

Topics



- Caterpillars sixth sense
- Chabahar port
- Eucalyptus as invasive
- Farm subsidies
- Why PNG is prone to landslides ??
- Cyclones in bay of bengal

Mains



By saurabh Pandey



Target Mains -2024/25

Q Explain the factors responsible for increase in landslide in pacific islands.

प्रश्न प्रशांत द्वीपों में भूस्खलन में वृद्धि के लिए जिम्मेदार कारकों की व्याख्या करें।

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A climber moth caterpillar, via Pexels

Caterpillars may sense threats using electric fields

Karthik Vinod

Caterpillars have a sixth sense that most land-based animals do not. They can sense electric fields around them with small bristles called setae on its body – a feat called electroreception. British researchers have discovered this in laboratory experiments and their findings were published recently in the *Proceedings of the National Academy of Sciences*. They studied four species of caterpillars: climber moth, scarer tussock moth, European peacock butterfly, and common wasp.

Researchers have long known that aquatic and amphibious animals use electroreception to detect both predators and prey. Since 2013, scientists have also

As an insect's wings flap through the air, static charges build up on them. When it nears the caterpillar, the setae sense these charges by building up charges of its own

found electroreception in arthropods like humpbeetles, hoverflies, and spiders. However, none of these land-based creatures use the ability to defend against predators. Caterpillars, which are also arthropods, may break this mould, using electroreception to sense predatory insects nearby.

"It works exactly the same way as breathing in 'other balloons on your hair'," said first author Sam England. He is a postdoctoral researcher at the Museum für Naturkunde in Berlin and was at the University of Bristol before.

Static charges accumulate on both the balloon and the hair, leading to a mutual electrostatic attraction. The balloon can then move the hair without touching contact. As an insect's wings flap through the air, static charges build up on them. When it nears the caterpillar, the setae sense these charges by building up charges of its own. This mutual interaction gives rise to an oscillating electric field.

In the study, researchers stimulated caterpillars with a live electrode carrying a voltage oscillating at 80 Hz, to mimic an approaching wasp. In response, the caterpillars flailed and coiled, a sign that they were stressed. Caterpillars around an electrode without the voltage didn't behave this way. The caterpillars' setae responded to frequencies of 50-350 Hz, possibly to help distinguish between threats and non-threats, Dr. England said. The setae vibrated the most when the field frequency was 220-3 Hz – close to the rate at which many predator insects flap their wings. He suspected the caterpillars could have evolved to tune to their predator's wingbeat. "These animals have had a lot of evolutionary pressure upon them to evolve defences because so many animals like to eat them."

That said, scientists also "already know" that caterpillars don't rely on electroreception alone to sense predators, Dr. England added. It supplements the other few senses. He also said that "sensory pollution" could damp the caterpillars' electroreception. The setae are sensitive to voltage frequencies also present in overhead power cables, around 50-60 Hz. This 'voltage' could desensitize the setae and diminish the caterpillars' ability to spot predators with them.

(Karthik Vinod is an intern with The Hindu)



Caterpillars sixth sense

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- **They can sense electric fields around them with small bristles called setae on its body — a feat called electroreception.**
- **Researchers have long known that aquatic and amphibious animals use electroreception to detect both predators and prey.**

- **Since 2013, scientists have also found electroreception in arthropods like bumblebees, hoverflies, and spiders.**
- **However, none of these land-based creatures use the ability to defend against predators. Caterpillars, which are also arthropods, may break this mould, using electroreception to sense predatory insects nearby.**

Chabahar's opportunities and challenges



The recently concluded contract between India and Iran, which gives New Delhi rights to invest in and operate the Shahid-Behesti terminal at Chabahar Port for another 10 years, has created many headlines. The port remains the crown project anchoring economic relations between the two countries. The deal came at a precarious time in West Asia as the war in Gaza continues unabated, Israel-Iran tensions remain critical, and the passing of Iran's President and Foreign Minister in a helicopter accident challenges domestic politics in Tehran.

