NMHSs Role in facilitating Climate Change adaptation at National Levels

(A Case Study of Pakistan)

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PMD

Meteorology  Hydrology  Seismology
Prime Minister’s Committee on Climate Change

Establishment of Global Change Impact Studies Centre (GCISC)

Establishment of NDMA

Automation of Meteorological Observing Network

Weather Stations 100
Climate Stations 26

Central data archiving Station
Automatic Weather Stations

Automation of 25 stations completed & 15 in process.
300 more AWS proposed.
Up-gradation of National Seismic Network for Pakistan (Approved June, 2005)

National Tsunami Early Warning Centre (TWC), Karachi

National Seismic Control Room Peshawar

National Geophysical Centre Quetta

RADAR NETWORK OF PMD

5 cm radar at Islamabad

10 cm radar at FFD Lahore

Area covered by Doppler radar at Lahore
SATELLITES FOR DATA ACQUISITION

Meteo-SAT-7
NOAA Series
Chines Satellite

Drought/Environment Monitoring & Early Warning Centre

Project Components

- National Centre for Drought/Environment Monitoring
- Regional Drought Centre

Additional data generation Resources in this project

- AWS 50
- Rain-gauge stations 500
- Soil Moisture & Underground Water situation Monitoring
SOURCES OF CLIMATE DATA & ANALYSIS

i. Climate Data Centre
   - PMD

ii. Weather & Climate Modeling
    - PMD & GCISC

iii. Agro-Climate Relationships
     - PMD, GCISC & Agri Universitiy F-Abad

Data Analysis Activities

- Internal driving forces
- External driving forces

Global Circulation Models (GCMs)

Global Forecast Models

Regional Forecast Models (HRM)

Grid Computing Facility

Forecast at 22 km x 22 km

- Flood forecast models
- River inflows

- Hydro-meteorological applications
- Crop-Weather Relationship studies
- Adaptation Measures

- Mitigation activities
- Early Warnings / Aviation Safety

- Agriculture
- Energy Demand
- Economic activities

Health / Environment

Livestock
Global Forecast Models

Global Circulation Models (GCMs)

Regional Climate Models (RCMs)

Global Climate Scenarios

Regional Climate Scenarios

Information at 30 km x 30 km

Information at 300 km x 300 km level

Crop-growth Simulation Models

Agriculture

Effects on Crop Yields

Adaptation Measures

Adaptation Measures

Area of NMHSs Activities at Present

Data Analysis Activities

Super Computer

Internal driving forces

External driving forces

Watershed Models

Mesoscale Climate Models (MMs)

Effect on River inflows

Information at Sub-km level

Simulation Models Currently in Use at GCISC

Regional Climate Models:
- RegCM3 (AS-ICTP, Italy)
- PRECIS (Hadley Centre, UK)
- WRF (NCAR, USA)

Watershed Models:
- DHSVM (Univ. of Washington, USA)
- UBC (Univ. of British Columbia, Canada)
- HEC-HMS (US Army Corps of Engineers)

Crop Simulation Models:
- DSSAT: Decision Support System for Agro-technology Transfer (Univ. of Georgia, Griffin, USA) comprising several families of models:
  - CERES (for cereals)
  - CROPGRO (for grain legumes)
  - CROPSIM (for root crops)
  - Other Crops (for Tomato, Sunflower, Sugarcane, Pasture)
Projected Temperature Change (°C) for 2080s by PRECIS (A2 Scenario)

Projected Precipitation Change (%) for 2080s by PRECIS (A2 Scenario)

Products to end Users

i. Next 24 hour Weather Forecast
ii. Next 2-3 days Weather Forecast for Farmers
iii. Weekly Weather Forecast
iv. Seasonal Weather Prediction
NMHSs are effectively contributing in minimizing Economic Losses across the globe.

Agriculture, power sector, water management, construction firms, kilns etc all are directly benefited from precise early warnings.

Few case studies are presented here.

Case Study 1: FLOOD WARNINGS IN 1997

Flood Forecasting Division (FFD) Lahore is a specialized unit of PMD for this purpose.

- **Responsibilities**
  
  i. Flood Forecasting
  
  ii. River stream flow forecasting
  
  iii. Water Management at Dams specially during Monsoon
Dear Doctor Sahib

I feel honoured to acknowledge the accuracy of Meteorological Department’s recent flood forecast during August, 1997 record rainfall. Early warnings and consequent pre-releases from Mangla Dam saved the country from flood damages of the tune of approximately 5 billion rupees.

With best regards,

sd/
(RIAZ AHMAD)
Director General,
Meteorological Department
H-8/2, Islamabad

Subject: IMPORTANCE OF WEATHER REPORTS FOR LOAD FORECAST.

Thanking you for the proposal attention to our requests. It will be appreciate to explain that daily weather reports help this centre in accurate Load Forecasts for the day. Based on Load Forecasts demand is placed on IPP’s thermal units.

On 2-7-1998 WAPDA saved Rs.12.3 million for not demanding HUBCO unit, as your report had a forecast of Rain at Lahore, which proved correct.

Concerned with weather of each city related to Load in turn, the undersigned shall be grateful if you supply us every minute weather details.

