Modernization of Hydro-Meteorological system: Challenges

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Outline

- Overview
- Modernization
- Present Status

1. Overview

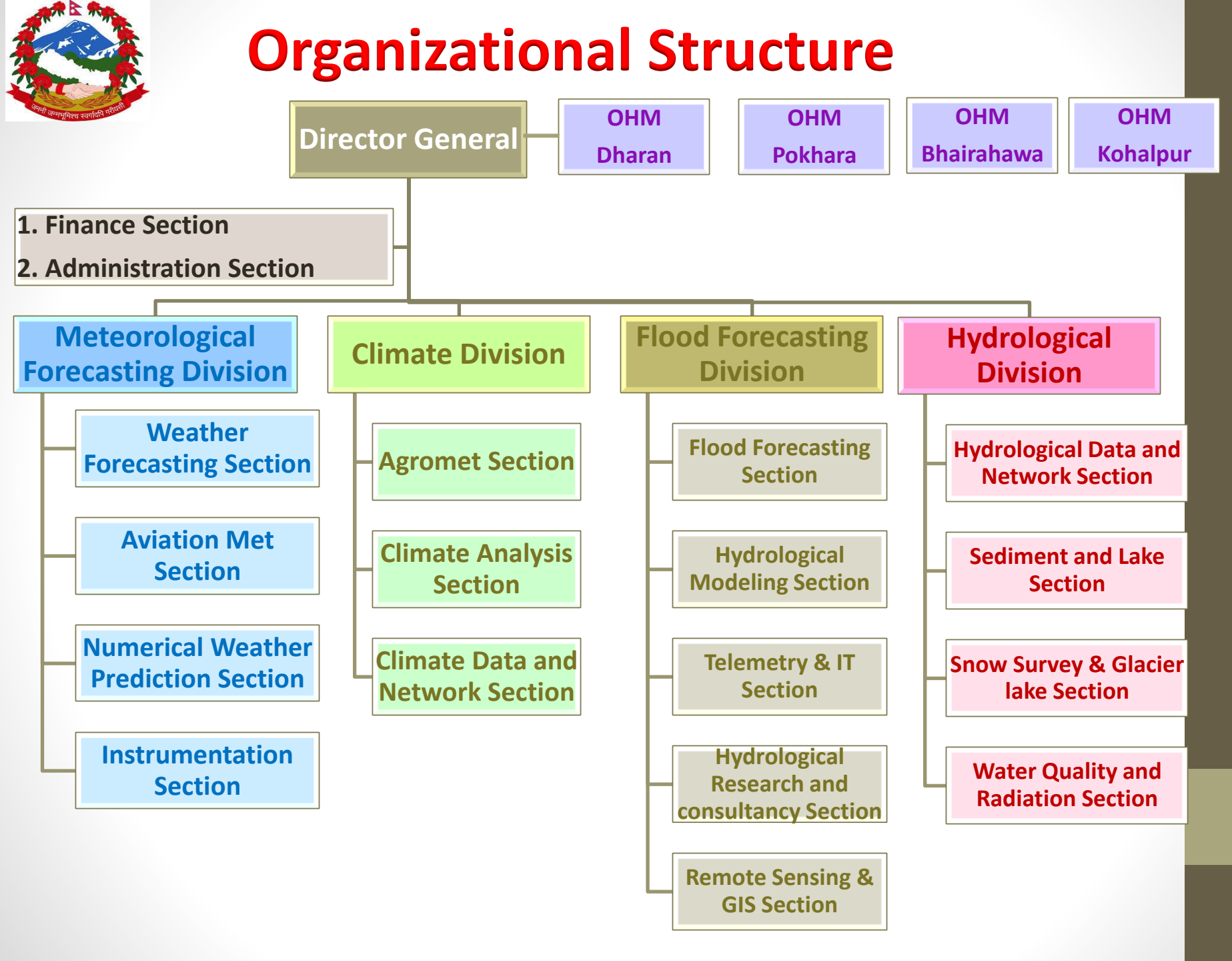
History

1962	Established as a section in the Electricity Department
1966	Became a member of WMO,
1967	Established as a Water Resources and Climate Department
1968	Public weather forecast started for Kathmandu
1968	First Climatological Records of Nepal (1966) published
1970	Started the first aviation Met Service
1988	Established as a Department of Hydrology and Meteorology
2013-2022	2013 -2020 Modernization of DHM

International Relations

1. Member with World Meteorological Organization (WMO)
2. BIMSTEC Centre for Weather and Climate को लागि सम्पर्क संस्था
3. Regional Integrated Multi-Hazard System for Africa and Asia (RIMES) को सदस्य
4. Focal Point for aviation Meteorology for International Civil Aviation Organization (ICAO)
5. International Hydrological Program (IHP) को Focal point

Organizational Structure



Meteorologist and Hydrologist

Offices	Total
Department, Kathmandu	128
• Office of Hydrology and Meteorology, Dharan	40
• Office of Hydrology and Meteorology, Pokhara	38
• Office of Hydrology and Meteorology, Dharan and (Gautam Budha Int' Airport)	34
• Office of Hydrology and Meteorology, Kohalpur	38
Total	278
Part time Observers	700

Dedicated Services

- Weather forecast 24/7 -365
- Aviation Met Service 24/7 -365
- Agromet Service
- Climate Service
- Flood forecasting service 24/y-monsoon
- Snow and Glacier service
- Meteorological and Hydrological Data

Weather forecast 24/7 -365 Days

- Three section working together to meet Aviation Met Service Demand
  - Weather Forecast Section
  - Aviation Meteorology Section
  - Numerical Weather Prediction Section
- Sub-daily to 3-day weather forecast updated twice a day
- Weekly weather outlook for agromet Advisory bulleting
- Media briefing
- High mountain weather forecast
- Public weather calls
- VIP calls
- Impact based forecast (Pilot Study)
- Seasonal forecast monsoon and winter