Representative of India's thinking

There is no denying that the Chabahar project is an important endeavour for both economic and strategic reasons. At the core of it, Chabahar, for India, represents its thinking from the perspective of an extended neighbourhood, and not necessarily as part of its West Asia outlook. The port is a fulcrum of the International North-South Transport Corridor, a project looking towards seamlessly linking India with Central Asia and Russia, bypassing Pakistan. Beyond this, Chabahar is also astutely tuned into the 'new' realities of Afghanistan. The Taliban-led interim government in Kabul has also thrown its weight behind the port, offering an investment of \$35 million as it looks to secure alternatives and not be economically reliant on Pakistani ports such as Karachi or the China-backed Gwadar. In November 2023, Taliban leader Mullah Baradar visited Chabahar, with Shahid-Behesti visible in the background.

Bilaterally for India and Iran, Chabahar is also a symptom of challenges between the two states. While there is a lot of public championing for the project, and for good reasons, if it was not for Chabahar, India-Iran ties today would look extremely dry. The reasons are multifaceted and tied to both country's views of their national,



Kabir Taneja

is Fellow, Strategic Studies Programme, Observer Research Foundation

The geopolitics around India's play in Chabahar and Iran's leverages is interesting

regional, and geopolitical interests. Instead of expanding projects and economic cooperation beyond Chabahar, many older ones, such as the gas field Farzad-B which was discovered by Indian state-owned enterprise ONGC Videsh, have now been written off. Another old bilateral platform, the IranoHind shipping company, was dissolved in 2013 because of sanctions. Chabahar is a legacy project, which has its foundations going back to 2003. This was an era when India was opening to developing economic assets abroad. Chabahar in Iran was one, Sakhalin-I in Russia, was another.

A reflection of diplomacy

The geopolitics today that surrounds India's play in Chabahar, and Iran's leverages, make for an interesting study. This latest iteration of the deal was signed not too long after both Israel and Iran exchanged missile fire and came critically close to a full-scale conflict. India's Adani Group, meanwhile, has also invested in a large port project in Israel. The company bought Israel's Haifa port on the Mediterranean Sea for \$1.2 billion. This was also made possible in part due to India's participation in new diplomatic and economic endeavours with the United States, Israel, and Arab partners, such as the I2U2 and India-Middle East-Europe Economic Corridor.

The fact that India's buy-in to Haifa was not a constraint for the Chabahar deal to go through is not only a testament to Indian diplomacy but also for the U.S. to also recognise that this kind of access which New Delhi has is beneficial, and not detrimental, to Washington.

Recent remarks from the U.S. over potential sanctions against Chabahar stand out as myopic. India's relations with Iran and the continuity of Chabahar's development, which offers access to difficult political terrain such as Central Asia, and even Afghanistan, could bring in a significant level of integration and help in building

alternatives to China-backed projects. Despite public discourse, China's heavy financial might and the 2021 strategic deal with Iran, does not automatically make Tehran subservient to Beijing. Iran is a quintessential survivalist state and plays a diverse set of cards in its playbook of geopolitics.

The Biden administration would benefit by not blindly following former U.S. President Barack Obama's doctrine on how to deal with India-Iran ties, and Chabahar, at its centre. New Delhi burnt its fingers by giving Mr. Obama too much room when it completely stopped importing oil from Iran. This took Tehran, consistently among India's top-two suppliers of oil for decades, out of the top 10. Even if India's thinking was to build influence in Washington around the nuclear deal negotiations, Donald Trump as the U.S. President and the unilateral exit of the U.S. under his watch from the Joint Comprehensive Plan of Action (JCPOA) in 2018, recalibrated how non-partisanship and the stability of critical U.S. foreign policies were to be viewed thereafter.

