

# Topics - MINDS MAPS included (Daily current affairs )-- 4th & 3rd November 2024



- **Aditya-L1 Mission**
- **WHAT IS DANA ?? /crop drop**
- **Diffraction Limit**
- **16th BRICS Summit**
- **Coastal Zone Management Plan**
- **World Cities Day: Urban Sustainability Focus**
- **Millet Consumption Dynamics**
- **TUMAINI FESTIVAL**
- **HEATWAVES**
- **Brazil's Stance on China's Belt and Road Initiative**



**By saurabh Pandey**

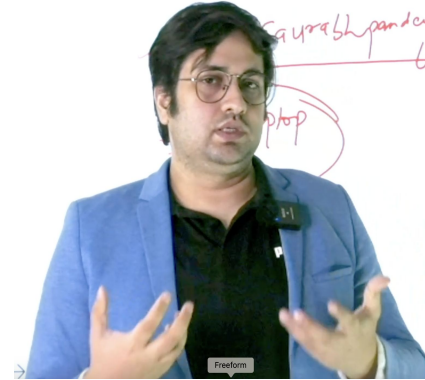


**THE HINDU**

- **Convention on Biological Diversity (CBD)**

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- **Graphene oxide**
- **Bariatric surgery**
- **Glaciers and Their Impact on Landscapes**
- **The Cat Ba langurs**
- **Mains**



**By saurabh Pandey**



**THE HINDU**

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## **Target Mains -2025/26 -**

**Q "Growth in per capita income will demand changes in agriculture as well" Discuss**

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# Rejuvenating the millet market in rural India by tackling challenges



Stakeholders in the millet industry contend that there is a need to recalibrate their policies and strategies to tap new opportunities; they, however, can't bombard the rural market with the same products that they are selling in urban areas; firms must mull different price points for rural areas

## NEWS ANALYSIS

K.V. Kurmanath

**B**. Dayakar, CEO of ICAR's Indian Institute of Millets Research's Nutrihub, insists it's a misconception millet consumption in rural areas is low. Traditional grains have not lost their appeal at all, recent research by the institute shows.

"Rural consumers are also consuming millets on par with their urban peers," he asserts, while countering this narrative of rural decline for millets at the recently-held international conference on millets in Hyderabad.

While factors like rising incomes and changing dietary preferences have contributed to an increase in urban millet consumption, rural India has steadfastly held onto its millet traditions, growing and consuming certain millet varieties and cuisines that are peculiar to those areas.

What does this mean for companies and start-ups that produce millet-based products? A lot, says experts in the ecosystem.

S Sivakumar, who heads ITC's Agri Business segment, argues millet consumption continued in rural India over decades.

"While it is significantly lower than what it used to be, it is still much larger than the consumption in



**Spread the word:** Millet players must raise awareness about their nutritional value. THE HINDU

urban India. In rural areas where millets are grown, it is part of the regular diet, primarily in the form of centre-of-plate staples" he says.

States with sizeable production such as Rajasthan, Uttar Pradesh, Maharashtra and Karnataka grow and consume millets at varying proportions for food, fodder and industrial uses.

In order to expand the opportunity in rural markets, millet players could look at all consumption occasions and formats similar to the approach in urban areas besides raising awareness about their nutritional value.

Stakeholders in the millet industry contend that there is a need to recalibrate their policies and



The success of TruGood underscores the importance of aligning pricing strategies with the economic realities of rural consumers

strategies to tap new opportunities. They, however, can't bombard the rural market with the same products that they are selling in urban areas.

"You have to have a different pricing strategy for rural markets. It should be affordable for rural buyers. Think of price points at ₹5, or a maximum of ₹10," Raju Bhupati, serial entrepreneur and CEO of Troo Good, says.

From nowhere, Troo Good has become the largest chikki maker in the country. The Hyderabad-based firm sells millet chikkis at ₹5 a piece.

But does ₹5 work? "Yes, of course," he argues, saying pricing millet products at ₹25 won't work in rural markets.

### Not the sole factor

While affordability is crucial, it's not the only factor driving millet consumption in rural areas. The success of TruGood underscores the importance of aligning pricing strategies with the economic realities of rural consumers. By offering millet products at accessible price points, companies can tap into a vast and largely untapped

market.

K.S. Narayanan, or KS as he's known in the food industry, suggests that encouraging rural consumers to continue their traditional millet consumption practices is key. This involves supporting local entrepreneurs who are developing millet-based products that resonate with local palates.