Dissemination

- Website, Emails, Social Media, Media (written and audio-visual)




- Press Release
- Flood Early Warning System by SMS
- Weather Early warning system not started yet

2. Modernization:

Building Resilience to Climate Related Hazards (BRCH) project

- Effectiveness Date : 20 June 2013 Original
- Project Completed November 2020

Financing Source

Strategic Climate Fund Grant: 16 Million
Strategic Climate Fund Loan: 15 Million

World Bank: US$ 31.0 Million
Government of Nepal: US$ 0.3 Million

Scope

Component A
Institutional Strengthening

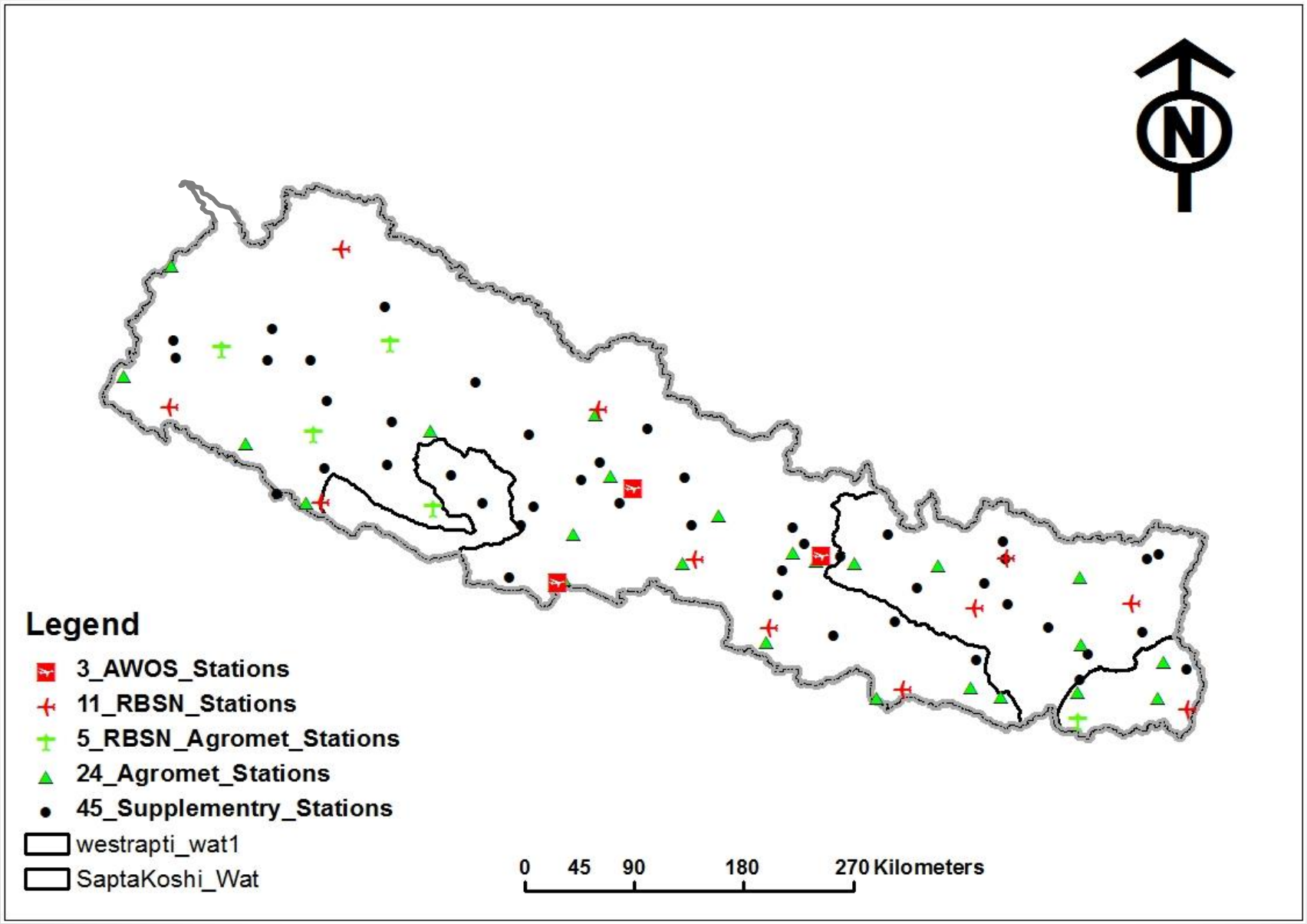
Component B
Modernization of the Observation Networks and Forecasting