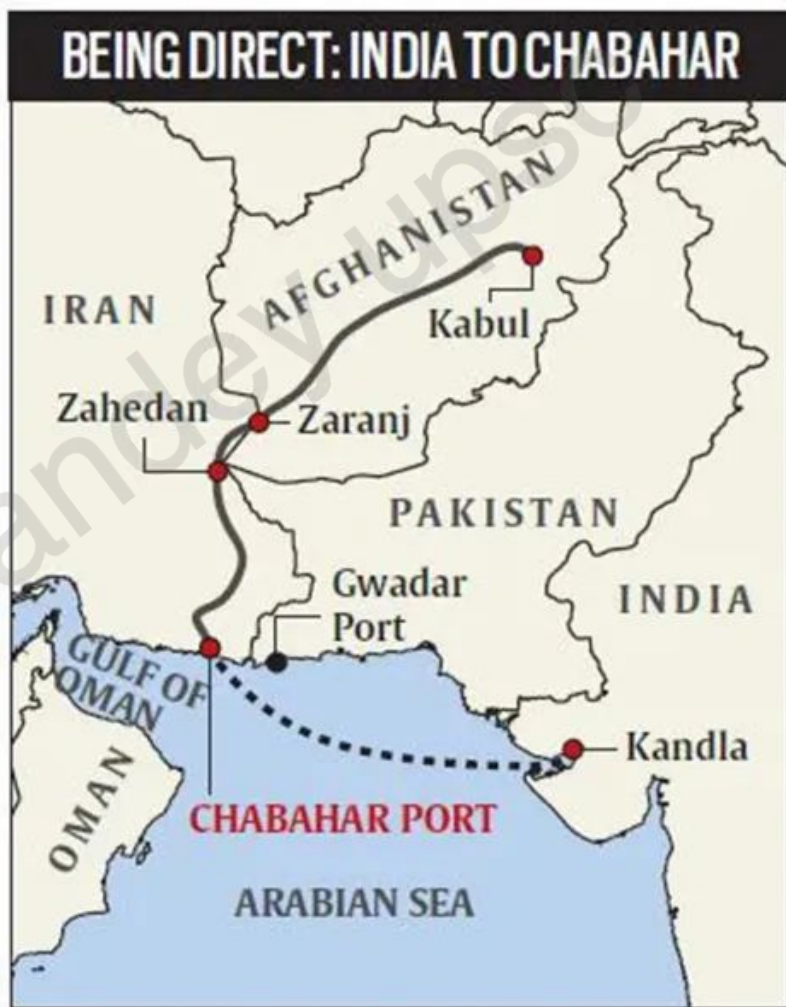
The bigger picture

Finally, for Chabahar, there are two main points to consider moving forward. First, the port project cannot be the singular major play in the bilateral relationship. This concentration of interests is volatile. Second, the U.S. must move towards being accommodative on sanctions against Chabahar. Viewing the port as a collateral against problematic Iranian policies in West Asia would not be an accurate understanding of the big picture of India's own outreach towards its extended neighbourhood which could benefit larger American aims as well.

This is important to be considered at a time when the U.S. itself maintains a channel with the Iranians not only through Swiss intermediaries but, increasingly, through Oman and Qatar as well.

Chabahar port

- **At the core of it, Chabahar, for India, represents its thinking from the perspective of an extended neighbourhood, and not necessarily as part of its West Asia outlook.**
- **The port is a fulcrum of the International North–South Transport Corridor, a project looking towards seamlessly linking India with Central Asia and Russia, bypassing Pakistan.**
- **Beyond this, Chabahar is also astutely tuned into the ‘new’ realities of Afghanistan.**



- **The Taliban-led interim government in Kabul has also thrown its weight behind the port, offering an investment of \$35 million as it looks to secure alternatives and not be economically reliant on Pakistani ports such as Karachi or the China-backed Gwadar.**
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The controversy over eucalyptus planting in Kerala

Why did the Kerala government allow the Kerala Forest Development Corporation to plant eucalyptus trees?
Why were environmentalists and social activists against the order?

The Hindu Bureau

The story so far:

The Kerala government issued an order allowing the Kerala Forest Development Corporation (KFDC) to plant eucalyptus trees for its financial sustenance in 2024-2025. Environmentalists soon protested the decision saying the move would adversely affect forests and heighten human-animal conflicts in future. Subsequently, the head of the Forest Force submitted a report to the State Forest Minister saying it hadn't permitted the planting of eucalyptus trees inside forests. On May 20, the government amended its order to limit permission to only cut exotic tree species from lands in the KFDC's control.

