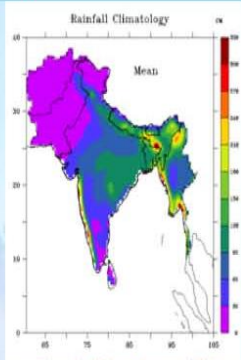


Weather Related Natural hazards occur throughout the year

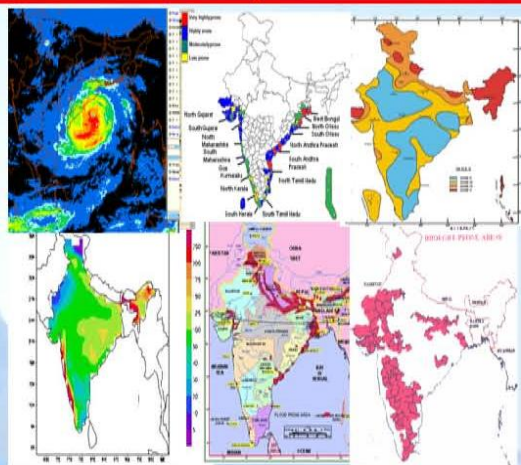
- ❖ WINTER (JAN-FEB)
 - ❖ WD
 - ❖ COLD WAVE, FOG, HEAVY SNOW, AVALANCHE
- ❖ PRE-MONSOON (MAR-MAY)
 - ❖ CYCLONIC DISTURBANCES
 - ❖ HEAT WAVE
 - ❖ THUNDER STORMS, SQUALLS
 - ❖ HAIL STORM
 - ❖ TORNADO
- ❖ MONSOON (JUN-SEP)
 - ❖ HEAVY RAINFALL, FLOODS
 - ❖ FLASH FLOOD
 - ❖ DROUGHTS
 - ❖ CYCLONIC DISTURBANCES
- ❖ POST-MONSOON (OCT-DEC)
 - ❖ NORTHEAST MONSOON
 - ❖ EASTERLY WAVE



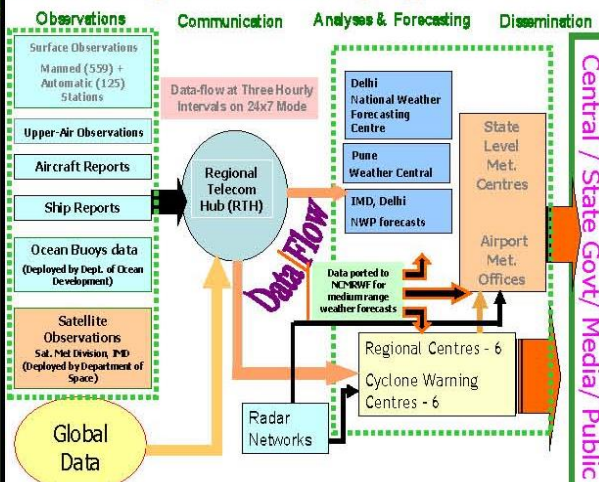
Near 90 % of loss of life due to natural disasters is caused by Weather, Climate and Water related hazards

Mapping of Major Natural Hazards

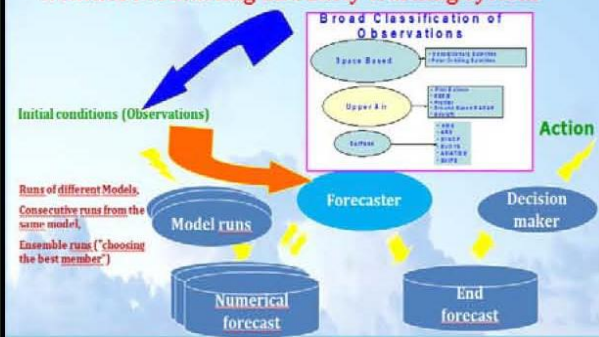
- | | |
|--------------------------------|---------------------------------|
| ❑ Floods - Days | ❑ Avalanches - Days |
| ❑ Earthquakes - Second/Minutes | ❑ Heat/Cold waves - Days/Weeks |
| ❑ Cyclones - Days | ❑ Tsunami - Minutes/ Hours |
| ❑ Droughts - Months | ❑ Thunderstorm - Minutes/ Hours |
| ❑ Landslides - Days | |



Weather Forecasting Services in IMD : An Integral Approach

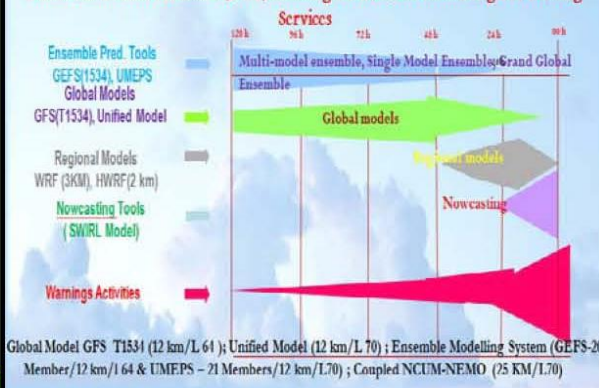


Weather Forecasting and Early Warning System



NWP Method

Numerical Weather Prediction (NWP) Modeling: Backbone for Forecasting and Warning



Weather Forecasting Services India Meteorological Department Ministry of Earth Sciences Government of India