Component C
Enhancement of the Service Delivery System

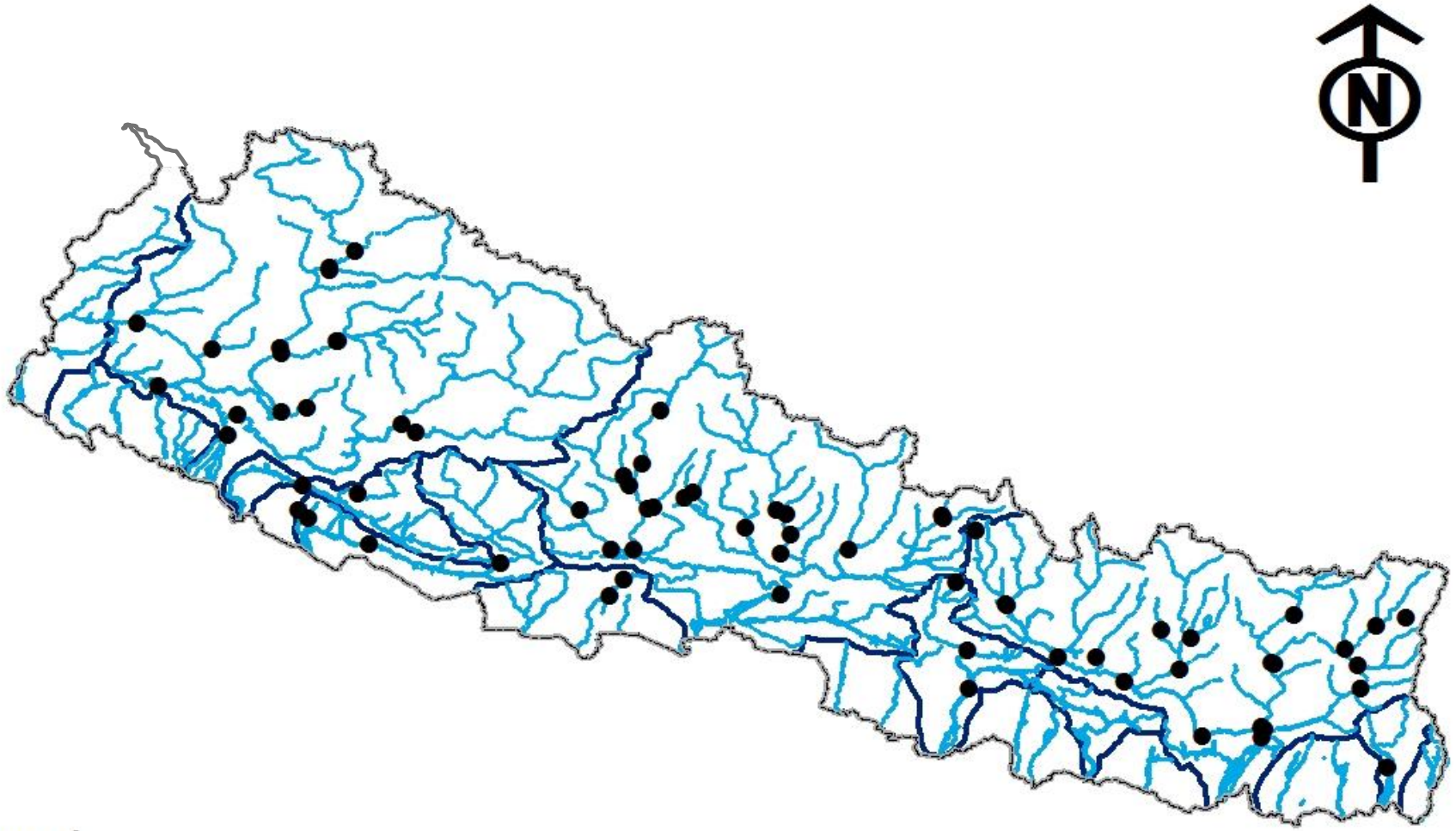
Component A: Institutional strengthening

- DHM institutional development and strategic planning (Not Completed)
- Development of a legal and regulatory framework for DHM (Not Completed)
- Users' satisfaction surveys (Completed)
- Cost recovery of DHM services (Not Completed)
- Capacity Development (Not Completed)

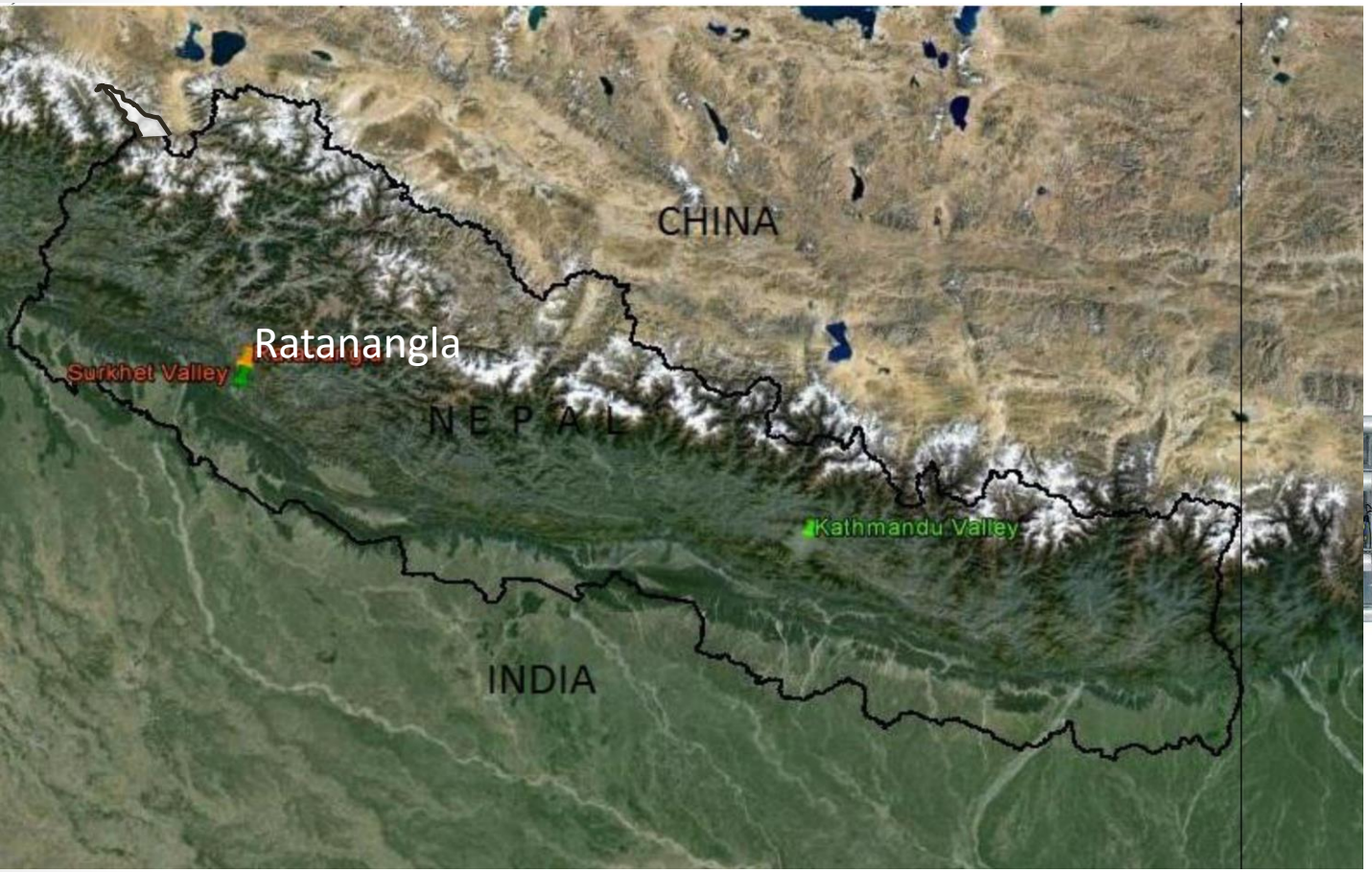
Added 88 Automatic Weather Stations (AWS)