What are KDFC and its plantations?

The KFDC was established on January 24, 1975, as part of a dynamic production forestry enterprise. According to the

KFDC website, the corporation has around 7,000 hectares (ha) of plantations. The plantation working circle includes the following species: *Eucalyptus grandis*, *Acacia auriculiformis*, *Acacia mangium*, *Acacia crassiparva*, *Acacia pycnantha* (also known as wattle), *Alnus nepalensis*, *Casuarina equisetifolia*, and *Pinus patula*.

Eucalyptus plantations have a rotation age of nine years; *Acacia auriculiformis* trees, 18 years; and *Acacia mangium*, seven years. At the end of each cycle, plantations approved by the Union Ministry of Environment, Forests and Climate change are felled.

Clear-felled plantations are planted with species listed in a management plan. Before planting, experts check for soil quality and consult with the Kerala Forest Research Institute. As of this month, the KFDC website also said plantations of exotic species, including eucalyptus, would be converted to those of indigenous species once exotic flora has been felled "so as to be more ecologically

and environmentally friendly".

What was the issue with the order?

In 2021, the State government had published an eco-restoration policy. Among other things, it sought to address what it called the "proliferation of invasive species that are not suitable for our environment" and the resulting "depletion of natural forests". Such depletion, according to the policy, was in turn forcing wild animals to move to human-occupied land in search of food and thus increasing the prevalence of human-wildlife conflict.

For example, a recent study by the Kerala State Forest Protective Staff Organisation – an association of frontline forest officers – found replacing exotic plants in forested areas with the corresponding natural species could help ensure food for wild elephants at Chinnakanal in Munnar. The Chinnakanal landscape is prime elephant habitat in the Munnar forest

division, and is filled with eucalyptus trees. The policy also acknowledged that invasive species of plants as well as animals had rendered "serious damage to natural habitats and ecosystems" and that "eradicating such invasive species ... is of high priority." Environmental activists alleged following the State's order – permitting the KDFC to plant eucalyptus trees – contravened the policy's aspirations and undermined efforts to beat back invasive species and mitigate human-animal conflicts.

What is eco-restoration?

Kerala has around 27,000 ha under industrial plantations. Against the backdrop of climate change and the promise researchers have said trees offer to mitigate against its worsening, the Kerala government had decided to phase out plantations of eucalyptus, acacia, wattle, and pine by 2024 and replace them with natural forests. This process is called eco-restoration. Many of these areas are currently overwhelmed with invasive species.

For example, in 2019, in the Marayoor Sandal Division in Idukki, the forest department initiated a project supported by the UNDP, the National Bank for Agriculture and Rural Development, and the Compensatory Afforestation Fund Management and Planning Authority. Some 108 hectares of exotic species were removed to allow natural grasses to flourish. The result: water streams in the area were restored after a 30-year gap.

THE GIST

▼ The Kerala government issued an order allowing the Kerala Forest Development Corporation (KFDC) to plant eucalyptus trees for its financial sustenance in 2024-2025.

▼ Environmentalists soon protested the decision saying the move would adversely affect forests and heighten human-animal conflicts in future.

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- **The Kerala government issued an order allowing the Kerala Forest Development Corporation (KFDC) to plant eucalyptus trees for its financial sustenance in 2024-2025.**
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Eucalyptus as invasive



- There are many possible reasons as to why introduced species become invasive – the introduced species is adapted to grow in a wide range of climatic regimes or soil types; it is dependent on generalist pollinators; it has no natural enemies in its adventive range; grows rapidly; establishes easily; etc.
- With these attributes invasive plants can outcompete/displace native species for space, access to nutrients and water, etc.
- Gums have another tool in their arsenal and that is allelopathy – they displace other species through chemical warfare, in other words they release chemicals that other plant species don't like. In this way they displace native species, improving conditions for themselves – eliminating competitors, etc.

