Earth

J. B. BODA

75 years & beyond...

WE BELIEVE

Issue: March - April 2019

Why the Indian Ocean is producing strong and deadly tropical cyclones in 2019?

Damaged buildings due to cyclone Idai| *Source: Skynews*

In March 2019, tropical cyclone Idai, the deadliest tropical cyclone ever to have made landfall on the southern African sub-continent, hit Mozambique.

Impact of Cyclone Idai: At a Glance

Countries Impacted:	Mozambique, Malawi, Madagascar, Zimbabwe
Casualties:	Over 1,000
Economic Losses:	Around US$ 2 Billion including damage to buildings (more than 100,000 houses were partially or completely damaged), infrastructure and agriculture (crops of more than 500,000 hectares were ruined). According to Red Cross, 90 % of city of Beira, Mozambique has been damaged or destroyed.

Before Idai, tropical cyclone Eline, which struck in 2000, was the most devastating tropical cyclone to make landfall in Mozambique.

Flooding in Beira, Mozambique Due to Cyclone, Idai | *Source: Skynews*

Within six weeks of Idai, tropical cyclone Kenneth, a category 4 tropical cyclone made landfall over the border of Mozambique and Tanzania six weeks after Idai.

Kenneth, in many regards, took the region by surprise. The storm was the northernmost tropical cyclone to make landfall on Mozambique, and the first to make landfall on Tanzania. It occurred very late in the season. Most cyclones in the region occur from January to March. It was also unusual for the Mozambique Channel to experience two severe tropical cyclones that made landfall within one season.

Following Idai and Kenneth, cyclone Fani, a tropical cyclone on the border of Category 5 intensity wind speeds, hit the east coast of India. This is the third major cyclone to emerge out of the Indian Ocean in 2019. Category 5 tropical cyclones were only first recorded in the North Indian Ocean from 1989 so, again, this storm Fani is unusually severe in the context of the longer historical records.

These high intensity storms have been tied to the very warm sea surface temperatures in the Indian Ocean. Temperatures of 30° Celsius are occurring more often and over longer periods of time. This is a result of gradual warming on a global scale, which has resulted in a net increase in ocean temperatures.

Warmer ocean temperatures allow stronger storms to form. These conditions are exacerbated by global forcing mechanisms including El Niño and the Indian Ocean Dipole, which concentrates warm ocean waters in smaller geographic areas.

Measuring intensity

Tropical cyclones form and intensify due to a combination of seven primary climatological conditions. Among other things, these include warm sea surface temperatures, high humidity levels and atmospheric instability. For a storm to intensify, these conditions have to be maximised while the storm remains over the ocean.

Tropical cyclones require a sea surface temperature of 26.5°C to form, while the highest intensity storms require much warmer sea surface temperatures of 28-29°C. This is important **because it's one of the reasons why southern Africa is experiencing more intense tropical cyclones.** The South Indian Ocean is warming rapidly. This means that regions that previously experienced the temperatures of 26.5°C that facilitated tropical cyclone formation are now experiencing temperatures as warm as 30-32°C.

Simultaneously, regions further from the equator which didn't previously have sufficiently warm water for tropical cyclone formation, with sea surface temperatures of 24-26°C are more regularly experiencing the threshold temperature. This increases the range in which these storms occur, making storms like tropical cyclone Dineo, which made landfall in February 2017 in southern Mozambique, more common.

These very warm sea surface temperatures are not a factor of global scale warming alone. They're further influenced by a range of global and local forcing mechanisms. These include El Niño Southern Oscillation, the Indian Ocean Dipole and the Southern Annular Mode. For this particular cyclone season, scientists are seeing the strongest impact from the Madden-Julian Oscillation, intra-seasonal tropical climate variability (i.e. varies on a week-to-week basis).

Comparing storms

Ranking storms on the basis of their Saffir Simpson classification is not always the most valuable measure. That's because it can't take the characteristics of the location of landfall into consideration.This results in two key shortcomings. First, it doesn't take the flooding potential into account. This is difficult to identify for a particular storm, because it's not only a function of how much rain is experienced and over what period – or even the height of storm surge – but also the nature of the region of landfall.