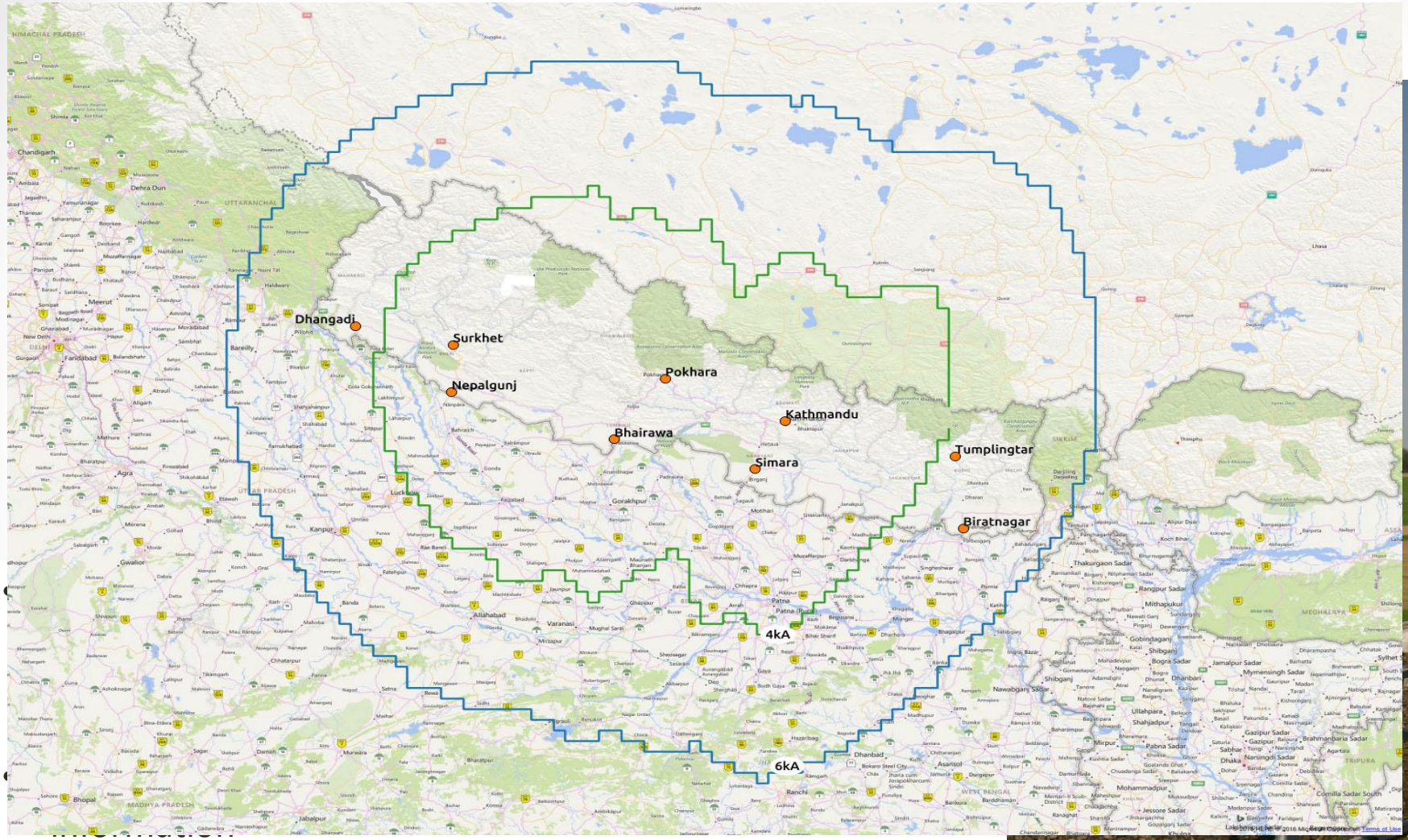
Added 70 Automatic Hydrological Stations



Doppler Radar at Surkhet



Lightening detection network



- Enable scientific research and risk analysis using archived lightening information

Radiosonde

- Upper Air Station in Kathmandu
- Once a day (5:45am)
- Issues tin ransferring data to WMO

