing, build international links.
- Capacity development for staff, observers, remote station maintenance, data quality assurance.
- Improve observation network reliability, spares, remote station servicing given Bhutan's terrain.
- Strengthen ICT/backbone connectivity and redundancy to ensure timely data exchange (crucial for WIS 2.0).Continue institutional strengthening under Hydromet Policy (2023), with roadmap across service delivery, observation, ICT/information systems

4. Expectation to JMA and other countries

1. Technical Support and Capacity Building

- Provide technical guidance for deploying a WIS 2.0 node (hardware/software) in Bhutan.
- Support training on data formats, metadata standards, and web service protocols used in WIS 2.0.
- Assist in setting up observation stations (AWS, upper-air, radar) with WIS-compatible systems.
- Help Bhutan in maintenance procedures, quality control, and integration of national observations into regional and global systems.

2. Financial and Resource Assistance

- Co-funding station installation, upgrades, and connectivity infrastructure.
- Support procurement of WIS 2.0 software tools like WIS2Box or similar.
- Fund pilot projects for real-time data sharing and system testing.

4. Expectation to JMA and other countries

3. Data Exchange and Operational Coordination

- Act as a regional hub for WIS 2.0 data, helping NCHM publish and access global datasets.
- Facilitate testing and validation of Bhutan's WIS 2.0 node, ensuring interoperability with other countries.
- Share best practices on data quality, metadata cataloguing, and real-time reporting

4. Policy and Institutional Guidance

- Provide guidance on national data policies, licensing, and metadata standards aligned with WMO's unified data policy.
- Advise Bhutan on national strategies for hydromet services modernization, including integration with early warning systems and disaster risk management.

5. Technical Exchange and Regional Collaboration

- Promote regional cooperation (e.g., Asia-Pacific WIS network) for Bhutan to learn from neighboring countries' WIS 2.0 experience.
- Organize knowledge-sharing workshops, technical missions, and collaborative projects.

Thank you