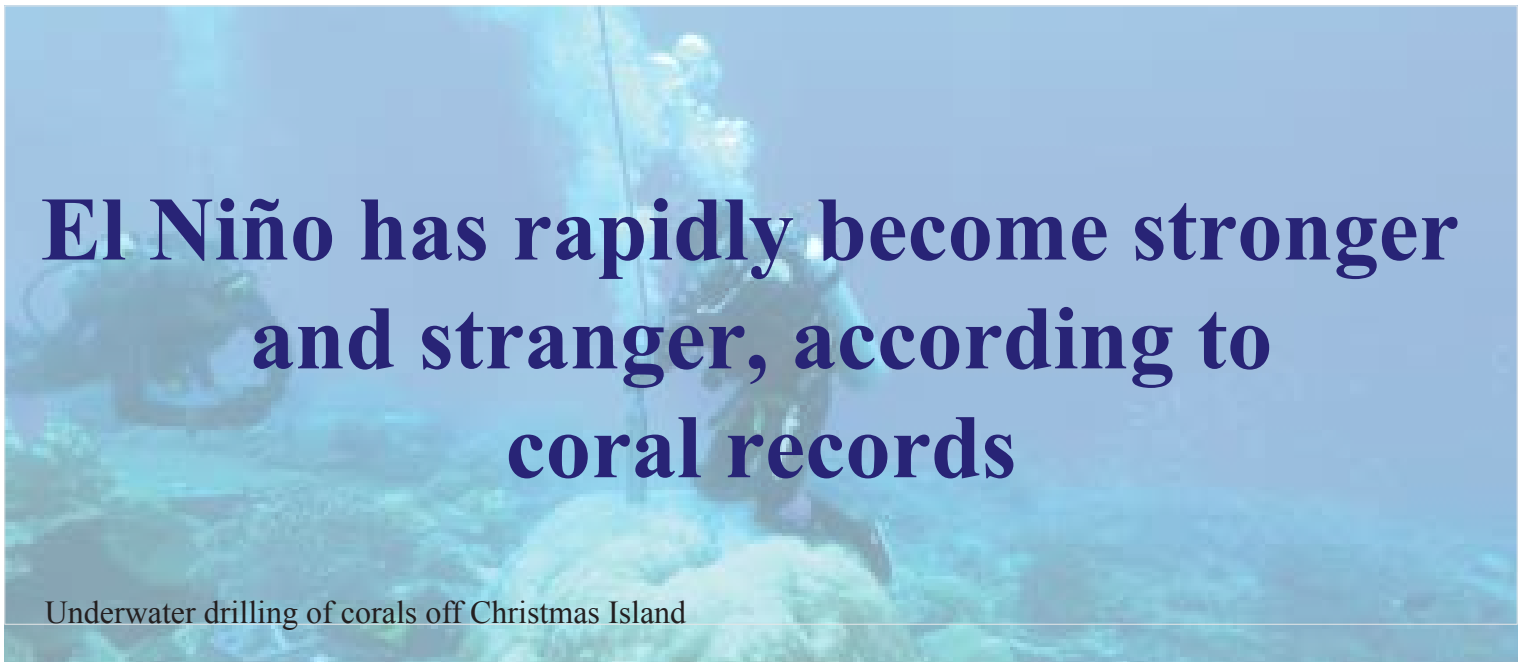
Lower-lying, relatively flat areas are more prone to flooding than higher elevation regions or those with rugged topography. This is part of the reason that Idai caused such severe flooding. Some regions will have better suited storm water infrastructure. And when flooding does occur, some regions are better able to warn and evacuate people to prevent or minimise the loss of life.

Another factor which determines the devastation resulting from a tropical cyclone is the population density of the area of landfall. The higher the population density, the more people who are at threat of losing their life, their homes and livelihoods. This also means more people who would need to be evacuated in a short period, and more people who need shelter until the storm's immediate effects have subsided. This is why Idai and Eline resulted in far greater losses and fatalities than the stronger intensity Kenneth, and why the total damage from Fani is projected to be particularly devastating.

Reference:

1.Fitchett Jennifer, "Why the Indian Ocean is spawning strong and deadly tropical cyclones"
2. United Nations

El Niño has rapidly become stronger and stranger, according to coral records



Underwater drilling of corals off Christmas Island

The pattern of El Niño has changed dramatically in recent years, according to the first seasonal record distinguishing different types of El Niño events over the last 400 years.

A new category of El Niño has become far more prevalent in the last few decades than at any time in the past four centuries. Over the same period, traditional El Niño events have become more intense.

This "new" El Niño is now recognised in the tropical Pacific and characterised by warm ocean temperatures in the Central Pacific Ocean, rather than the more typical warming in the far Eastern Pacific near the South American coast.

Although not as strong as the Eastern Pacific version, the Central Pacific El Niño is clearly observed in recent decades, including in 2014-15 and most recently in 2018-19. Over most of the last 400 years, El Niño events happened roughly at the same rate in the Central and Eastern Pacific.

By the end of the 20th century, research showed that Central Pacific El Niño events becoming evident. At the same time, the number of conventional Eastern Pacific events stayed relatively low, but the three most recent Eastern-type events (in 1982-83, 1997-98 and 2015-16) were unusually strong.

Using coral to unlock the past

To understand new Central Pacific flavour of El Niño, scientists started looking at corals from the tropical Pacific. As the corals started growing decades to centuries before human beings began routinely measuring the climate with instruments, they are an excellent archive of changes in water conditions they experience as they grow, including ocean changes related to El Niño.

The researchers combined the information from a network of coral records that preserve seasonal histories. At a seasonal timescale, the scientists observed the characteristic patterns of past El Niño events in the chemistry of the corals. These patterns tell which El Niño is which over the last 400 years. It is in this continuous picture of past El Niños obtained from coral archives that the researchers found a clear picture of an unusual recent change in the Pacific's El Niño flavours.

Reference:

Freund Mandy et al "El Niño has rapidly become stronger and stranger, according to coral records"

For more details email us at **earth@jbbodagroup.com**

Address: J. B. Boda Insurance and Reinsurance Brokers Pvt. Ltd.

Maker Bhavan No. 1, Sir. Vithaldas Thackersey Marg, Mumbai 400 020, India | Phone :+91-22-6631 4949

www.jbboda.net | www.linkedin.com/company/jb-boda | www.facebook.com/jbboda