(HABIB ULLAH)
Chief Engineer NPCC
### Case Study 3: Impact on Agriculture

|---------------------|-----------------------|-------------------------------|-----------------------------------|-----------------------------------|-------------------------------|----------------------------------------|---------------------------------------------|-------------------------------------------|------------------------------------------------------------------------------------------------|

### Met. Observing Network in Pakistan

**AGROMET NETWORK**

- Rawalpindi
- Faisalabad
- TandoJam
- Quetta
- Usta Muhammad

**Agromet Observatories**

- Murree
- Kamra
- Jhelum
- Lahore
- Multan
- Khanpur
- Sargodha
- Sindh
- Multan, Larkana, Hyderabad, Balochistan
- Abbottabad
- Khuzdar
- Kalat
- Peshawar
- Quetta
Weather Services
For
MOUNTAINEERING

Weather For Mountaineers
One Day to One Week Outlook

Snow Storm
Blowing Snow
Wind Speed at Different Levels
Wind Storm
Visibility
Sky/Cloud Condition
Avalanches

Main Peaks in Pakistan

K2 - 8611m
Nanga Parbat - 8125m
Broad Peak - 8051m
Gasherbrum I - 8080m
Gasherbrum II - 8034m
Rakaposhi - 7788m
Batura II - 7762m
Chogolisa - 7665m
Noshah Peak - 7492m
Skilbrum - 7360m
Weather Services
For
MOUNTAINEERING

EverestNews.com

2005 Pakistan Meteorological Dept Warning for all K2 / Broad Peak / Nanga Parbat / G1 / G2 2005 Expeditions

WARNING: June 10, 2005

Due to unprecedented heavy snowfall in this winter especially over 5 around K2 / Broad Peak / Nanga Parbat / G1 / G2, the tracks/strengthen have changed; and the risk of avalanches (due to loaded-snow) will be high as compared to previous 5 years.

Shortly, the coming expedition season may be very hard.

Note: The publishing of the Pakistan weather reports yielded excellent results in the past. These forecasts have been used in the past with excellent results, however one should always be reminded these are forecasts and forecasts can be wrong. Climbing mountains is a very high risk activity where people die, many times due to the weather. So be careful.

Response to National Issues

WIND MAPPING SURVEY ALONG COASTAL AREAS
Response to National Issues

Potential area for wind power generation is around 9700 sq.km (Total power potential 11000 MW)

Extreme Events

i. Heavy Rainfall in Islamabad in 2001

ii. Tropical Cyclone in southwest of Pakistan in 2007

iii. Extended cold wave in Feb. 2008

iv. Extended drought in 2000 – 2002 in southwest Pakistan
Response to National Issues
Flash Floods Warning & Dissemination System

- Flash Floods Warning & Dissemination System
- Real-time Rainfall/Water Level Observation
- Judgement: 10 minutes
- Minimal warning activity
- Flood Forecasting
- Required evacuation time: 1 to 2 hours
- Good enough time to evacuate: 1 to 2 hours
- Integrated warning for evacuation
- Flood prediction time: 1 to 2 hours before flood
- To reach a specific water level for warning
- To start warning for evacuation
- To start river overflow
- To shorter required evacuation time by adequate evacuation plan
- Risky time zone causes loss of life

Shortfalls

- Capacity Building
- Acquisition to new tools & Technologies for speedy utilization of data
- Outreach to end users
- Effective dissemination System
- Maintaining Data Quality
Weakness of Pakistan in Confronting Climate Change Challenge

- Low technological and scientific base;
- Limited access to knowledge;
- Weak institutional mechanism;
- Low financial resources.

Regional Centres

- SAARC Regional Meteorological Research Centre
- Regional Climate Centre China
- Regional Drought Centre Iran
- World Data Centre for Greenhouses gases Japan
RA II (Asia) represent 35 Nations.

- Regional Climate Centers in China, Korea, Japan providing seasonal to inter-annual prediction for the region.

- Pakistan, India & some other countries issue seasonal forecasts (Winter & Monsoon Seasons) for planning and mitigation activities.

Strategic Plan (2012-2015) for RA-II

The Next WMO Strategic Plan shall:

(a) Invest in precise prediction and dissemination systems for high impact events.

(b) Help NMHSs developing geo-spatial based data distribution & Information system

(c) Help access to new tools & technologies for effective use of collected data.

(d) Standardize Key Performance Indicators so that the cumulative impact of the Organization’s performance can be measured.
How to Seek Strategic Plan Aims

The Strategic Plan be achieved through, among other things, assisting the NMSs:

(a) To develop and be provided access to appropriate databases, resources and expertise to produce appropriate advice and products for application sectors (such as agriculture, aviation, maritime and tourism) and for national development planning and for decision makers;

(b) To develop scientific methodology to provide climate information and climate predictions;

c) To strengthen services related to disaster mitigation, prevention and preparedness; environmental pollution monitoring; hydrology and water resources assessment and management;

(d) To develop a scientifically sound programme on weather modification; and

(e) To upgrade and modernize their Services including their infrastructure (buildings, equipment and facilities) and technology, and to have adequate qualified and trained staff.