- **Wetlands in water scarce countries are critical, especially now that climate change is impacting on the frequency and abundance of rainfall.**
- **However, in the past, gums were used to dry up wetlands, swamps, marshes, etc. to try to curb the incidence of malaria – the gums suck up the water which is then lost to the atmosphere as a result of evapo-transpiration.**
- **To try to mitigate their negative impacts it is important not to grow them near any water resources – wetlands, rivers, etc. where they will have a far greater impact on water.**

What is eco restoration ?

- **Ecological restoration aims to recreate, initiate, or accelerate the recovery of an ecosystem that has been disturbed.**
- **Disturbances are environmental changes that alter ecosystem structure and function. Common disturbances include logging, damming rivers, intense grazing, hurricanes, floods, and fires.**

U.S., U.K. fret over farm input subsidy rise



Sharp rise: India's farm input subsidies increased by a sharp 50% to \$48.13 billion in 2022-23. THE HINDU

Amiti Sen
NEW DELHI

India's farm input subsidies, including sops for fertilizers, electricity and irrigation, have increased by a sharp 50% to \$48.13 billion in 2022-23 from \$32.07 billion in the previous fiscal, as per notifications of the country at the WTO.

This prompted several countries such as the EU, the U.K. and the U.S., to raise concerns and call for greater transparency at a recent peer group review meeting of the WTO, officials said.

"New Delhi explained the input subsidies are mainly for power, irrigation and fertilizers, and the increase was due to inflation and rising costs of fertilizers. It further said the country had duly notified the information to the WTO," a Geneva-based official told *businessline*.

Farm subsidies

Agricultural input subsidies, targeted towards low income and resource poor farmers, are exempt from limits on domestic subsidies under the carve-out of special and differential treatment measures offered to developing nations under WTO rules.

As India has declared that 99.43% of farm holdings in the country are of low-income or resource-poor farmers (per the Agricultural Census for 2015-16), its input subsidies are excluded from capping. "There is more peer group scrutiny on input subsidies also because it is not capped and can be increased without limits," the official said.

(The writer is with *The Hindu businessline*)

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Green Box

- These measures are exempt from reduction commitments and, indeed, can even be increased without any financial limitation under the WTO.
- Applies to both developed and developing country members but in the case of developing countries special treatment is provided in respect of governmental stockholding programmes for food security purposes and subsidized food prices for urban and rural poor.

(India's PDS does not come under Green Box)

Amber Box

- All domestic support measures considered to distort production and trade (with some exceptions) fall into the amber box.
- For instance, MSP, Procurement Price, sum total of subsidies on inputs like fertilizer, water, credit, power, etc

Blue Box

- These are basically Amber Box subsidies, but they tend to limit the production. Any support that would normally be in the amber box, is placed in the blue box if the support also requires farmers to limit their production.
- These measures are also exempt from reduction commitments.

Special and Differential Treatment Box

- It comprises of investment subsidies like tractors and pump sets, Agricultural input services like fertilizers to farmers etc.
- SDT box subsidies can be given by only developing and low-income countries.



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‘More than 2,000 buried in Papua New Guinea landslip’

Associated Press

MELBOURNE

A Papua New Guinea government official has told the United Nations more than 2,000 people were believed to have been buried alive by Friday's landslip and has formally asked for international help.

The government figure is roughly triple the UN estimate of 670 killed by the landslip in the South Pacific island nation's mountainous interior. The remains of only six persons had been recovered so far.

In a letter to the UN resident coordinator dated Sunday, the acting director of the South Pacific island nation's National Disaster Center Luseta Laso Mana said the landslide "buried more than 2,000 people alive" and caused "major destruction" at Yambali vil-



Taking stock: Locals gather at the site of a landslip at Mulitaka village in Papua New Guinea's Enga Province on Sunday. AFP

lage in the Enga province.

Estimates of the casualties have varied widely since the disaster occurred.

