



Resilient Atoll Nations in Productive Oceans

27–29 August 2019 • Kurumba Resort, Male', Maldives



Hazard to Risk **Multi-hazard analyses**

Atoll Adaptation Knowledge Sessions

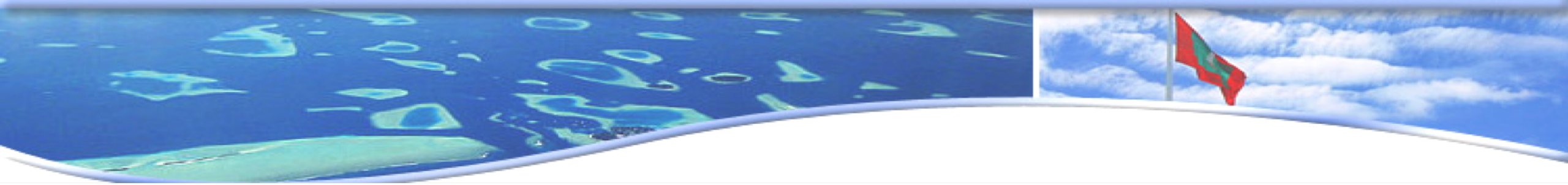
Ahmed Rasheed

ahmed.rasheed@met.gov.mv

Maldives Meteorological Service

28 Aug 2019

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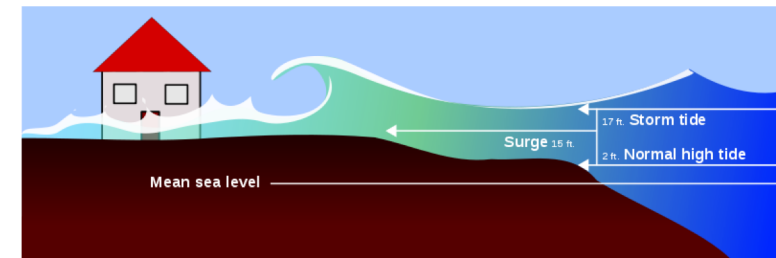
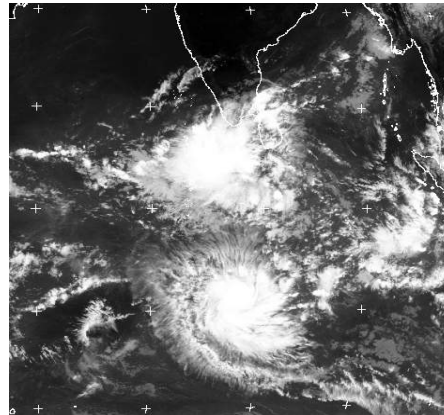
Meteorological & Seismological Hazards in Maldives

Meteorological Hazards

- Heavy Rain
- Flooding
- Strong Winds
- Squalls (*frequent gust*)
- Waterspout (*tornado*)
- Rough Seas
- Swell surge & Tidal Waves
- Tropical Cyclone

Seismological Hazards

- Earthquake
- Tsunami



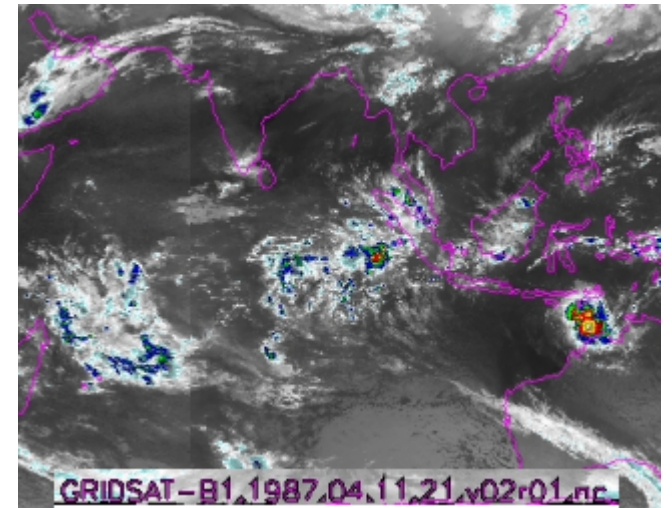
Some significant historical events-1

- **Tidal Waves (Swell Surge) in April, June and Sep 1987**

16 islands reported swell surge.

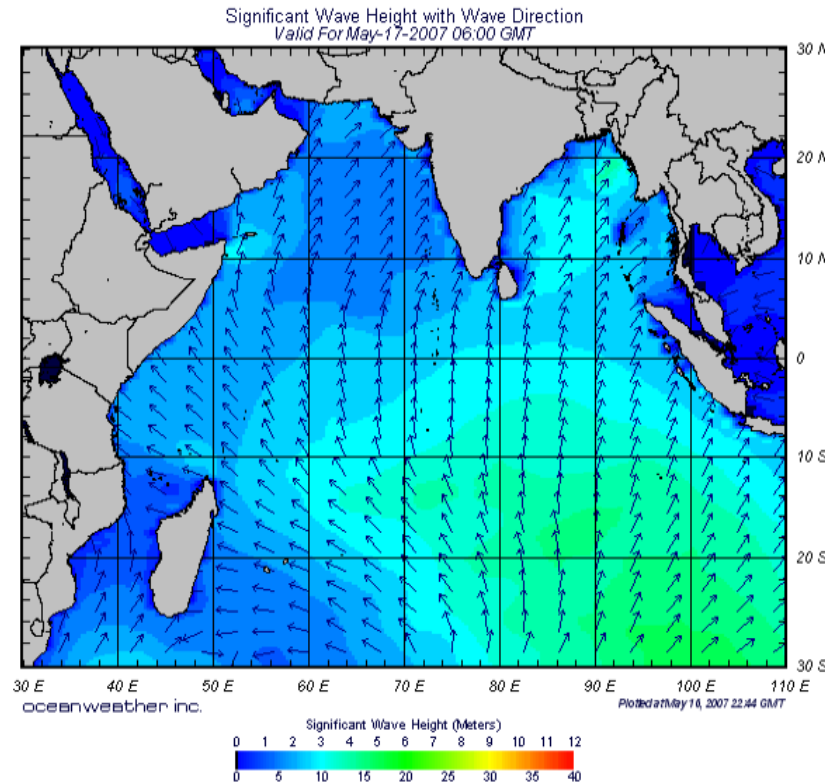
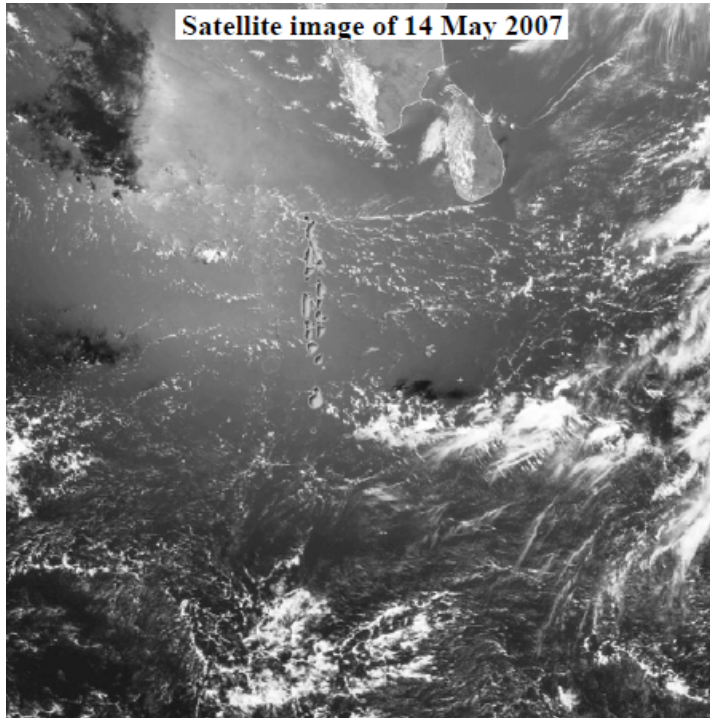
Flooding gave rise to an outbreak of serious diarrheal diseases.

