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SURENDRANATH EVENING COLLEGE

NAME – SUMAN BERA

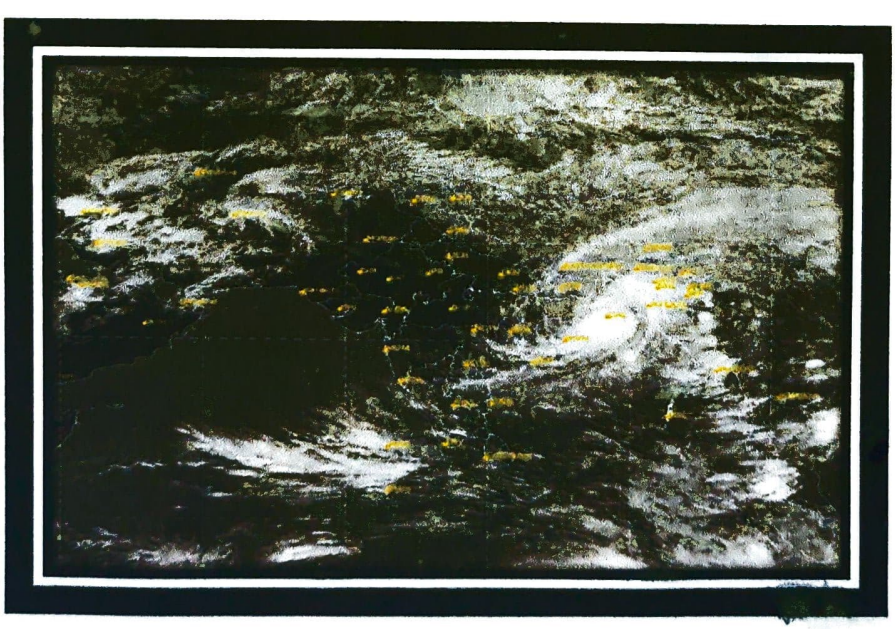
DEPARTMENT- ELECTRONICS (HONS)

YEAR - 3 RD YEAR

REG NUMBER – 117-1111-1145-17

ROLL NUMBER – 3117-61-0001

SUB - AMPHAN CYCLONE



Introduction :-

cyclones are low-pressure systems that form over warm tropical water, with gale force winds near the centre. The winds can extend hundreds of miles away from the eye of the storm or the centre of the cyclone. These cyclonic storms of the further are accompanied by high intensity rainfall and storm surge. Due to humongous absorption of large quantities of moisture, cyclones produces torrential rains and flooding resulting in major loss of life and property damage. Tropical cyclones in the Bay of Bengl are graded according to maximum wind speed at their center.

The Bay of Bengal basin in the North Indian Ocean reports among the highest number of tropical cyclones globally, the lastest addition being Amphan cyclone which originated from a low-pressure area persisting a couple hundred miles east of Colombo, Sri-Lanka, on may 13, 2020. It is consider the first super cyclone storm in the Bay of Bengal. It made landfall between Digha, some 180 km South of kolkata in west Bengal. The rapid intensification of the Amphan over the sea for a considerable period of time due to very slow movement made it very powerful. The main reason behind this was the high sea surface temperatures of 32-34°C in the Bay of Bengal.

The name Amphan, which is pronounced as 'um-Pun' meanes sky and was given by Thiland in 2004. India, Bangladesh, Myanmar, Pakistan, maldives, oman Sri-Lanka and Thiland decide the name of the cyclone in this region.

Material and Methods :-

The Indian Meteorological Department (IMD) classified cyclones on the basis of sustained wind speed into six major type

Table - 1. Location of the Sampling Stations

SL NO	Sampling Station	Coordinates
1.	Raichak	22° 12′N and 88° 07′E
2.	Diamond Harbour	22° 11′N and 88° 10′E
3.	Kulpi	22° 36′N and 88° 23′E
4.	Balari	22° 07′N and 88° 11′E
5.	Haldi River mouth	22° 00′N and 88° 03′E
6.	Sagar South	21° 39′N and 88° 01′E

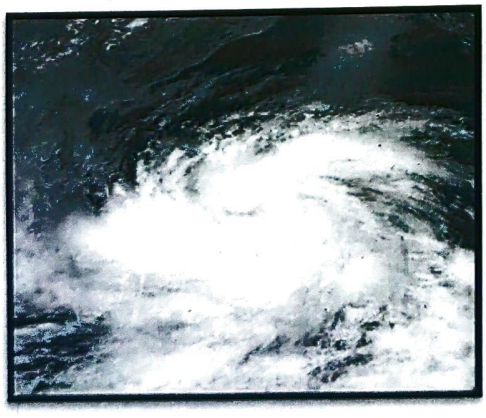


Figure 1. Amphan depression as recorded on May 16.