"Historically, millet consumption was prevalent in rural areas, especially with home-made recipes. This is still continuing in those areas. However, with the green revolution and the rise of wheat and rice, millet consumption declined, even in rural areas," he explains. He suggests introducing ready-to-cook and ready-to-eat millet products in smaller, more affordable packs for rural markets. Like Mr. Bhupati does, Mr. Narayanan also suggests different kind of price points for rural areas to be successful.

### Supply chain 'missing'

Vishala Vuyyala, founder-CEO of Millet Bank, too insists millet products for the rural markets should be price sensitive. She says despite a lot of noise around millet production and consumption, several knotty issues need to be solved. "Supply chains connecting the growers to the markets is missing by and large. We can leverage technology to connect

farmers and consumers, facilitating direct sales and promoting local produce," she says.

She cites the example of Millet Farmers Hub, a Facebook page that she started, encouraging millet farmers and FPOs (Farmer Producer Organisations) that provide a platform to connect with both millet companies and end consumers.

### Government initiatives

ITC's Sivakumar says one needs to understand the millet consumption scenario in the country in totality. Some consumers shifted to millets by appreciating its nutritional value. Farmers growing millets consume them as a matter of habit over generations. There is a significant consumption of millets through various government initiatives as well. "Each has its own context," he points out.

Part of the demand for millets is driven by various Central and State government initiatives. Ms. Vuyyala highlights the success of initiatives by the public distribution system (PDS) in States like Odisha and Karnataka, where millets are procured and distributed at subsidised rates. "Odisha is even procuring millets from other States to ensure that millets are distributed its PDS," she points out.


(The writer is with The Hindu businessline)


# Topic → Aditya-L1 Mission


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 Aditya-L1 Mission: India's first scientific mission dedicated to studying the sun was launched by ISRO in September 2023.


 Visible Emission Line Coronagraph (VELC): Developed by the Indian Institute of Astrophysics (IIAP) in Bengaluru, VELC is a key instrument aboard Aditya-L1.


 Coronal Mass Ejections (CMEs): The mission focuses on studying CMEs, which are powerful solar explosions that can disrupt satellite electronics and radio communications on Earth.

 First Science Result: The VELC successfully predicted the onset time of a CME on July 16, showcasing its capability in solar observation.

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 Scientific Goals: One of VELC's major goals is to observe CMEs as they originate and understand their plasma characteristics, which is crucial for understanding their source regions on the sun.

 Continuous Monitoring: Ongoing observations with VELC are expected to yield valuable scientific data about solar activity.

Summary: The Aditya-L1 mission, India's first solar study initiative, successfully predicted a coronal mass ejection, demonstrating the capabilities of its VELC instrument

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# Coronal Mass Ejection

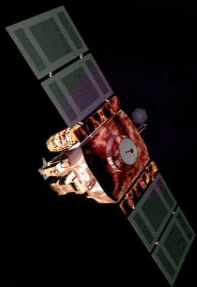


## Impact on Earth

Highly unlikely. Electricity and communication networks are affected. Polar lights appear at the poles.

## How CME's arise

They are created by magnetic fields twisting against each other in the convection zone.



## What is a CME?

Out cast matter ejected by the Sun at 2000km/s.



## Frequency

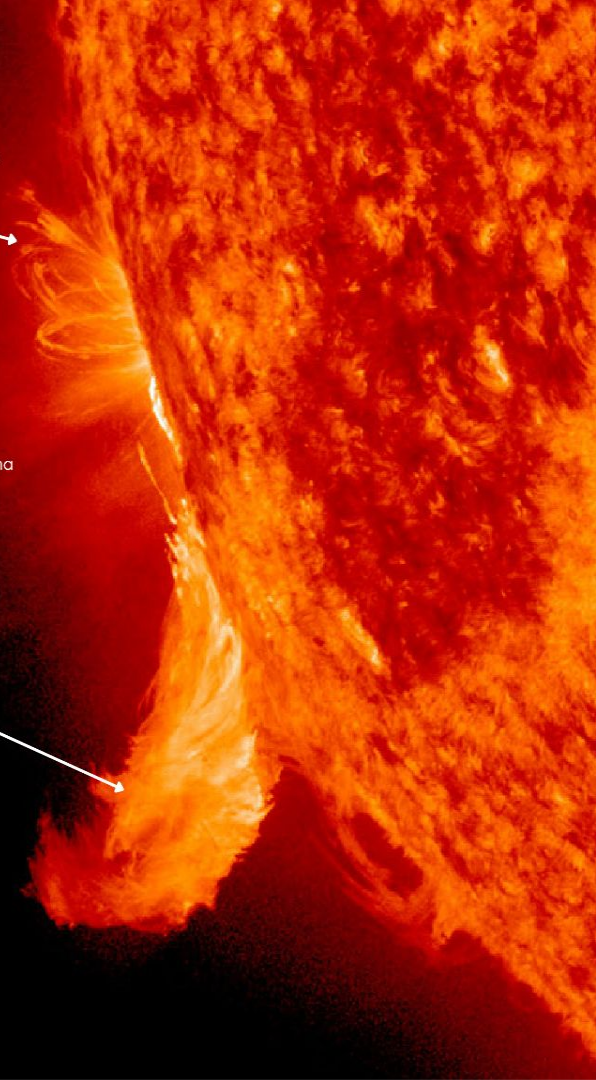
The frequency is linked to solar activity and sunspot frequency. It varies between 0.2 to 6 CME's daily.