300 peoples being evacuated and homeless in Male'



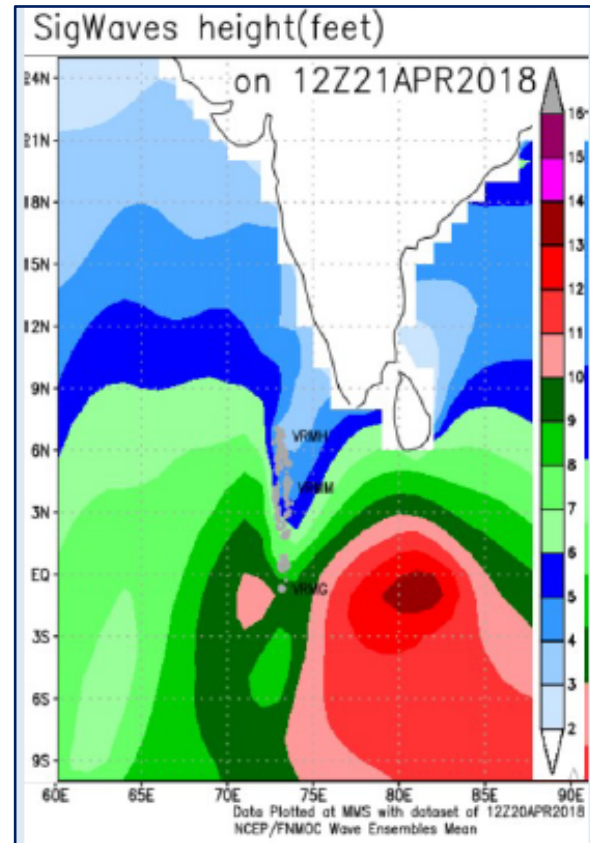
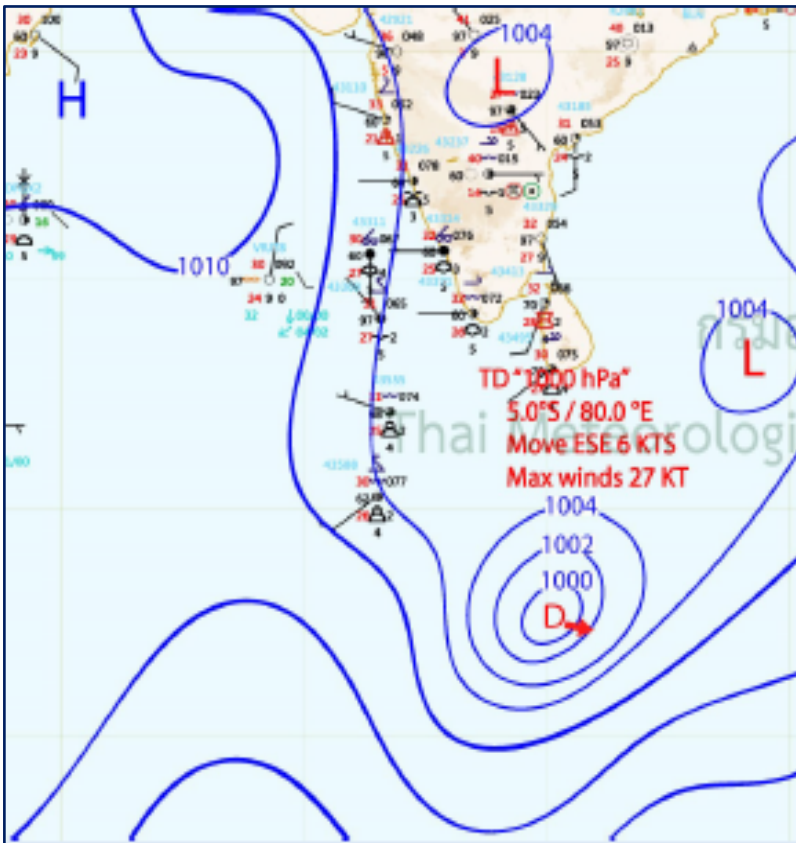
Some significant historical events-2

- Swell Surge and Tidal Waves : 15 - 17 May 2007
- 68 islands from Addu, Huvadhu, Thaa, Ari atoll and Male



Some significant historical events-3

Swell Surge, 20-21 April 2018



Swell surge in HDh. Makunudhoo on 21 Apr. NDMC,MMS,Council Viber group photo by Ahmed Athif

Swell surge in Th. Thimarafushi on 21 Apr. NDMC,MMS, Council Viber group photo by Rilvaan