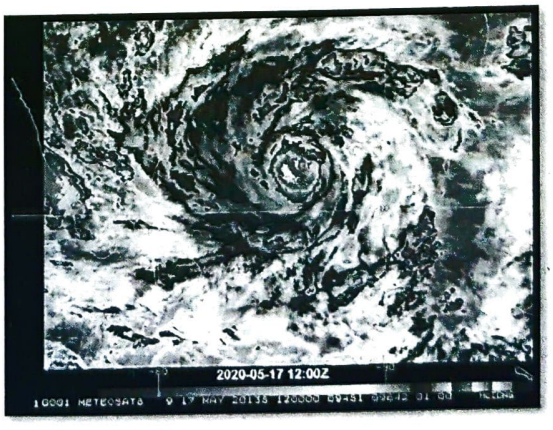


Figure 2. Rapid Intensification of Cyclone Amphan.

United States Joint Typhoon center (USJTc) and the India meteorological Department (IMD) measured different wind speed for cyclone Amphan. (USJTc measured the cyclone's Peak wind Speed at 270 kph making it the Strongest cyclone ever to have been recorded in the Bay of Bengal. IMD on the other hand recorded the cyclones maximum Speed as 240 kph, a difference of 30 kph. IMD used a Scatterometer Placed on weather monitoring Satellites including the ISRO's Scatasat-1 Satelite launched in 2016 to measure winds near the ocean Surface. The Satelites, however, do not provide images of the required resolution. Further, IMD employed five doppler weather Radars installed along the coast and buoys on Sea Surface to measure wind Speeds by looking directly at the cyclone. A doppler weather radar generates microwave Signals and directs them towards air molecules in a cyclone or any other Storm. It anylyses the Signals that bounce back from the molecules for a change of frequency of the micro waves. It then calculates the Speed with which the air molecules move, which in turn Shows wind Speed. Radars in Paradip and Gopalpur in Odisha and Visakhapatnam in Andhra Pradesh were being used by IMD to track and measure the characteristics of cyclone Amphan. The wind measurement through these radars, however still does not reflect the desired accuracy.

Andhra Pradesh were being used by the IMD to track and measure the characteristics of cyclone Amphan. The wind measurement through these radars, however, still does not reflects the desired accuracy. currently, wind measurement technologies across the world meteorological organizations use following procedures.

i) Satellite-based ballon measurements
ii) Surface measurement
iii) Through aircraft

The cyclone retained its intensity for about 24 hours after it hit the landmasses as it was close to the Bay of Bengal. It laid centered over the Gangetic delta of a considerable period of time. cyclone Amphan has seen storm surges extended for dozens of kms inland overwhelming towns and cities with widespread devastation. Due to occurrence of Amphan there was intrusion of saline water from Bay of Bengal. into the Hooghly-matla estuarine system.

Study area :-

For each observational station, triplicate water samples were collected from the surface during two tidal conditions at a distance of 50 meters of each other and analyzed for the selected parameters. The values are thus the mean ± S.D.

The surface water salinity was recorded by means of an optical refractometer in the field and crosschecked in laboratory by employing Monoknudsen method. The correction factor was found out by titrating the Silver nitrate solution against standard.

Our method was applied to estimate the salinity of standard seawater procured from NIO and a standard deviation of 0.02% was obtained for salinity. Glass bottles of 125ml were filled to overflow from collected water sample.

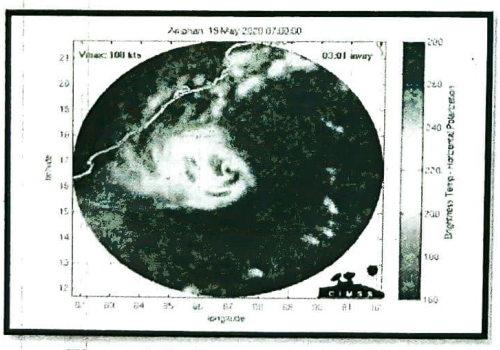


Figure 4. Early Visuals of Cyclone .