ICT instruments for infrastructure development and management

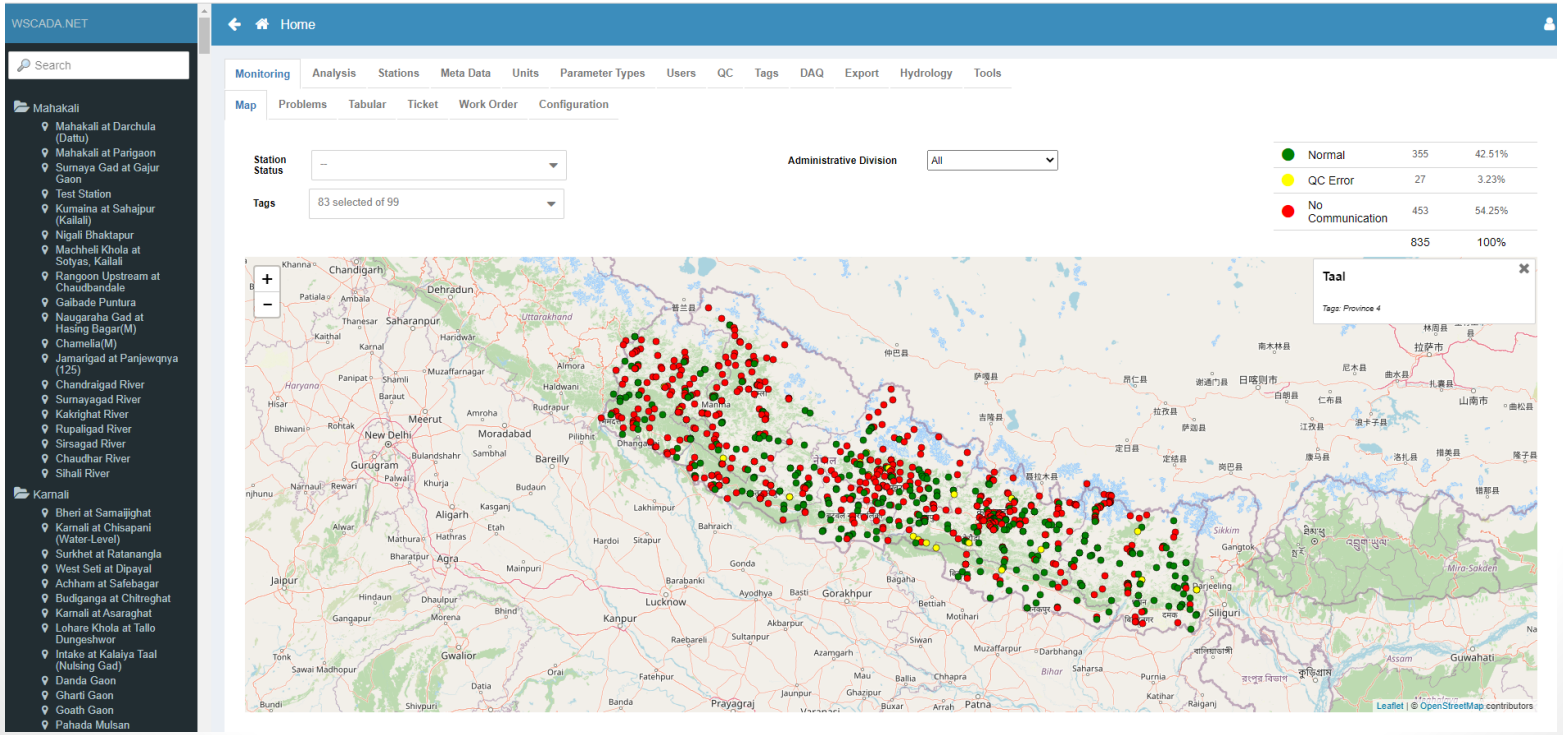
ICT infrastructure **hardware** (server, ethernet, firewalls/routers etc.)

and

Software (visualization, LINUX, etc.) which will be installed at NITC.

ICT infrastructure and Database management system

- Implement and operative ICT infrastructure
- Set up a data management system: automated for storing and processing hydro-meteorological data
- Delivery of data and products to various customer platforms.



High Power Computer (HPC) for Numerical Weather Prediction

- Minimum 512 core
- RAM 128 GB
- Storage system 32 TB expandable up to 64 TB

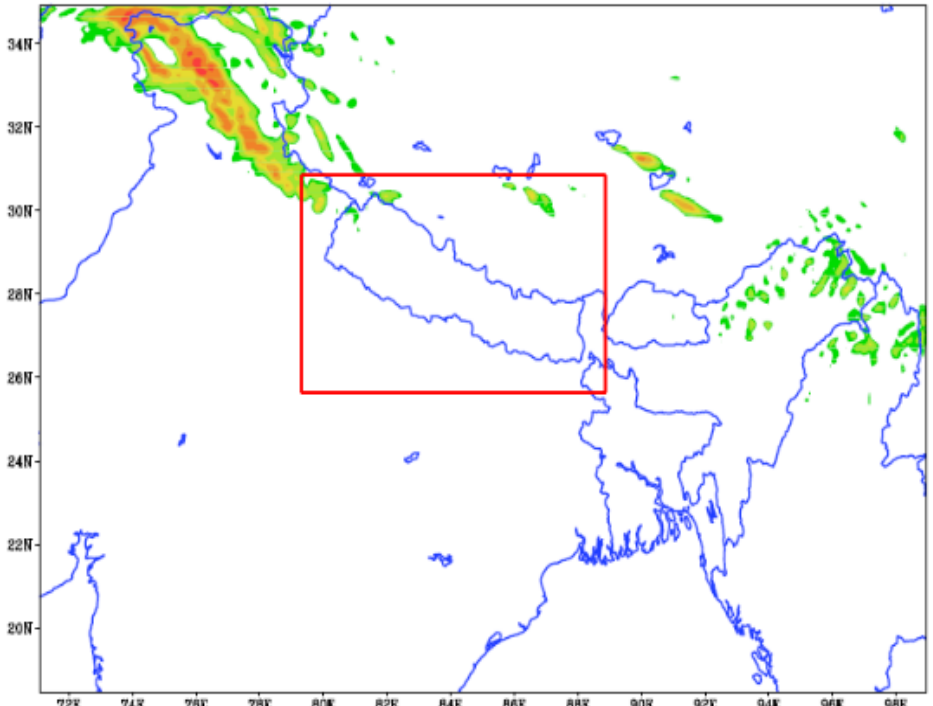
- Data retrieval from various sources (observations, radar, satellites etc.)