Some significant historical events

Tropical Cyclone

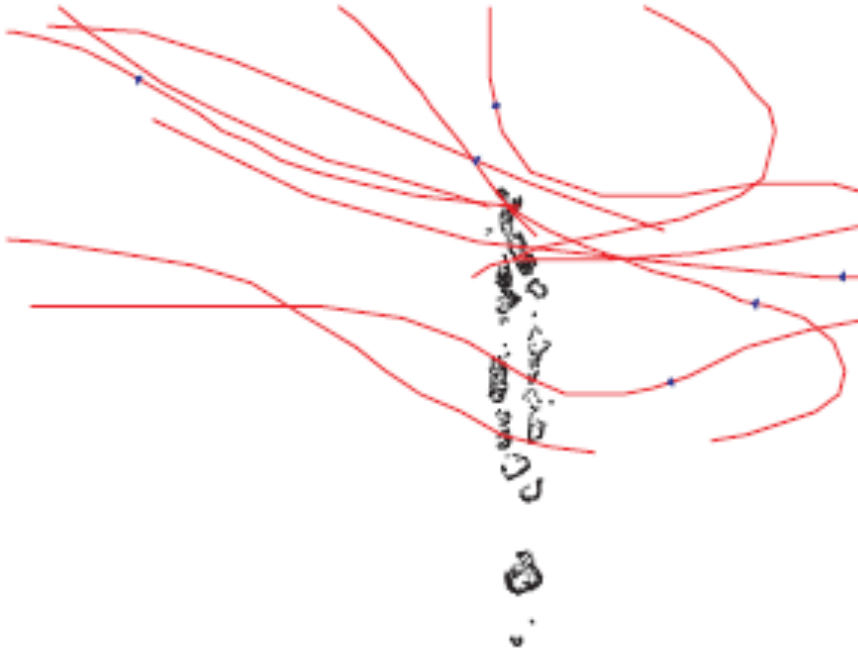
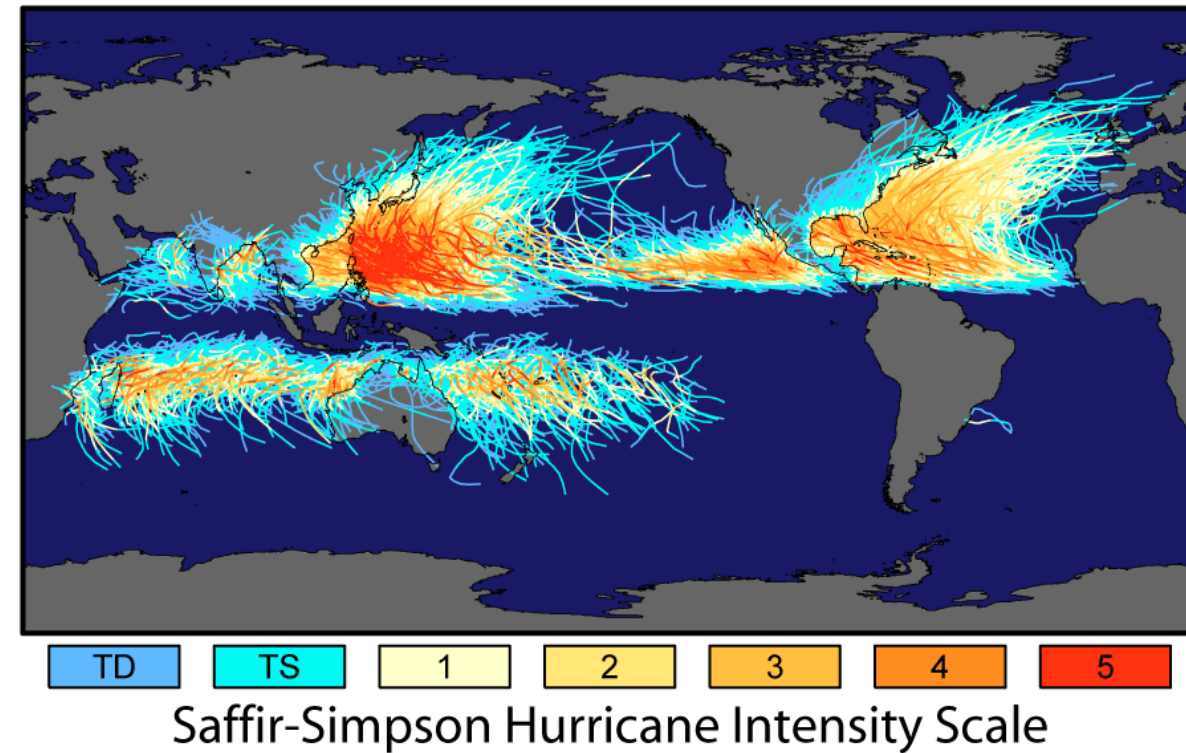


Figure 14: Tracks of Cyclones affecting Maldives, 1877-2004

Tracks and Intensity of All Tropical Storms



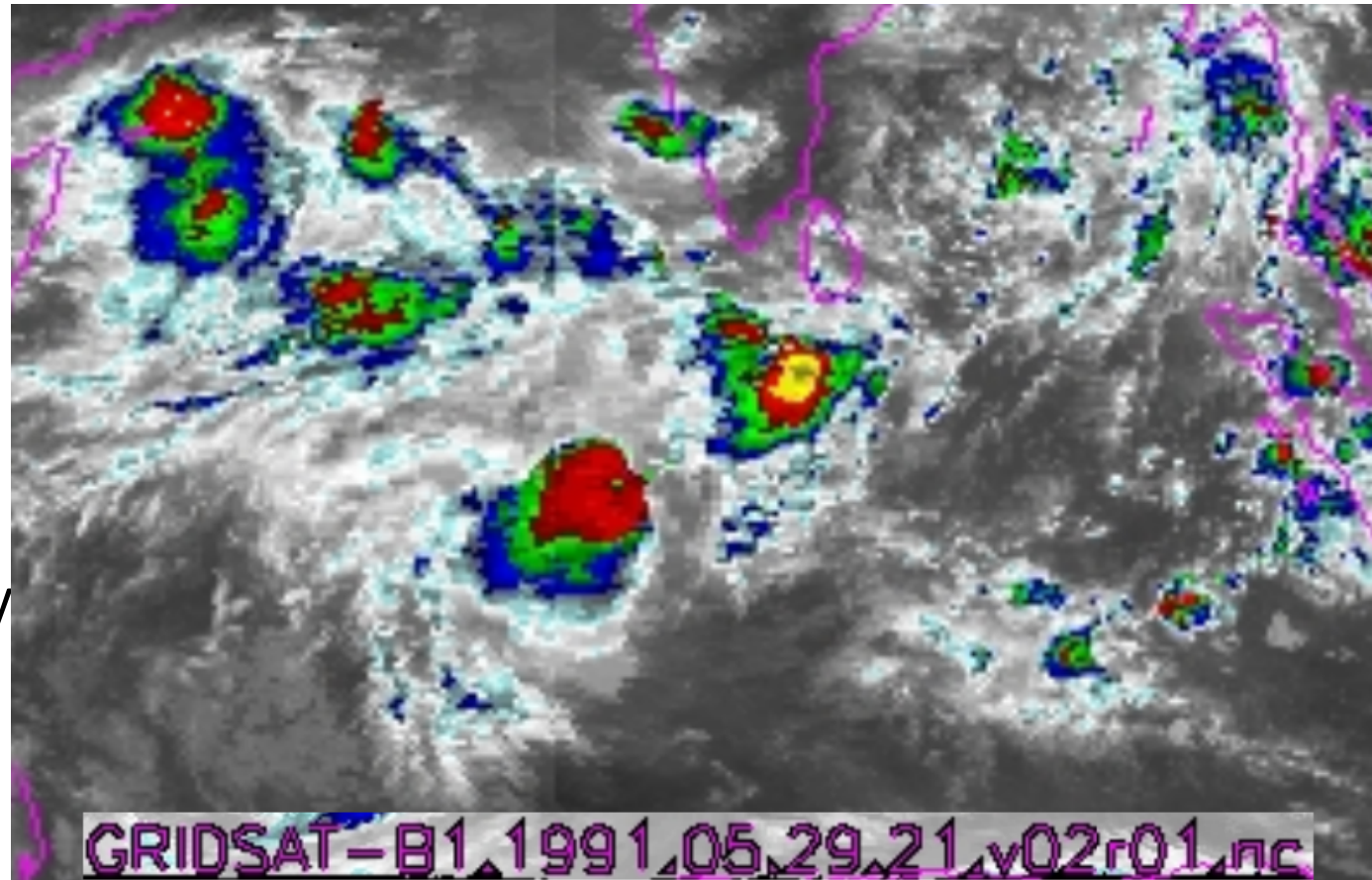
Some significant historical events - 4

Storm hit Addu Atoll in May 1991

The lowest ever recorded atmospheric Pressure of 997.3hPa recorded on 29th May at 2100 UTC.