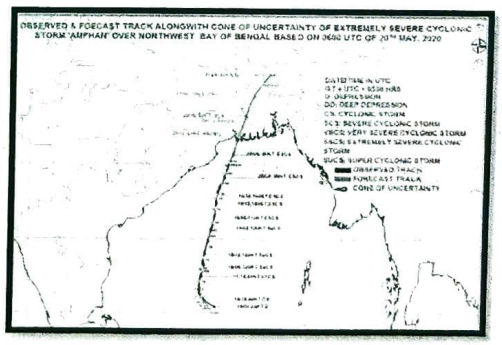


Figure 5a. Track of Super Cyclone Amphan from BOB to Bangladesh (May 20, 2020).
Source: IMD New Delhi

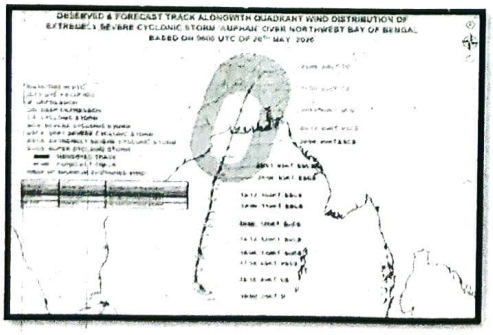


Figure 5b. Track of Super Cyclone Amphan from BOB to Bangladesh (May 20, 2020.
Source: IMD New Delhi

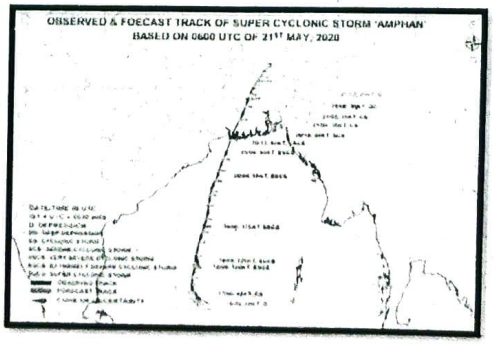


Figure 5c. Track of Super Cyclone Amphan from BOB to Bangladesh (May 21, 2020).

Results and Discussion:-

Bay of Bengal is geographically exposed to the formation of strongest of tropical cyclones across the globe. The eastern coastal states of India such as west Bengal, Odisha, Andhra pradesh and Tamil Nadu along the Eastern coastal plain are among the most vulnerable. cyclones make a landfall with tremendous intensity and inundate the shores with strong tidal waves, stormwater, flood, severe wind intensity damaging the coastal as well as estuarine resources.

This has been a common and recurrent phenomenon. Global climate change impacts played a key role in increasing the frequency of cyclones across the globe. Supercyclone ever Amphan is one of the strongest cyclones ever recorded in the history of tropical cyclone events in BOB. The early visuals of cyclone Amphan as of may 19, 2020 is projected in the Figure-

while track of Super cyclone Amphan from BoB through west Bengal and ultimately dissipation in Bangladesh is depicted in the figures. indicate the slow movement of cyclone over sea surface with intensification and low pressure formation around the eye of the cyclone.

On May 20, between 10.00 and 11.00 UTC, the cyclone made landfall in West Bengal. At the time, the Joint Typhoon warning centre estimated Amphan's one-minute sustained winds to be 155 km/h. Amphan rapidly weakened entering inland and dissipated shortly thereafter entering into Bangladesh.

cyclone associated heavely rainfall, stormwater surges, severe flash floods and rapid invasion of saline water majorly contributes to soil salinization along the path of the cyclone leading to irreversible damage of agriculture and allied services. Similar observation were documented after the Aila cyclone in Sundarbans. The PH value also increased significantly in the study area due to the sudden intrusion of seawater in the estuarine system.

Temperature (°C) :-

Similarly, for sea surface temperature (SST). in there has been an abnormal increase in surface water temperature due to intense solar heating and lack of precipitation.

The significant gap between pre-Amphan and Post-Amphan graph clearly indicates that landfall of the cyclonic storm has reduced SST largely.

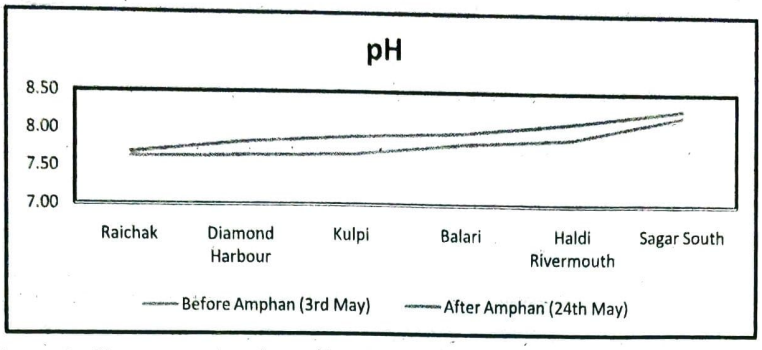


Figure 6. pH concentration shows significant difference during Pre and Post Amphan period.