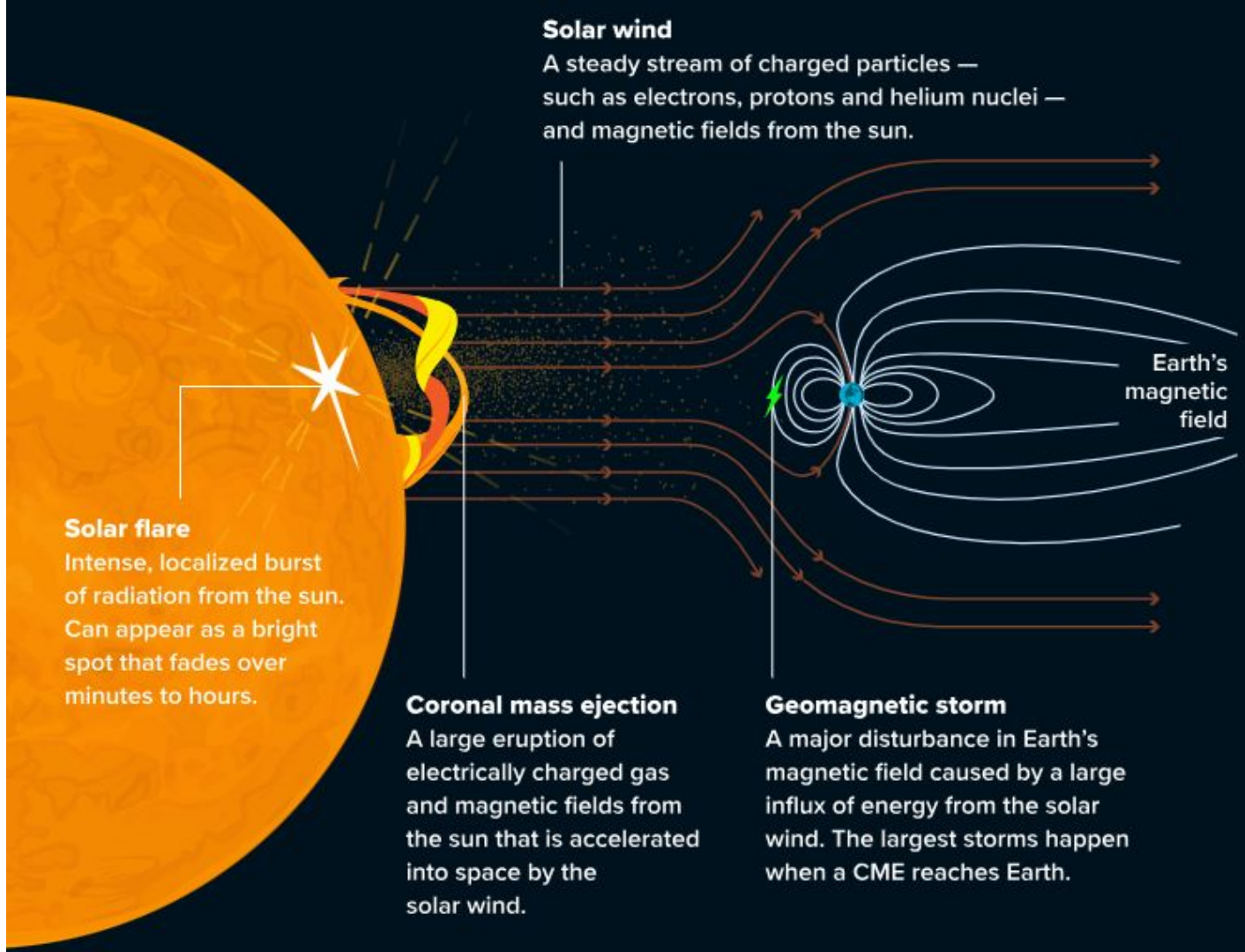
Magnetic field lines protruding from the Sun.