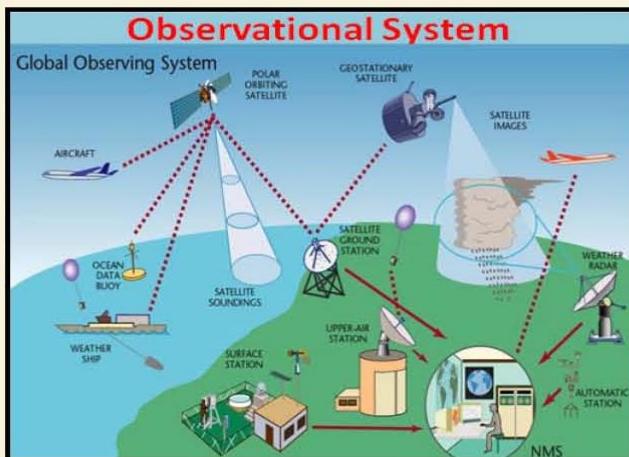
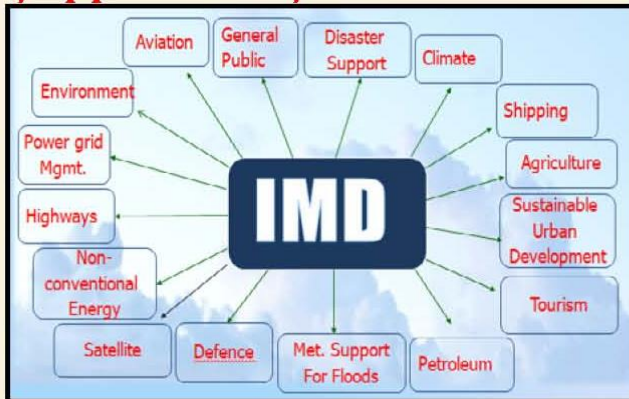
IMD: (Three Tier Forecasting Structure)

Level	Responsibility
NATIONAL	
NWFC	Met Subdivision Forecasting & Warning, Guidelines Developmental work.
PUNE	Documentation, Reports, National tools/Techniques.
REGIONAL	
RMC (06)	District-wise Forecasting/warning, other Forecasts.
LOCAL	
MC (21)	District-wise Forecasting/warning, other Forecasts.

Vision and Mission of IMD

- Meteorological observations & forecast for optimum operation of weather sensitive activities
- No weather hazard to go undetected and unpredicted
- Accurate warnings against hazards with reasonable lead time, triggering response from disaster managers and public to save life and property.

Major science themes /applications/services of IMD



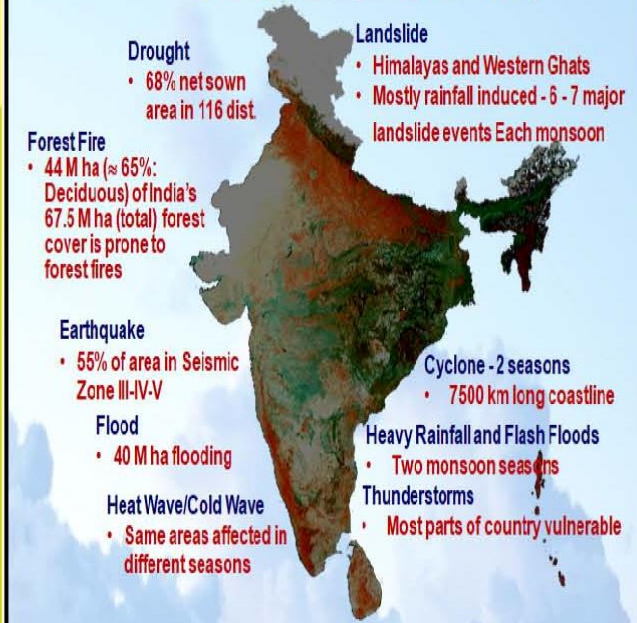
History of Weather Forecasting in India

- ❖ Early philosophical writings of the 3000 B.C. era, such as the Vedas and Upanishadas, contain serious discussion about the processes of cloud formation and rain and the seasonal cycles caused by the movement of earth round the sun.
- ❖ Varahamihira's classical work, the Brihatsamhita, written around 500 A.D., provides a clear evidence that a deep knowledge of atmospheric processes existed even in those times.
- ❖ It was understood that rains come from the sun (Adityat Jayate Vrishti) and that good rainfall in the rainy season was the key to bountiful agriculture and food for the people.
- ❖ Kautilya's Arthashastra contains records of scientific measurements of rainfall and its application to the country's revenue and relief work.
- ❖ Kalidasa in his epic, 'Meghdoot', written around the seventh century, mentions the date of onset of the monsoon over central India and traces the path of the monsoon clouds.

History of Weather Services in India

- ❖ First Meteorological observatory at Calcutta in 1785 and Madras in 1796.
- ❖ Asiatic Society of Bengal founded in 1784 at Calcutta, and in 1804 at Bombay (now Mumbai), promoted scientific studies in meteorology in India.
- ❖ Henry Peddington published 40 papers during 1835-1855 in the Journal of Asiatic Society on tropical storms and coined the word "cyclone".
- ❖ IMD used telegrams for collecting observational data and sending warnings.
- ❖ IMD was first organization in India to have a message switching computer for supporting its global data exchange.
- ❖ One of the first few electronic computers introduced in the country was provided to IMD for scientific applications in meteorology.
- ❖ India was the first developing country in the world to have its own geostationary satellite, INSAT, for weather monitoring.

Natural Hazards in India



Weather Systems affecting India