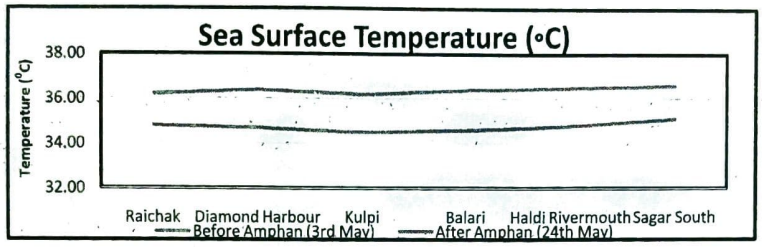


Figure 7. Sea Surface Temperature during Pre and Post Amphan period.

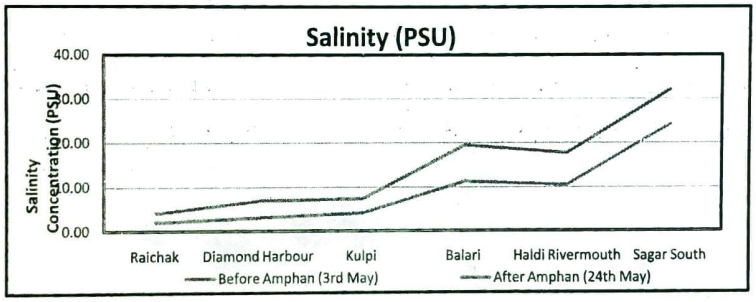


Figure 8. Fluctuations in salinity concentration observed in sampling stations during Pre and Post Amphan period.

Amphan cyclone took several days before undergoing a landfall. On May 18, at approximately 12.00 UTC, Amphan reached its Peak intensity with 3-minute sustained wind speed of 240 km/h 1-minute sustained wind speeds of 260 km/h and a minimum central barometric pressure of 925 mbar. The Storm began an eyewall replacement cycle shortly after it reached its peak intensity. but the continued effects of dry air and wind shear disrupted this process and caused Amphan to gradually weaken as it paralleled the eastern coastline of India.

This is true for all the Sampling Stations and nearby areas. Tropical cyclogenesis depends on multitude of factors such as sea surface temperatures, atmospheric instability, high humidity in the lower middle layers of troposphere, enough coriolis force to develop a low-pressure center, a pre-existing low-level focus or disturbance, and low vertical wind shear.

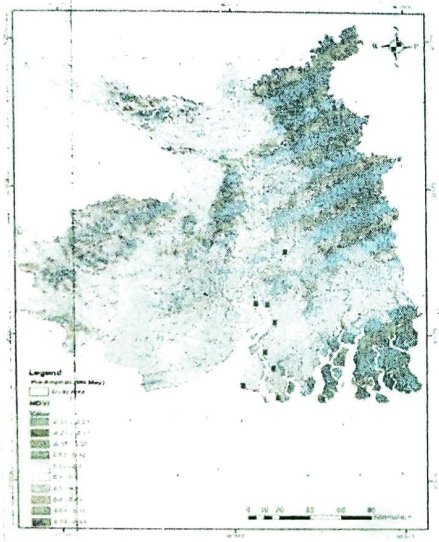


Figure 9a. NDVI map of selected stations during Pre-Amphan period.

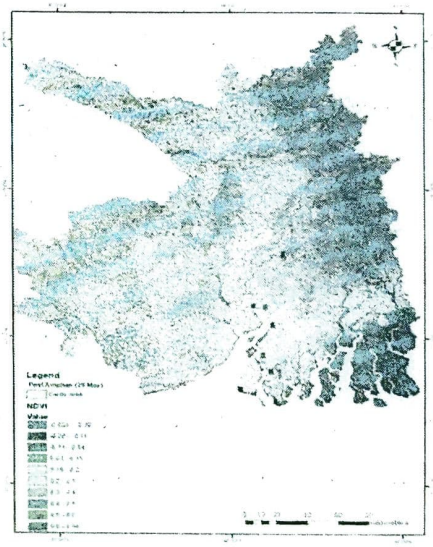


Figure 9b. During Post-Amphan period.

There is a difference of SST by 4°C in Raichak during pre and post Amphan whereas there is a difference in fact of conditions developing in the sea area favorable to tropical cyclogenesis over a period of one month. High temperatures favored the generation of low pressure system leading to intensification of cyclone Amphan.

Stormwater surges induce salinity ingression into the freshwater ecosystem upstream through estuaries, creeks and inlets leading to change in physico-chemical properties of aqueous medium as well as ambient media. Salinity of water can greatly affects aquatic flora and fauna and alter freshwater biodiversity.

Increase in salinity can cause harmful algal bloom as seen in case of alga. chattonella marina. This radiophety flagette is responsible for mass cultured fish mortalities in Japan. while salinity induces phytoplakton fluctuations in salinity concentration during pre and post Amphan periods. All the station show an increase in salinity post the cyclone.

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Editorial of TOI (Times of India)

and specially thanks to www.wikipedia.com