MEASURING THE VALUE OF EARTH OBSERVATIONS

Our team

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What is Early Warning System?

Early warning systems (EWS) are a critical life-saving tool for floods, droughts, storms, bushfires and other hazards. These systems are built for empowering individuals and communities threatened by hazards to act in sufficient time and in an appropriate manner so as to reduce the possibility of personal injury, loss of life and livelihoods, as well as minimizing damage to property and the environment.

Effective EWS include four components

- Detection, monitoring and forecasting the hazards
- Analysis of risks involved
- Dissemination of timely and authoritative warnings
- Activation of emergency preparedness and response plans.

Some satellites that protect us!

NISAR | US - IN

Earthquakes, Tsunamis, Volcanoes and Landslides

EOS-01 | IN

Disaster Management System, Earth Observation

Jason-3 | US - EU

Tropical cyclones, Global sea surface height, Global warming

INSAT-3DR | IN

Climate & Environment, Disaster Management System

RISAT-2B | IN

Disaster Management System, Earth Observation

Some real life examples

France

- PRE EWS
  - In France, following the devastating December 1999 winter storm Lothar in which 100 people died, the public Vigilance warning system was developed as part of revised emergency planning and response mechanisms. A similar storm in January 2009 resulted in only eight deaths.
- POST EWS
  - Later, following the intense heat wave in 2003 which led to over 15,000 deaths in France, Vigilance was upgraded to include heat/health warnings. As a result, the 2006 heat wave caused only 31 per cent of the number of deaths that would have occurred without the warning and response mechanisms. River flood risk warnings were included following a major flood in 2007.

India

- PRE EWS
  - The 1999 Odisha cyclone was the most intense recorded tropical cyclone in the North Indian Ocean and among the most destructive in the region. 12.9 million people were affected by the storm; estimates for the storm's death toll vary significantly, though the India Meteorological Department indicated that around 9,887 were killed, with an additional 40 persons missing and 2,507 others injured.

- POST EWS
  - The 2019 Extremely Severe Cyclonic Storm Fani was the worst tropical cyclone to strike the Indian state of Odisha since the 1999 Odisha cyclone. Prior to Fani's landfall, authorities in India and Bangladesh moved at least a million people each from areas within Fani's projected path onto higher ground, and into cyclone shelters, which is thought to have reduced the resultant death toll and casualties. Fani killed at least 89 people in eastern India and Bangladesh and caused about US$ 8.1 billion in damages in both India and Bangladesh.

Satellites used for early detection of Fani

According to IMD, data from satellites Insat-3D, Insat-3DR, Scatsat-1, Oceansat-2 and Megha Tropiques were used to study the intensity, location and cloud cover around Fani.

USA

When Alaska's volcanoes awaken, they can pose a serious threat to residents and industries. One particular hazard is volcanic ash, which can shut down aircraft engines flying through it.

- Around 25,000 airline passengers a day fly over Alaska's volcanoes, which can become hazardous when eruptions spew volcanic ash.
- A NOAA-NASA project tracks volcanic clouds to provide guidance to regulators and airlines.
- The project offers volcanic ash data to forecasters, who then quickly update pilots with the most accurate location of ash.

Bangladesh

- In Bangladesh, following the tropical cyclones and storm surges in 1970 and 1991, which led to some 300,000 and 140,000 casualties respectively, the government together with the Red Crescent Societies of Bangladesh implemented a Cyclone Preparedness Programme. This resulted in a much-reduced death toll, with less than 3,500 casualties from super cyclone Sidr in November 2007.

- The Cyclone Preparedness Programme(CPP) of Bangladesh Red Crescent Society (BDRCS) came into being in 1972. CPP is a mechanism which relies on technical skills and volunteer's commitment for ensuring that all potential victims of an approaching cyclone are given sufficient warning to enable them to move to safe-sites including cyclone shelters and buildings. It operates an extensive network of radio communication facilities.