Strong gust Winds of 92 – 103 miles

caused widespread damages to Addu city

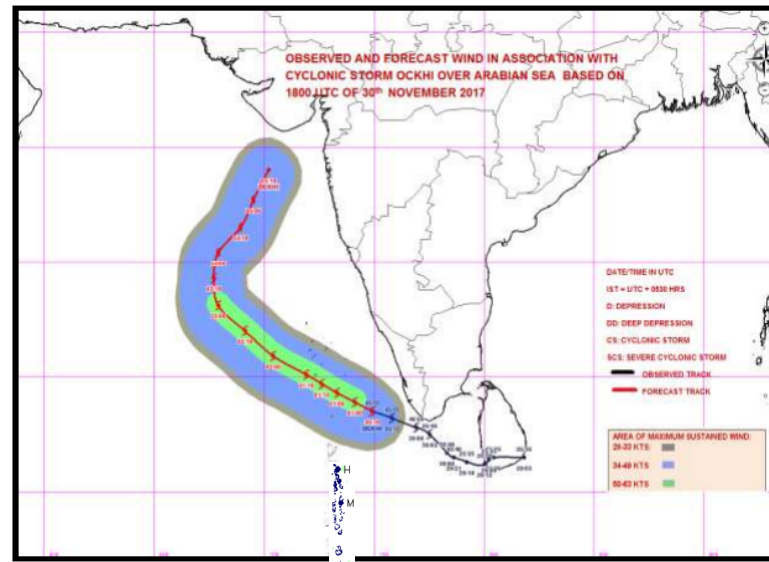
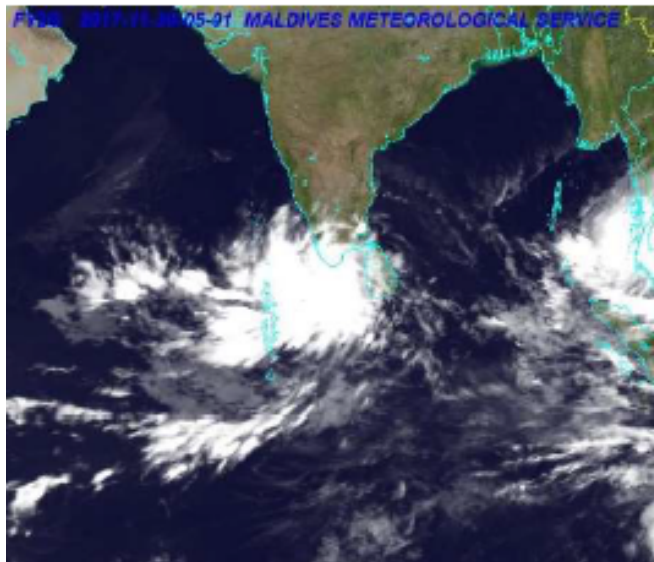


Some significant historical events - 5

Tropical Cyclone OCKHI

30 Nov 2017

- Homes in 57 islands across the Maldives were damaged
- 36 islands experienced flooding due to heavy rainfall
- A boat and a barge capsized due to rough seas



Some significant historical events - 6

Flooding South Huvadhu atolls on 9 Jul 2002

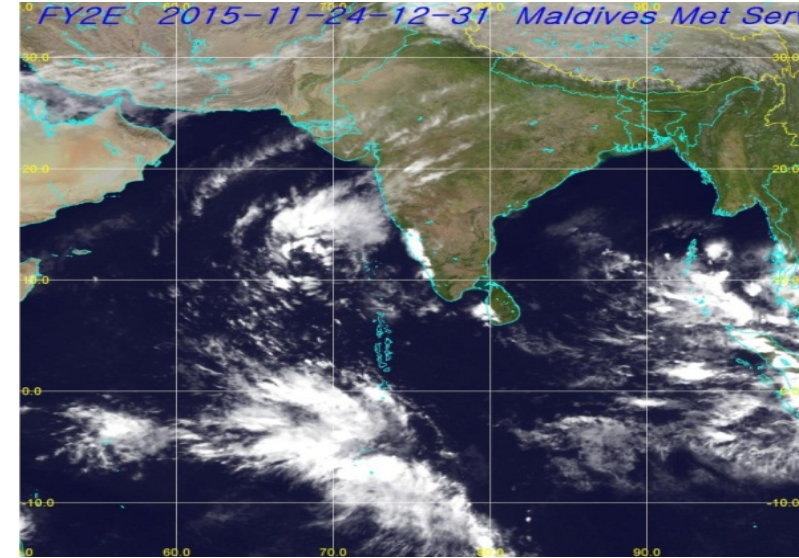
Record breaking rainfall of 219.8 mm was recorded at Kaadedhdhoo Met Office.

Many Houses Damaged due to flooding

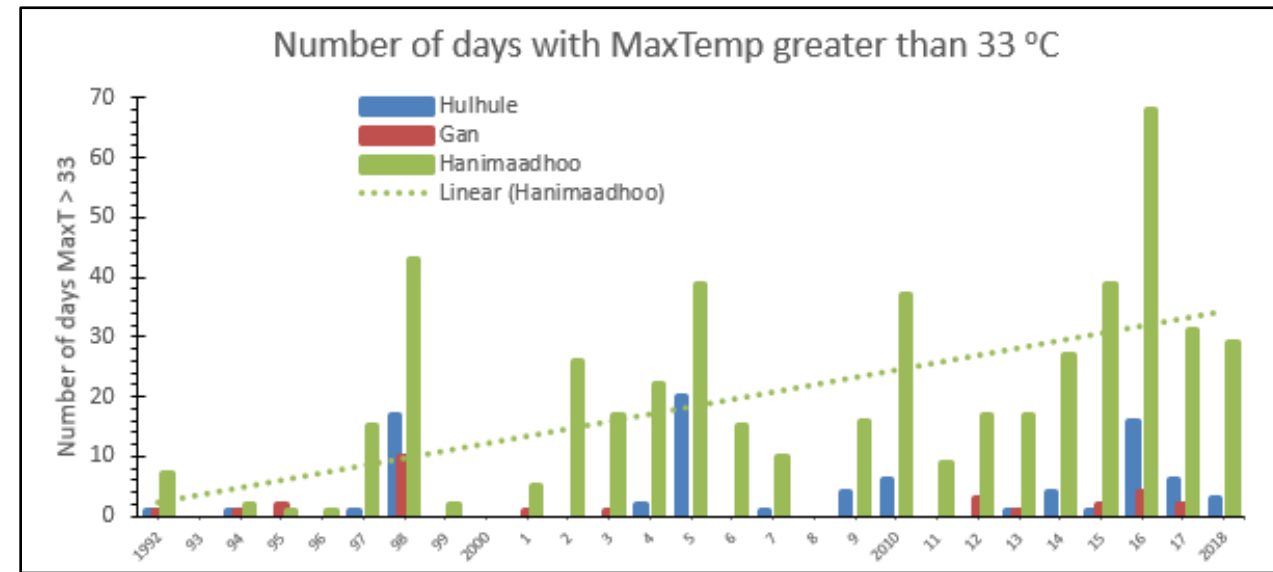
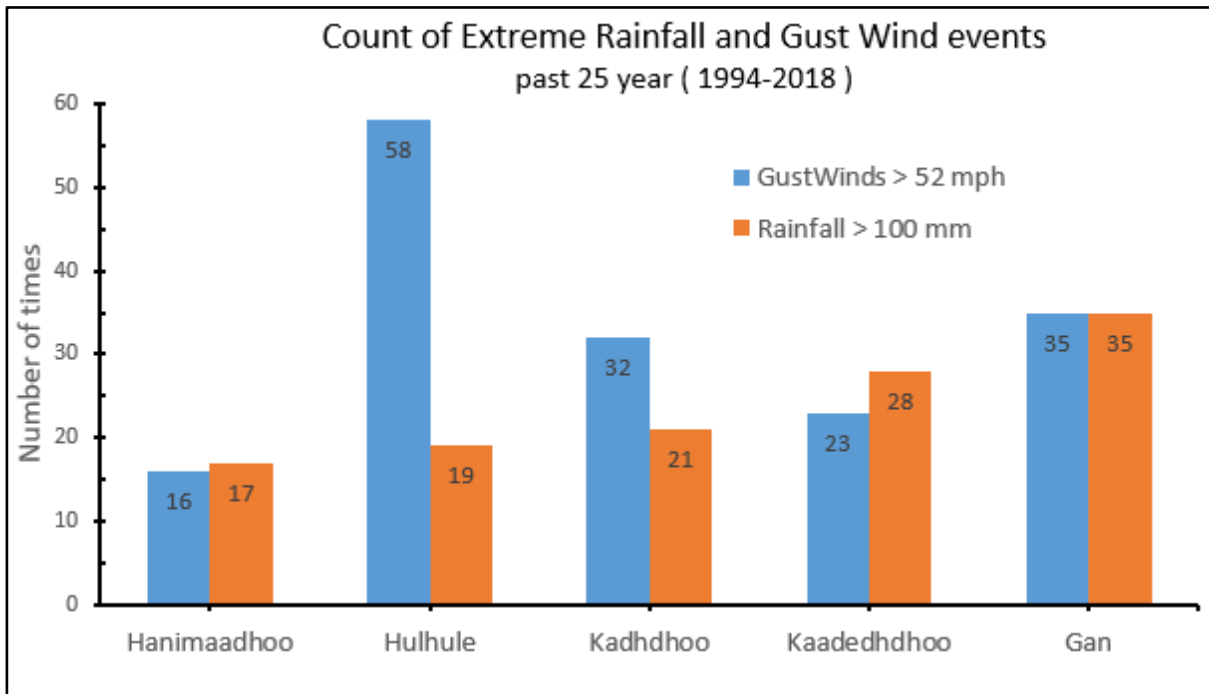
Flooding Addu atoll on 24 Nov 2015