- Data storage and processing including 24/7 operation of a high-resolution NWP model
- Automated and computer assisted application and product generation

HPC Super Computer at the GIDC

High Resolution Local Area Numerical Weather Prediction System

- To provide short term weather forecast by establishing an operational High Resolution NWP system
- To provide quantitative precipitation forecast (QPF) for flood forecasting thereby Increasing lead time for flood warning.



Hydrometeorological workstations

- viewing all data, in spatial and temporal dimensions
- Challenges in operating

Calibration laboratory

- To calibrate meteorological instruments such as
temperature, humidity, pressure

TV presentation system at DHM

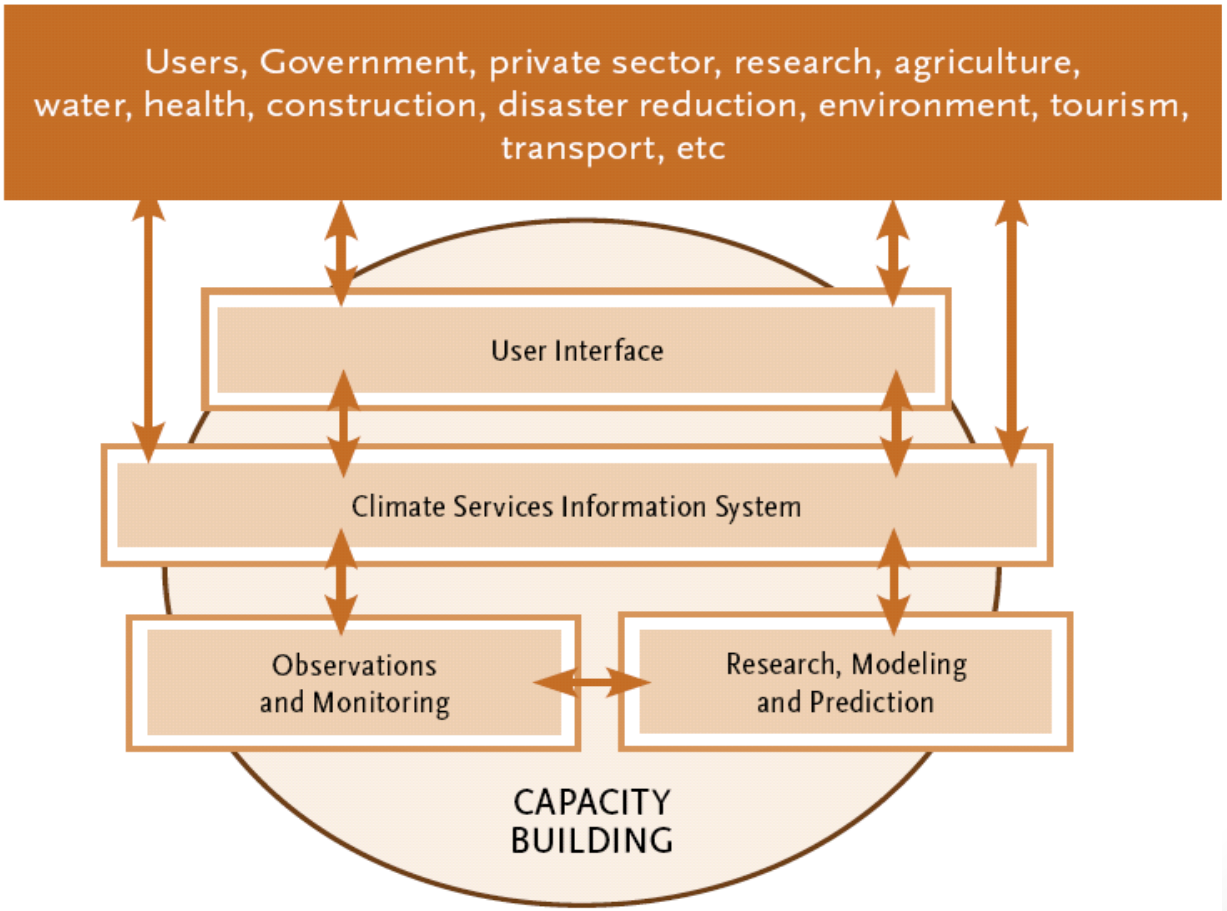
- Weather Broadcast
- Meteorologists will present the weather forecast
- Need Training and Staff

End to End Flood Early Warning System at Koshi and West Rapti Basins

- Development of model for an effective End to End Early Warning System (EWS)
- Establishment of fully operational real time End to End Flood Forecasting and EWS (72 hours)

National Framework for Climate Services (NFCS)

Could not Complete



Incomplete Activities

- Snow and Glacier station installation
- Development of NFCS
- Capacity building
- Organizational Restructuring
- Hydromet Act

Problematic Activities

- RADAR Operations
- Lightning Network
- Workstation
- Calibration Lab
- TV Studio
- Service Delivery
- NWP data Assimilation