Case study on EWS for "YAAS" Cyclone

Very Severe Cyclonic Storm Yaas was a relatively strong and very damaging tropical cyclone that made landfall in Odisha and brought significant impacts to West Bengal during late May 2021. 20 people across India and Bangladesh died due to Yaas. The total damages in West Bengal, the most heavily impacted Indian state from Yaas, were estimated to be around ₹20 thousand crore. The cyclone also caused a whooping ₹610 crore in damage in Odisha.

1st Press Release

issued on 19th of May, Adverse weather warnings and advisories for fishermen (3 days prior to formation of LPA on 22nd May)

2 nd Press Release

issued on 22nd of May on formation of LPA indicating formation of cyclonic storm over Bay of Bengal (4 days prior to landfall)

Pre cyclone watch

for east coast was issued at 1350 hrs IST of 23rd of May, on development of depression over east-central BoB (about 70 hours prior to landfall).

Cyclone alert

for Odisha-West Bengal coasts was issued at 0830 hrs IST of 24th May, on intensification of the system into the cyclonic storm YAAS (about 54 hours prior to landfall)

Cyclone Warning

for Odisha-West Bengal coasts was issued at 2030 hrs IST of 24th May, when the system was a cyclonic storm over east-central BoB (about 39 hours prior to landfall)

Post landfall outlook

for interior districts of Odisha and West Bengal was issued at 1700 hrs IST of 25th, when system was a severe cyclonic storm over northwest and adjoining areas of BoB (about 18 hours prior to landfall)

S.N.	Type of Bulletin	ACWC Kolkata	CWC Bhubaneswar	CWC Visakhapatnam
1	Coastal Weather Bulletins	16	31	13
2	Fishermen Warnings	16	38	10
3	Port Warnings	19	33	10
4	Heavy Rainfall Warning	26	30	-
5	Gale Wind Warning	18	23	-
6	Storm Surge Warning	15	18	-
7	Warning issued to State Government	28	36	5
8	No. of Press releases	26	10	5
9	Impact based warnings	56	20	30
10	Whatsapp messages	350830	101479	20
11	Facebook updates	24	42	20
12	No. of updates on twitter	26	110	1