Another record breaking rainfall of 228.4mm was recorded at the Meteorological Office, Gan.

Several houses in the islands were flooded causing damage to household items. Over 200 houses had reported flooding of varying magnitude.

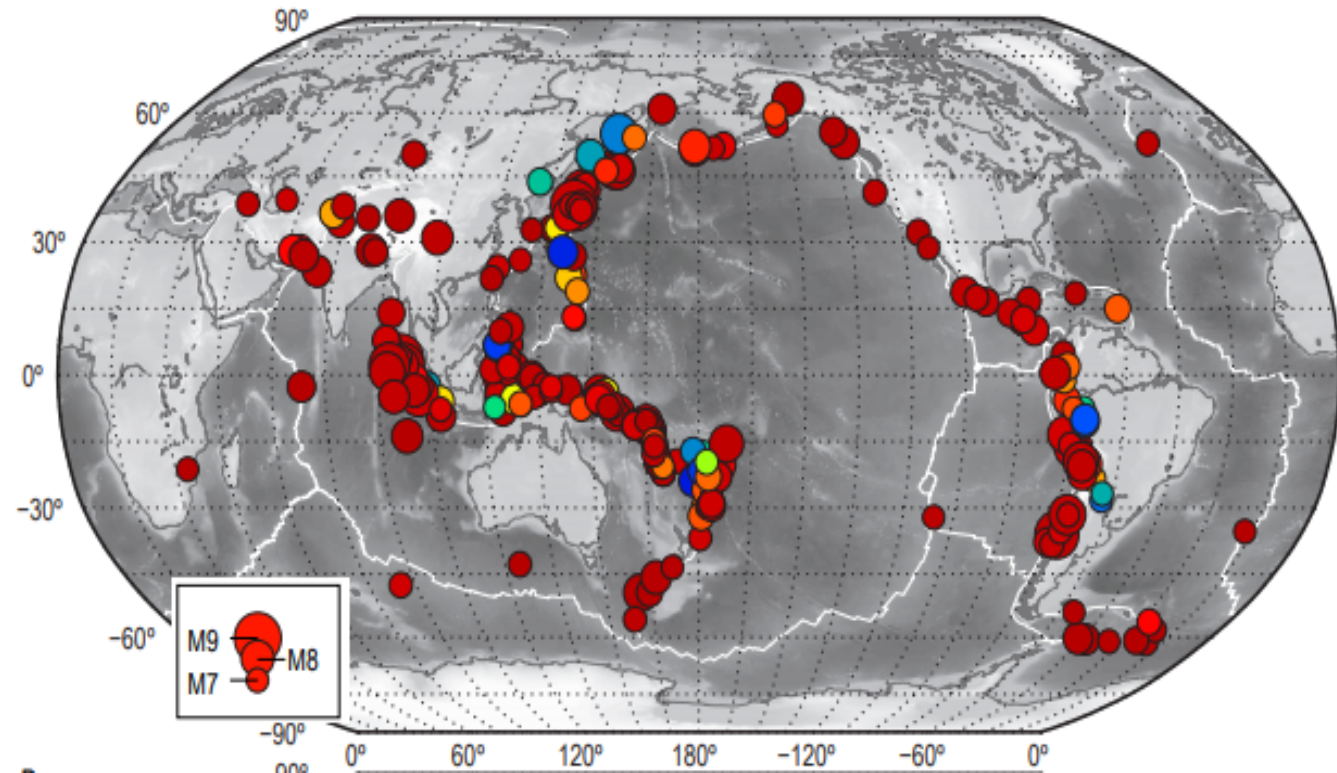
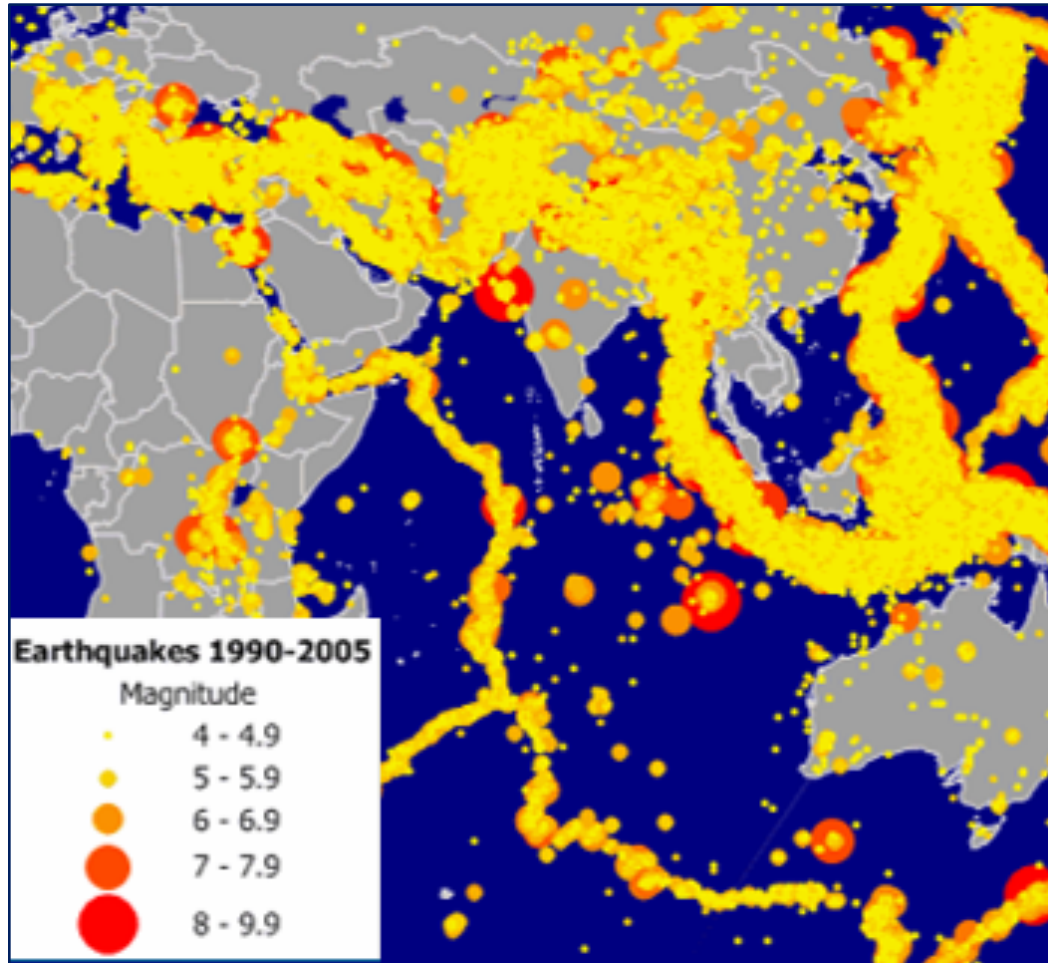