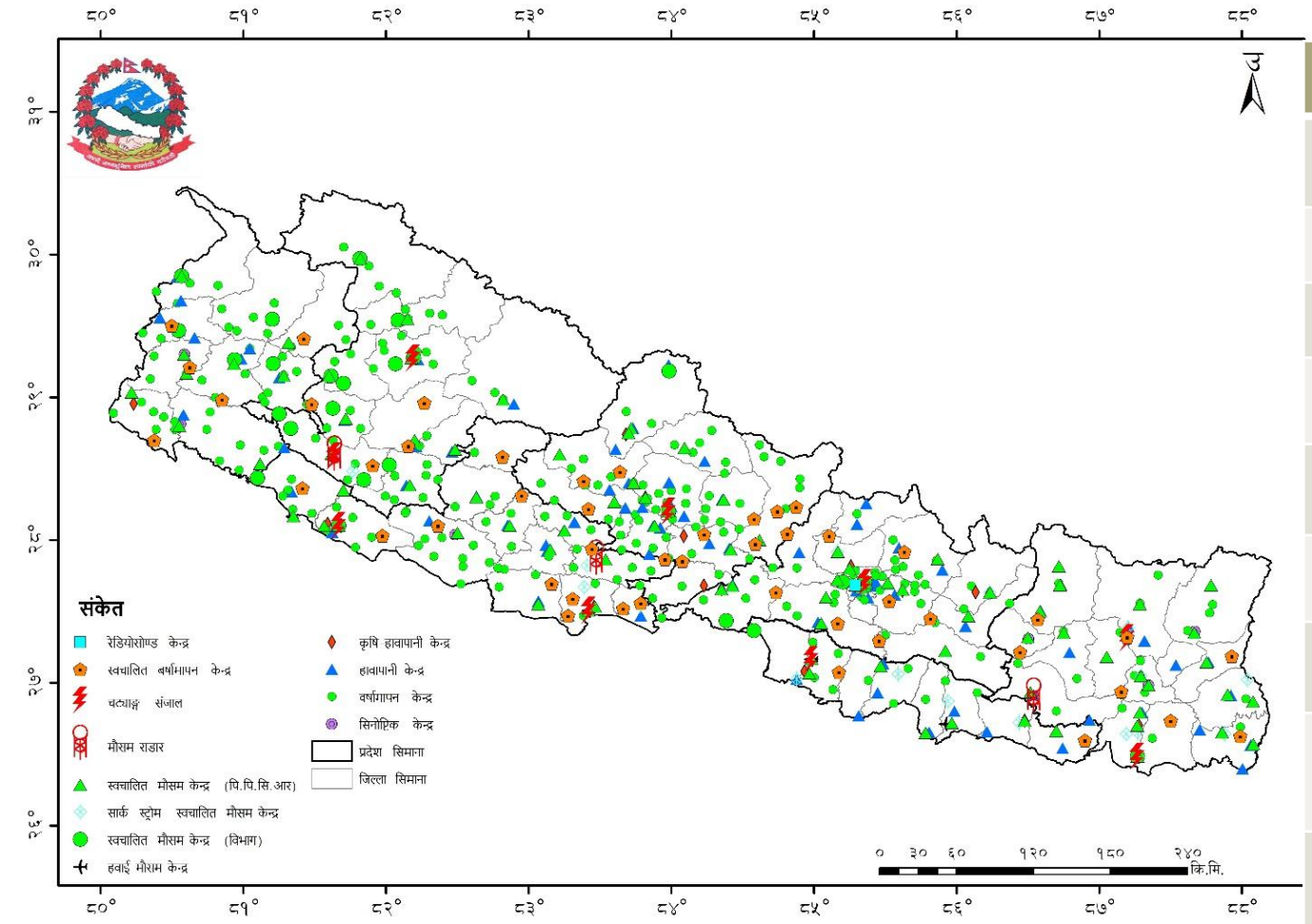
Lessons Learned

- Readiness
  - Procurement Trainings
  - Institutional Structure

- Sustainable Exit Plan was lacking
  - Infrastructure to Service Delivery
  - Continuous/focused capacity Development
  - Long-term Maintenance system inbuilt along with Capacity Development