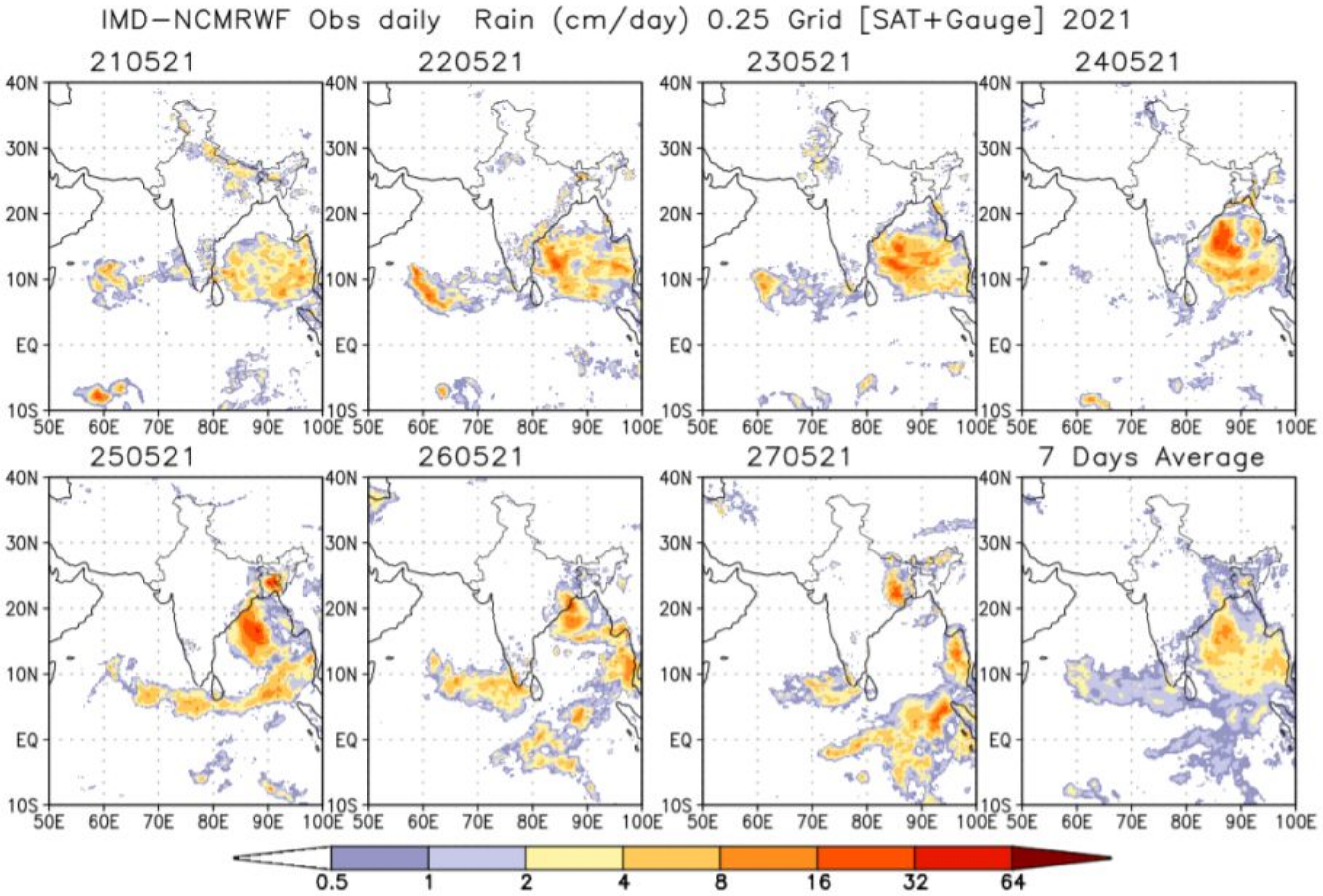

Fig.4: IMD-NCMRWF GPM merged gauge 24 hr cumulative rainfall (cm) ending at 0830 IST of date during 21st May – 27th May and 7 days average rainfall (cm/day)

DATA ANALYSIS OF NATURAL DISASTERS (1900-2013)

We have analyzed the past data about natural disasters using Python frameworks and made the following observations. Due to the size of the diagrams they couldn't be made a part of the slides, to view the entire data analysis report we request you to visit: https://github.com/IshikaGiroti/NASA-Space-Apps-2021

- In our first analysis we can observe that all the years present in top 10 are amongst the 1900s, when the early warning facilities were under-developed as compared to the recent years, i.e 2000s as shown in Figure 1.2.

- In our second analysis, we observe that 2004 is the highest year with the most number of injuries, this is because of the Indian Ocean earthquake and tsunami, making it one of the deadliest years in modern history.

- In our third analysis, we observe that most of the damage costs are high in the 2000s due to more developed and modern infrastructure which increases the total cost as compared to the 1900s. Another factor that affects the damage cost is the increasing population in the cities over the years.

- As seen in our fourth analysis , the top 10 years are amongst the 1900s. One main reason of that are the poor infrastructure facilities as compared to the modern times. The infrastructure failed to withhold itself in the course of a natural disaster, leaving people without a home. Figure 4.2 indicates the lessening of homeless people due to natural disasters around the world in the modern years with better infrastructure facilities.

- In our fifth analysis, 2002 is the highest in the list due to record-breaking rains, triggering devastating floods in Europe, destruction of homes across the Caribbean and life-threatening mudslides in India, Nepal and Bangladesh. Similarly, as mentioned in the analysis of the number of people injured due to natural disasters, the total amount of people affected in 2010 is high due to the earthquake in Haiti and the Russian summer heat wave. Following the year 2010, the graph declines wrt the amount

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THANK YOU