Determining the scale of the disaster is difficult because of challenging conditions on the ground including the village's remote location, a lack of telecommunications and tribal warfare throughout the

province which means international relief workers and aid convoys require military escorts.

The government estimates Papua New Guinea's population at around 10 million people, although a UN study, based on data including satellite photographs of rooftops, estimated in 2022 it could be as high as 17 million.



More than 670 feared killed in landslide

Emergency crews continue to retrieve bodies after a massive landslide in the South Pacific island nation's Enga province buried more than 150 homes on Friday.



Why PNG is prone to landslides ??



- attributes PNG's regular landslides to a number of specific factors, chief amongst them being the country's deeply weathered, mountainous terrain and tropical climate.
- Heavy rain and storms lead to increased erosion, flooding and higher tides, all of which raise the chance of dangerous rockfalls,
- Add to that the fact that the country sits on the Ring of Fire — a string of active volcanoes and high seismic activity that runs along the border of two tectonic plates in the Pacific — and you have perfect landslide conditions.
- "You have regular significant earthquakes, which of course trigger landslides in their own right, but also weaken the rock slope,"
- "The whole area is very tectonically active."

- Alongside small villages and farms, PNG's forests play host to a number of large industries that create conditions where landslides can become more likely
- Gold, silver, nickel, copper and cobalt are all mined in the country, and LNG operations have been taking place in areas where **deadly landslides occurred in the past.**
- PNG also has a large illegal logging industry, as well as being the **world's fifth-largest exporter of palm oil**, which requires extensive deforestation

- In the meantime, climate change — itself exacerbated by deforestation — is making extreme weather events more likely, as well as contributing to higher king tides as global sea levels rise.

Six killed, life severely affected as Cyclone Remal batters southern districts of Bengal

Shiv Sahay Singh

KOLKATA

Six people were killed and life was severely affected as Cyclone Remal left behind a trail of destruction across the southern districts of West Bengal.

One person was killed in Kolkata when the roof of a structure collapsed in the Entally area and an elderly woman died on Mousuni Island at the mouth of the Bay of Bengal, when a tree fell on her house. A man and his son at Purba Bardhaman and a youth in North 24 Parganas were electrocuted. Later in the evening, a woman died from electrocution in the Metiabruz area of Kolkata.

The weather formation,



A boat damaged in Cyclone Remal near the Sundarbans area in South 24 Parganas district of West Bengal on Monday. ANI

which made landfall on Sunday night, gradually weakened into a cyclonic storm on Monday morning and further weakened into a deep depression by evening. The wind speed had touched 120 kmph over Sagar Island on Sunday.

A preliminary report by the State government said more than two lakh people were evacuated to safer places.

The government said that nearly 2,500 houses were destroyed and 27,000 damaged.

It said 1,700 electric poles had been brought down and many trees were uprooted in North 24 Parganas and South 24 Parganas.

Kolkata recorded 144 mm of rainfall in the 24 hours till 8.30 a.m. on Monday, resulting in widespread waterlogging. Several trees were uprooted in the metropolis and its adjoining coastal regions. While Haldia received 110 mm, Tamluk received 70 mm and Nimpith 70 mm. Flights resumed at Kolkata's Netaji Subhas Chandra Bose airport on Monday morning.

The airport services were suspended for almost 20 hours.

Chief Minister Mamata

Banerjee, while acknowledging the damage caused by Remal, said that due to the actions of the State administration, the loss of life was relatively less.

In the Sundarbans, minor breaches of embankments were reported in several places in the coastal areas of South 24 Parganas.

The IMD has predicted surface wind with speed reaching 50 to 60 kmph gusting to 70 kmph likely over North and South 24 Parganas, East Midnapore, Nadia and Murshidabad; reaching 40 to 50 kmph likely over Kolkata, Howrah and Hooghly.