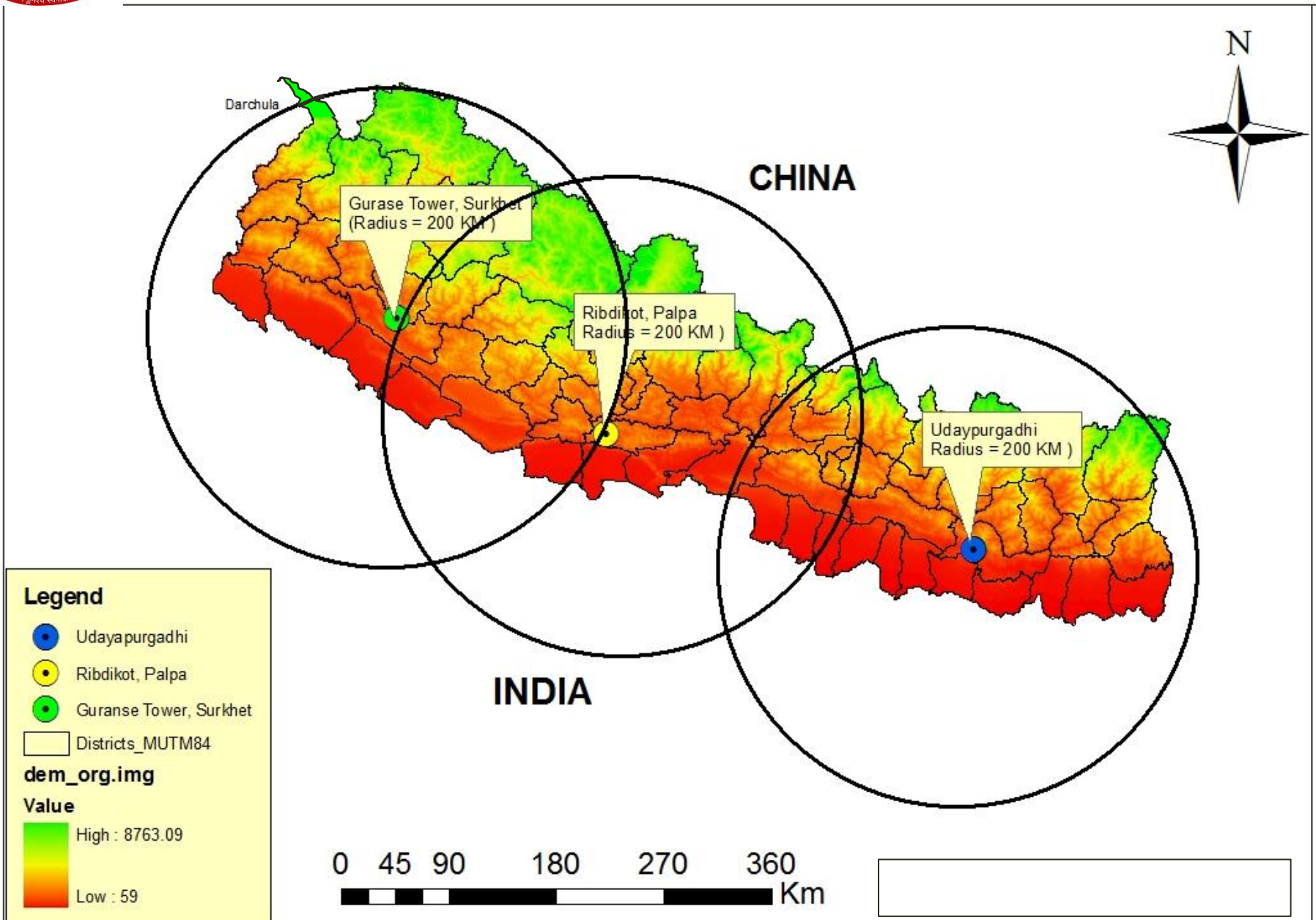
3. Current Status

Meteorological Stations Network

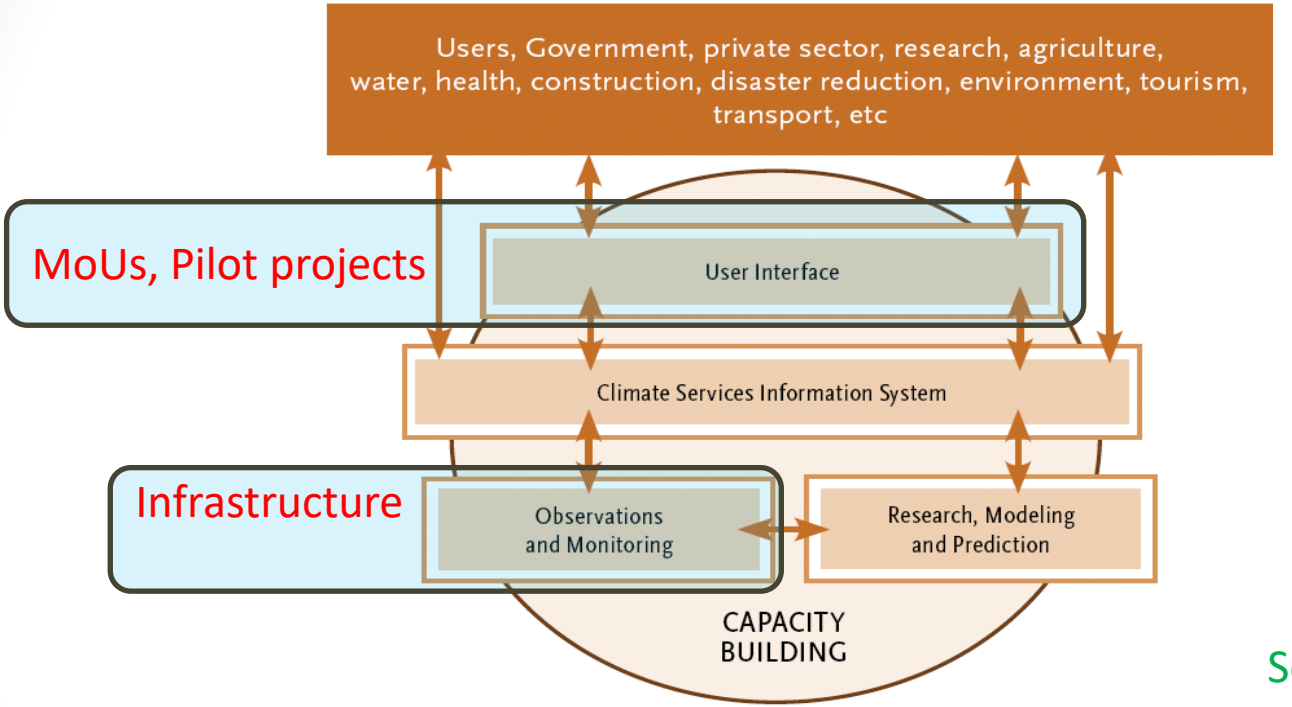


Station	No.
Precipitation Station	~500
Climate Station	~130
Agromet Station	32
Aero-synoptic & Synoptic Station	22
AWS (PPCR)	88
Lightning Station (PPCR)	9
Radar – Ratanangla, Surkhet (PPCR)	1
Radar – Udayapur, & Palpa (DHM)	2
Radiosonde Station– Kirtipur (PPCR)	1

Current 3 Doppler Radars



Achievements



Pilot Projects

- IBF
- Domestic Enroute Forecast
- Coldwave and Heatwave Alerts
- QMS-Aviation

Services Added

- Tourism
- Health
- Energy (Hydropower)

High Demand Services

Started as Pilot activity

1. Fog/shitlahar Forecasting
2. Domestic Aviation Weather forecast
3. Tourism Weather Forecasting (Piloting process)
4. Urban weather forecast (As per WMO requirement)[Providing service for 12 cities]

Need plans and projects

1. Sub-seasonal Forecast
2. MHEWS
3. Thunderstorm forecasting
4. Snowfall forecast
5. 7-day Forecast
6. Forecast for health
7. Location based Forecast for agriculture
8. Highway weather
9. Rainfall induced landslide warning

Challenges

- Science Communication
- Insufficient Human Recourses
- Operation and Maintenance of RADAR and Lightening Detection Network (lacking technical capacity)
- Product Development and Application of RADAR (need research)
- Improvement of NWP (need research)

Ongoing Activities

- Preparation of Hydromet Policy
- Preparation Hydro-Met Master plan
- Implementation SOFF
- QMS implementation in Aviation Met
- Piloting Impact Based Forecasting
- MoUs with Government Departments, NGOs, INGOs,

Thank You.