Geo-referenced Information Systems for Disaster Risk Management Activities in DMH

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Outlines

- Introduction
- Roles and Responsibility of Department of Meteorology and Hydrology (DMH)
- Current Status in Use of Geo-reference Information for DRR
- Identified Gaps
- Expected Collaboration with ESCAP
Introduction

Meteorological, Geological and Hydrological Hazard in MYANMAR

- Tropical storms
- Strong winds
- Heavy rains
- Storm surges
- Continuous rain spell
- Tornadoes
- Thunderstorms
- Continuous dry spell
- Heat and cold waves

- Earthquake
- Land slide
- Tsunami

- River floods
- Flash floods
- Inundations
- Very low River water levels
- Very low ground water levels
- Heavy rain spells
- Droughts
Introduction

Meteorological, Geological and Hydrological Hazard in MYANMAR

Strong Earthquake in Myanmar

Tarlay Earthquake (2011)

Magnitude 7.0
Thabeikkyin Earthquake in Myanmar (2012)

Roles and Responsibility of DMH

- Meteorological Services in 1937
- Agro-meteorological Services in 1970
- Hydrological Services in 1964
- Seismological and Earthquake activities in 1961
- Acid Deposition Monitoring in 2003
- Issued Information, Forecasts and Warning
- Provide to decision makers, policy makers
- Early Warning System is main responsibility of DMH
Roles and Responsibility of DMH

Meteorological Stations

Agro-meteorological Stations

Hydrological Stations

Seismological Stations

Legend
- Radar Observation Stations
- River Level Stations
- Seismic Stations
GPS Stations for Fault Line Analysis

GPS installed on 2012
- Hakha
- Kani
- Shwebo
- Sint Gu

GPS installed on 2011
- Gyophyu
- Ingale
- Waow
- Kyaikhteeyo

Roles and Responsibility of DMH

Sea Level Gauge (for Tsunami Warning) installed on 2006 (donated by UNESCO-IOC)

- Tsunami Drill cooperate with IOC and RTSP's (Regional Tsunami Services Provider for Indian Ocean (India, Austrian, Indonesia)
- Issue Tsunami Warning for Indian Ocean every 2 year for Regional Drill
- Issue Tsunami Warning on Disaster day (14, October) every year for National Plan
Roles and Responsibility of DMH

- Meteorological Stations - 63
- Meteorological & Hydrological Stations - 39
- Hydrological - 30
- Pilot balloon - 1
- Agro-meteorological - 17
- Satellite receiving (MTSAT, FY-Cast) - 3
- Aviation Met. Offices - 6
- Seismological - 14
- GPS Station (Manual) - 8

Not yet installed or set up any Automatic Stations such as; (automatic Rain gauge, Flood monitoring and Warning System)
Roles and Responsibility of DMH

Simulation using WRF Model

For Daily Water Level Forecast
- River Stage Correlation Method
- Empirical Model (based on single and multiple regression analysis)
- Integrated Flood Analysis System (IFAS)

For Seasonal Water Level Forecast
- Based on flood characteristic occurred in Analogue years
- Based on seasonal weather forecast
- Based on comparison of current flow with the individual hydrograph for the last (10) years
- Based on the average flow of the last (10) years
- Based on the Flood frequency analysis
### Roles and Responsibility of DMH

**Warning, Bulletin, Forecast and News**

- Cyclone Warning
- Storm Surge Warning
- Flood Warning
- Untimely Rainfall Warning
- Fog Warning
- Heavy Rain Warning
- Aviation Weather Warning
- Low flow water level
- Tsunami Warning
- Port Warning
  - Agro-meteorological Bulletin
  - Bay Bulletin
  - Flood Bulletin
  - Special Weather Bulletin
- Daily Weather/Water Level
- 10 Days Weather/Flood
- Monthly Weather/Flood
- Seasonal Weather/River Flood Forecast
- Aviation Weather Forecast
- Marine Weather Forecast
- Special Forecast
- Earthquake News
- Rainfall / Temperature Records
- Cyclone News

### Roles and Responsibility of DMH

DMH has small own studio to broadcast daily weather forecast, severe weather disturbances passing through MRTV, MRTV-3, MRTV-4, MWD and various FM radios.