Significant records statistics



Some significant historical events

Earthquake



Tectonic Summaries of Magnitude 7 and Greater Earthquakes from 2000 to 2015

Some significant historical events

Tsunami in 2004

- 82 Died and 26 missing
- 13 islands were destroyed, 56 islands sustained major physical damage due to flooding.
- Over 2,500 houses were destroyed and more than 3,500 others were severely damaged.
- Nearly 1/3 of Maldives' population was severely affected,
- About 29,580 residents were displaced and around 12,000 were rendered homeless.
- Tourism, fisheries and agriculture were among the hardest hit sectors



Some historical events

Tsunami.

Tsunami return period over Maldives

Tsunami return period	
Wave Height (meters)	Return period (years)
2	50
4	100
2004 tsunami	219

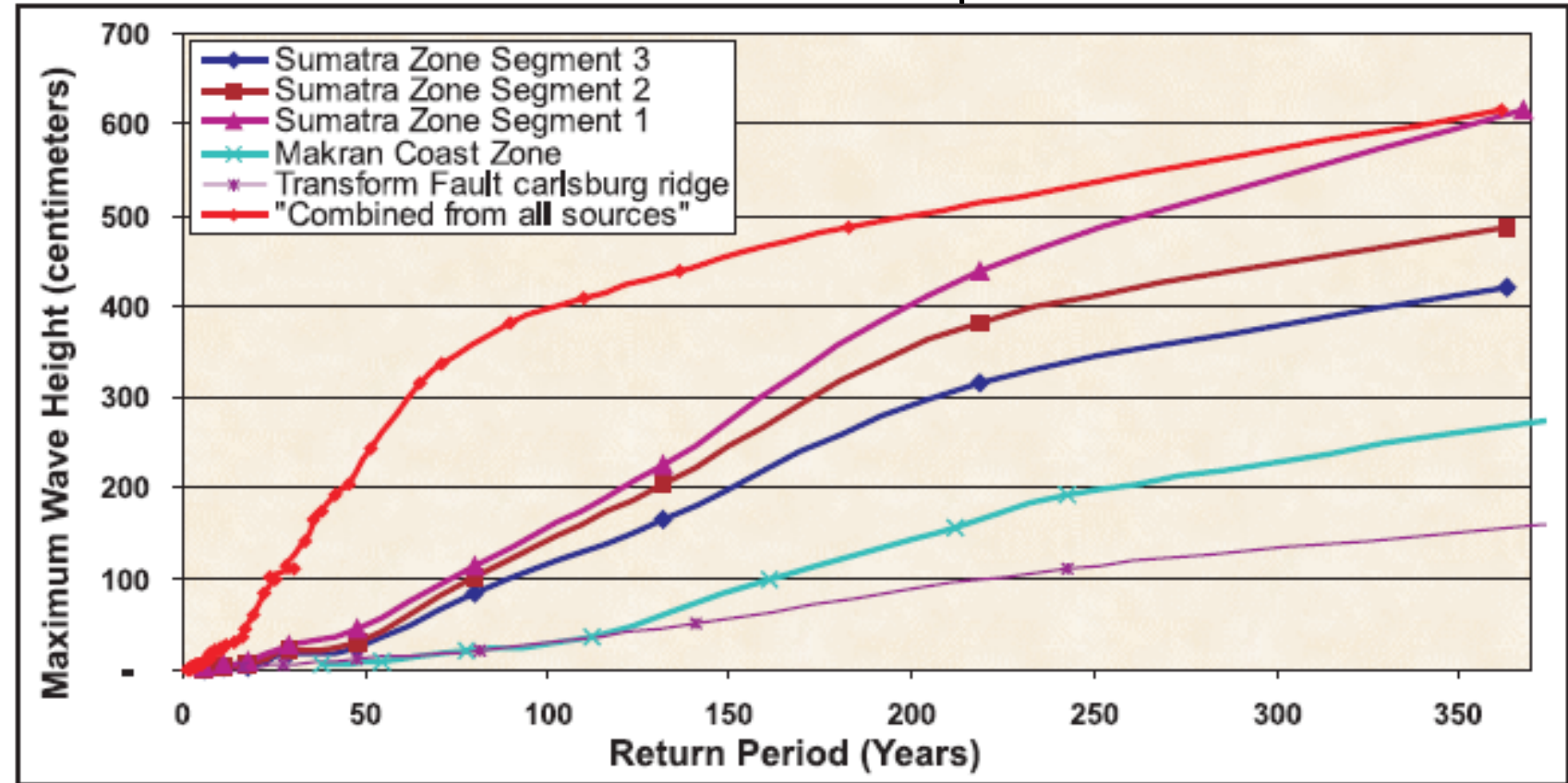


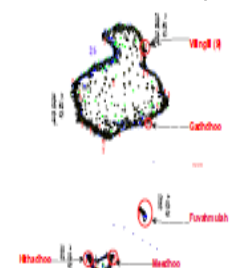
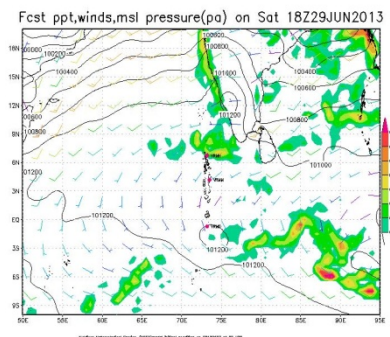
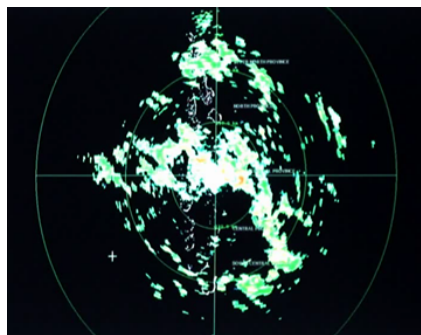
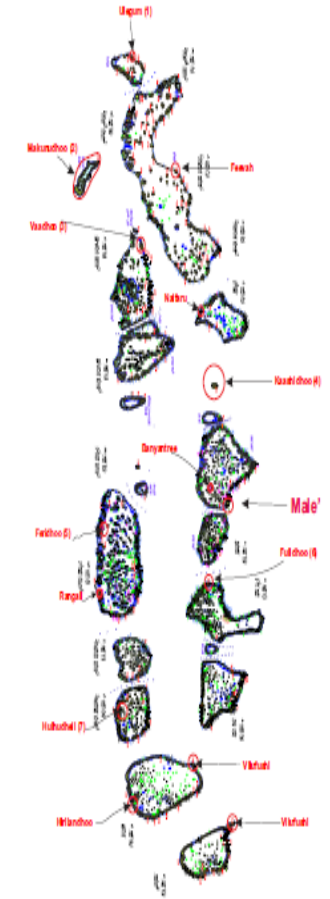
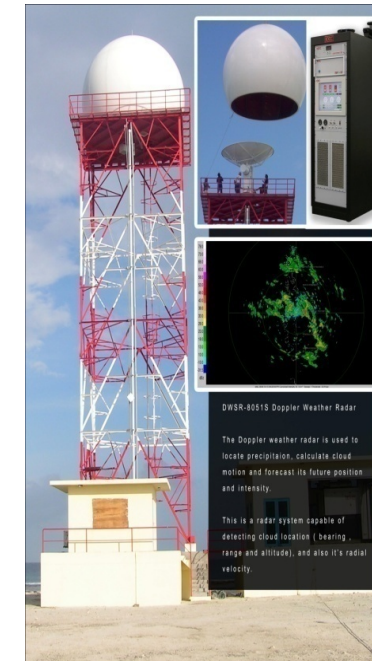
Figure 12: Return Periods of Maximum Tsunami Wave Heights from various Source Zones

Weather, Earthquake and Tsunami monitoring and early warning system in Maldives

Weather, Earthquake and Tsunami monitoring

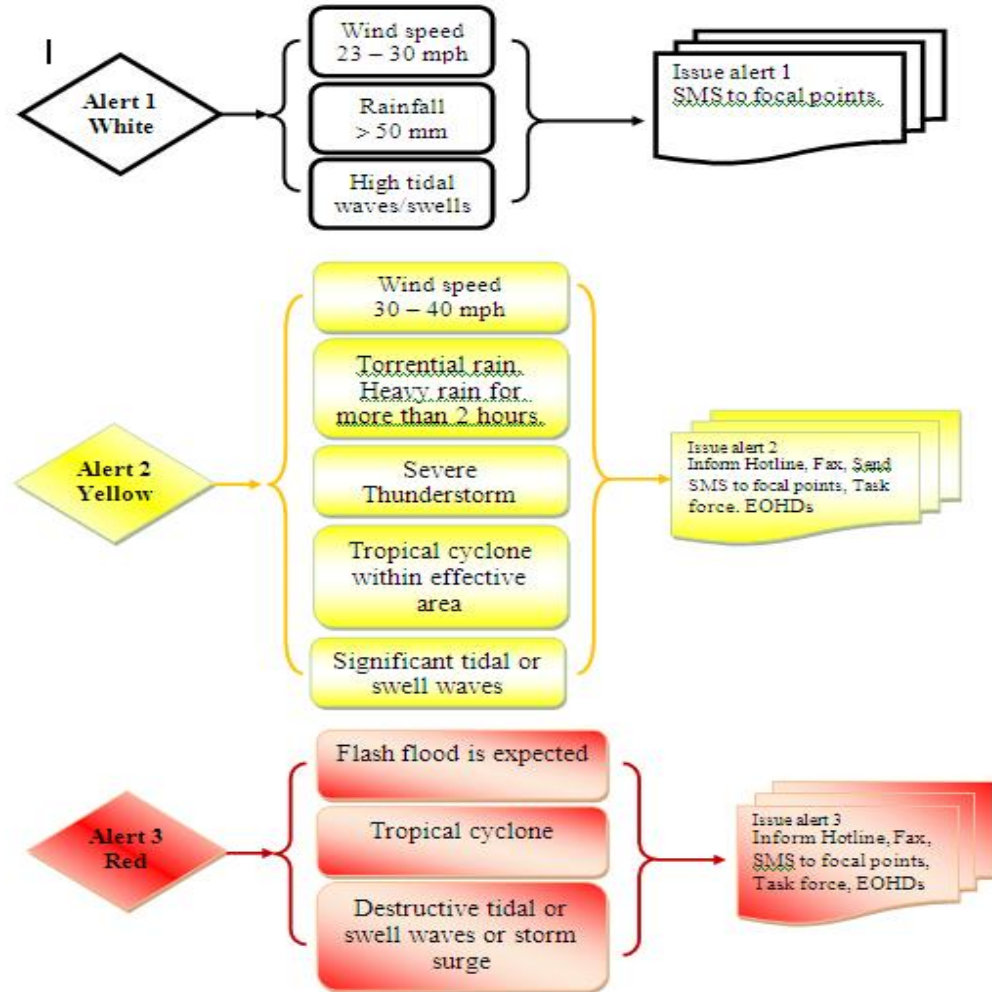
Observation Network

- Manned observatories : 5
- Automatic Weather Station : 36
- Upper air observation : 1
- Weather RADAR : 1
- Seismometer : 2
- Tide gauge : 3
- Satellite picture receiving system: 1
- Numerical Weather Prediction Models (WRF)