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Cyclones in bay of bengal

(1) BoB water is warmer than Arabian sea water ,

a) landlocked- less heat circulation (b) less powerful winds- again lesser heat circulation

(2) fresh water from rivers fall into BoB, (as suggested in and above) making the water as a light thin layer, more prone to evaporation

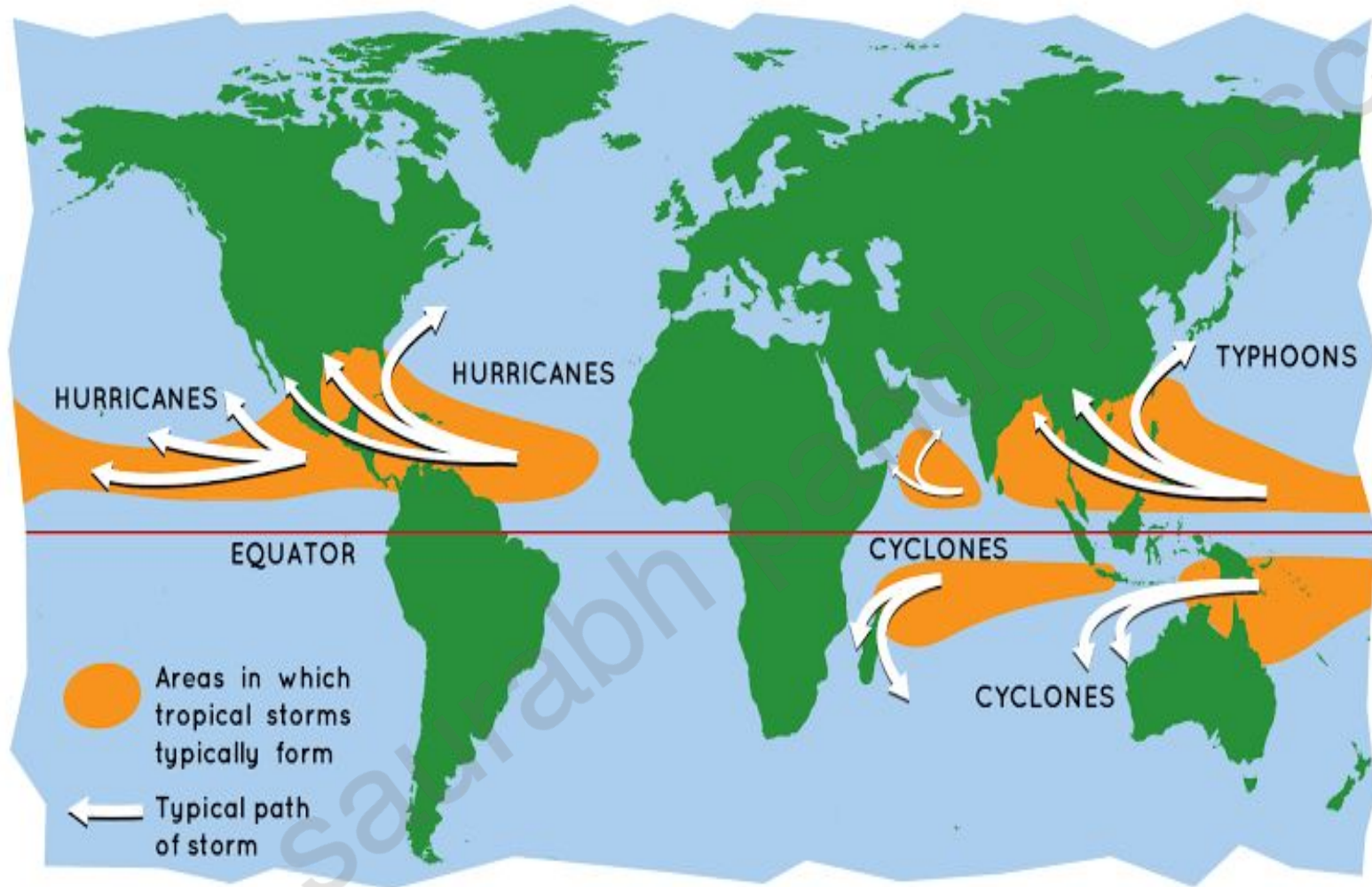
(3) easterly jet - causing the windfall in eastern coastal States of India. And in Arabian sea these winds will steer the windfall towards eastern Africa , not towards western coast of India

- On an average, five to six significant cyclonic storms emerge in the Bay of Bengal region every year.