![Own Studio in DMH at NPT](image-url)
Roles and Responsibility of DMH

Normal Situation

Daily Weather Forecast Dissemination System

- Radio
- Newspaper
- Local Meteorological Office
- TV

- Higher Authority
- Communities

- Public
- Local Authority
- Public
Roles and Responsibility of DMH

- DMH set up Remote Sensing and Geographic Information System (GIS) Section on September, 2012.
- River network, Drainage Density, Catchment Area
- Generating Flood Hazard Map using model and field survey
- Establishing value added products using open source software such as JOSM, Open Street Map, QGIS
- Extract Flood affected area using microwave satellite images (before and during flood)
- Convert Excel Format data, Jpeg data to the Geo-referenced Data for the geo-data base

Current Status in Use of Geo-reference Information for DRR

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Flood Hazard Map for Zalun and Seiktha of Ayeyarwady Region

RIVER FLOOD ANALYSIS for the Homalin City, MYANMAR
Cooperation between JAXA, AIT (GIC), DMH
Establish a database of value added products and Flood maps for Hpa-an, Mandalay and Hinzada in MYANMAR

Cooperation between Sentinel ASIA (J AXA), AIT (GIC), DMH

- To show how value added products can be generated by combining information from the web and ground
- To establish a database of value added products
- To generate Flood maps by using Microwave Satellite images
Flood Maps using Microwave Satellite Images (Hpa-an, MYANMAR)

Overlay with Building from JOSM

Cooperation between Sentinel ASIA (J AXA), AIT (GIC), DMH

Flood Maps using Satellite Images (Mandalay, MYANMAR)

AVNIR2 images

HEC-RAS Model

SAR images

Cooperation between Sentinel ASIA (J AXA), AIT (GIC), DMH
Methodology for the Flood Disaster Risk Management

Preparedness Phase

- Satellite Data
  - Before Flood
  - During Flood
  - Change of Backwater

- Application of Flowrate of multiples of 20%22
  - Flood map 1
  - Flood map 2
  - Flood map 3

- Verification on the ground

- Selection of appropriate threshold for risk site

Emergency Response Phase

- Time of Disaster

- Activation of Disaster charter
  - Image Acquisition

- Flood Map for the site

- Overlaying/Compressing

Preparedness Phase

- Infrastructure footprint using DSM

- Value addition by
  - Field survey, secondary information

- Value added database

Seismic Risk Assessment for Mandalay City in MYANMAR

Cooperation between
Norwegian Ministry of Foreign Affairs, ADPC, DMH
Ongoing Project

- 3 Radar Stations (JICA)
- 30 Automatic Weather Stations (DMH Budget)
- 5 CCTV Flood Monitoring System (DMH Budget)
- Agro-Ecological Zone Map for Myanmar (ESCAP, RIMES)
- Flood Risk Assessment for Hpa-an City (UNDP, UNHABITAT)

Identified Gaps

- GIS base CCTV Monitoring and Controlling System for the flood and other weather data
- High resolution Satellite Images and Good DEM
- Lack in facilitating data sharing among the organization and public sector
- Incompatibility and non-standardization of data collected by different organizations.
- National wide risk assessment based on space and GIS technology
- Lack of infrastructure and man power
- Adequate facilities to promote current efficiency
- Learning and knowledge exchange, Technology support including hardware and software, Capacity Building, etc.
Expected Collaboration with ESCAP

- Facilitate for web based system for early warning as well data base management system for share data and information among the national and regional agencies
- Upgrade manual to GIS base CCTV flood monitoring system for some stations
- Establishment of GIS and Remote sensing Laboratory in Department of Meteorology and Hydrology (DMH)
- Enhancement of Capacity Building of GIS and RS division of DMH (Short Term/ Long Term Fellowship)

THANK YOU FOR YOUR KIND ATTENTION!