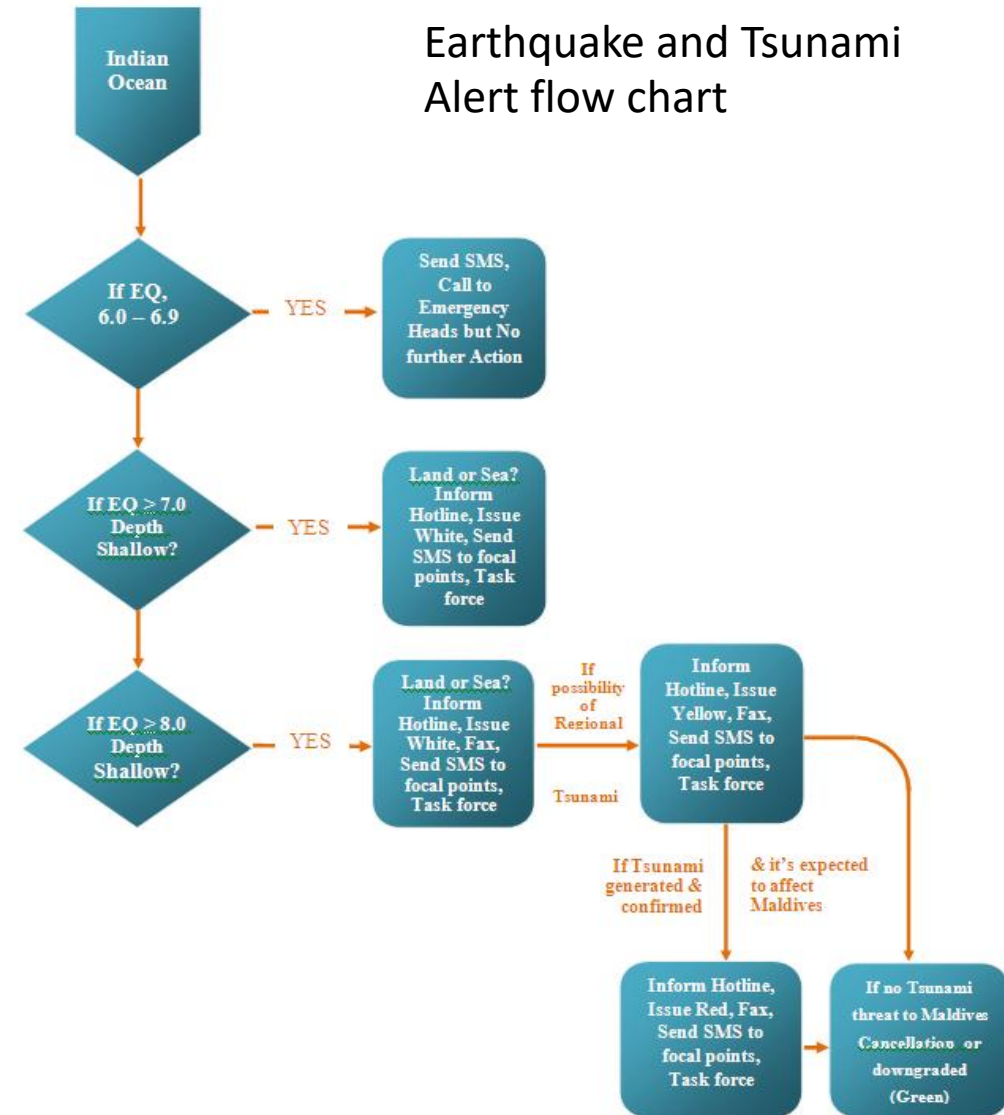


Weather, Earthquake and Tsunami monitoring

Weather advisories and warnings flow chart

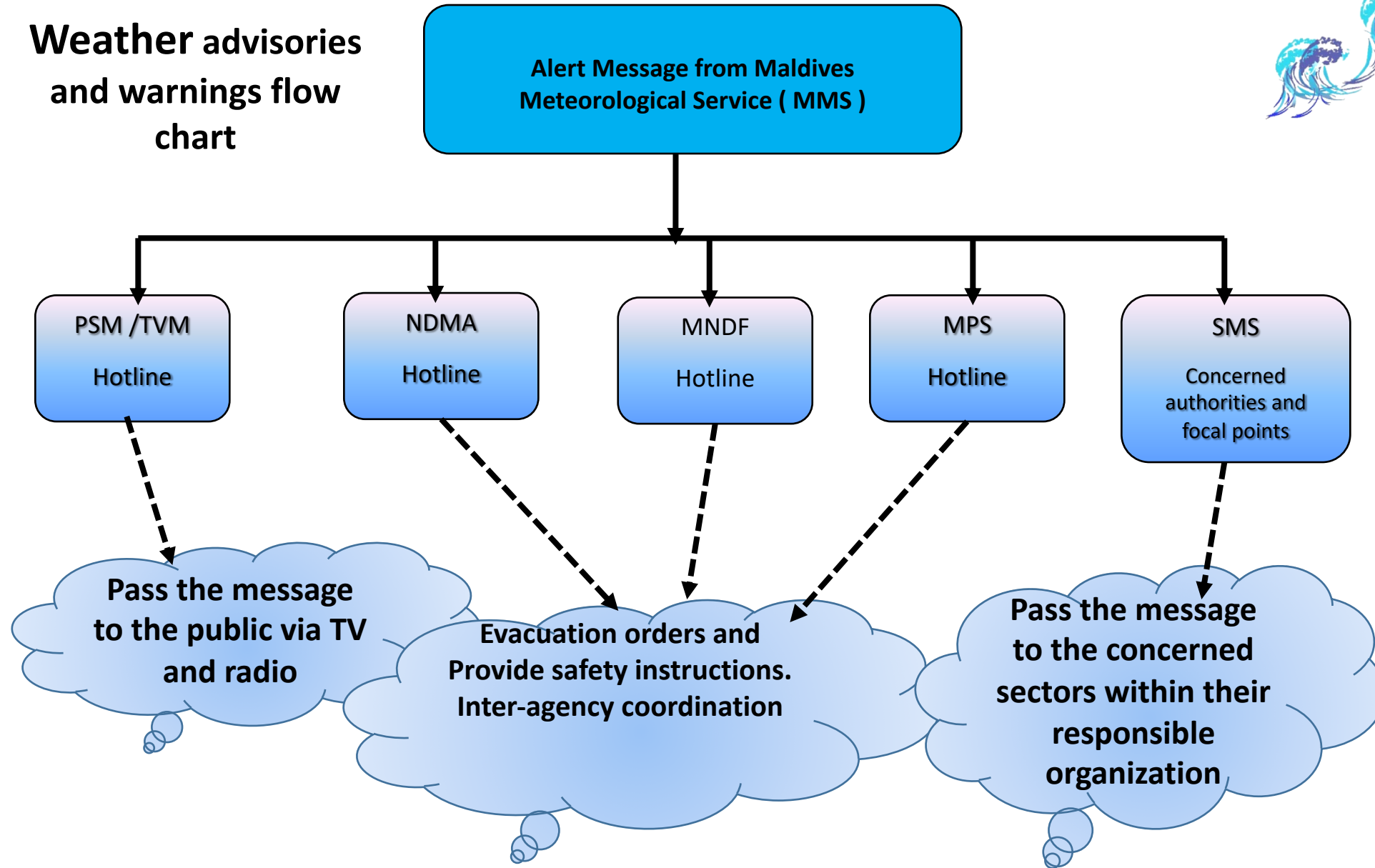


Earthquake and Tsunami Alert flow chart



Early warning message dissemination Mechanism

Weather advisories and warnings flow chart



Early warning message dissemination Mechanism

Recent changes in Alert Message dissemination via Social Media

Community Viber group with **15,000+ members**



@MetMaldives
12,000+ followers



@MetMaldives
26,000+ followers

Early warning message dissemination Mechanism

Recent changes in Alert Message dissemination via Social Media



MMS mobile Application – 5,000+ downloads

Early warning message dissemination Mechanism

Recent changes in Alert Message dissemination (ongoing project)





Thank you