The months of April and May just before the start of the monsoon, and then October to December immediately after the end of the monsoon, are the prime seasons for tropical cyclones.

A big difference between the strengths of cyclones in April-May and October-December is that the former originate in situ in the Bay of Bengal itself, barely a few hundred kilometres from the landmass.

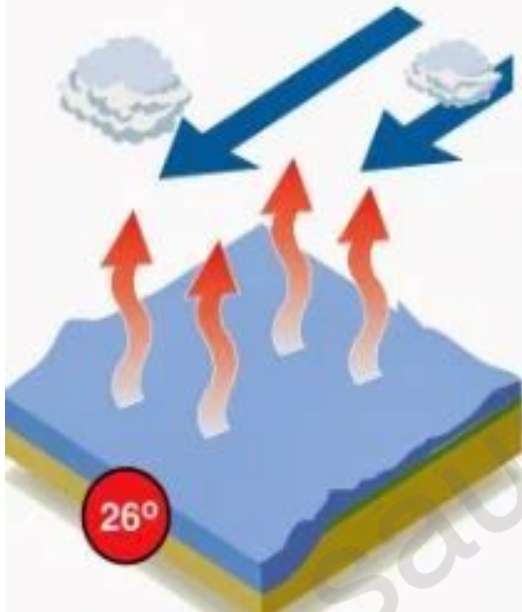
- On the other hand, **cyclones in October-December are usually remnants of cyclonic systems that emerge in the Pacific Ocean**, but manage to come to the Bay of Bengal, considerably weakened after crossing the southeast Asian landmass near the South China Sea



How tropical storms are formed

High humidity and ocean temperatures of over 26°C are major contributing factors

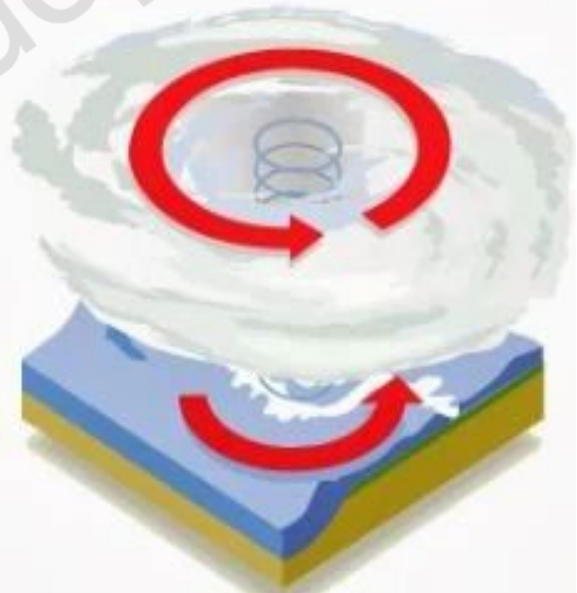
Water evaporates from the ocean surface and comes into contact with a **mass of cold air**, forming **clouds**



A **column of low pressure** develops at the centre. **Winds form** around the column



As pressure in the central column (the eye) weakens, the **speed of the wind around it increases**



Cyclones are named as per guidelines decided by the World Meteorological Organisation (WMO). The WMO says that countries in the affected region should name the cyclones.

In the north Indian Ocean region, eight countries decide the names of cyclonic storms. These countries include India, Bangladesh, Maldives, Myanmar, Oman, Pakistan, Sri Lanka and Thailand.

The name 'Remal' in the list of tropical cyclones is given by Oman. It will be the first cyclone to hit the region this 2024 pre-monsoon season. 'Remal,' meaning 'sand' in Arabic

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Q Explain the factors responsible for increase in landslide in pacific islands.

प्रश्न प्रशांत द्वीपों में भूस्खलन में वृद्धि के लिए जिम्मेदार कारकों की व्याख्या करें।

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