## Coronal Loops

The loops reorganise and the plasma tubes detach. The plasma trapped there causes strong radiation.

Up to 10 billion tonnes of material can be emitted here.







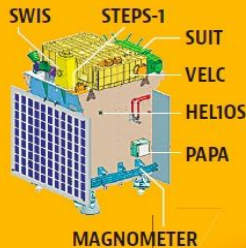
# Isro's next mission – The Sun

Aditya-L1, the first space-based Indian solar observatory, will take off on Sept 2, Isro said. A look at what the mission, in which a probe will be placed millions of kilometres between Earth and Sun, entails.

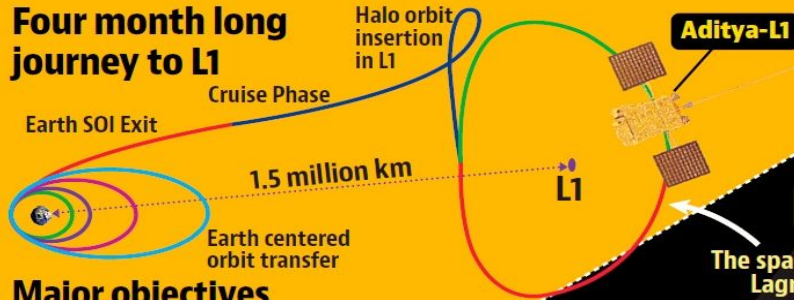
## THE MISSION

The mission will be launched by Isro's PSLV XL rocket from Satish Dhawan Space Centre, Sriharikota. Initially, the spacecraft will be placed in a low-Earth orbit. Subsequently, the orbit will be made more elliptical and later the spacecraft will be launched towards its final destination by using onboard propulsion. Once it leaves Earth's gravitational Sphere of Influence (SOI), the cruise phase will start and subsequently the spacecraft will be injected into a large halo orbit around L1 (see figure on the right). The total travel time from launch to L1 would take about four months.

It will carry 7 payloads and will observe the photosphere, chromosphere, and the outermost layers of the Sun (the corona). Four of these payloads will directly view the Sun and the remaining three will carry out in-situ studies of particles and fields.



## Four month long journey to L1



## Major objectives

- Coronal heating and solar wind acceleration
- Coupling and dynamics of the solar atmosphere
- Solar wind distribution and temperature anisotropy
- Initiation of Coronal Mass Ejection (CME), flares, and near-earth space weather

**1.5 million km**  
from the Earth – distance of L1 from Earth

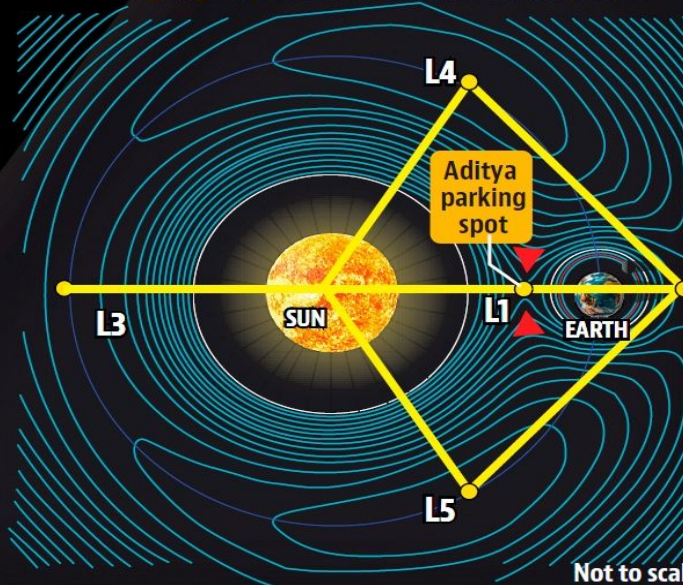
**Lagrangian Points** are positions in space where the gravitational forces of a two-body system (like the Sun and the Earth) create pockets of gravitational equilibrium. These can be used by spacecraft to stay docked in a single position without requiring to burn fuel.

Each planet, with respect to the Sun, has five such points – L1 to L5. Of these, L1 and L2 are closest (comparatively speaking) to the planet, and thus serve as good spots for observational missions.

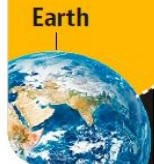
The most famous occupant of L2 is the Nasa and Esa joint effort, the James Webb Telescope – a successor to Hubble. From L2, it gets a perfect vantage point to observe deep space.

## ADITYA'S PARKING SPOT LAGRANGE POINT 1

The spacecraft will be placed in a halo orbit around the Lagrangian point 1 (L1) of the Sun-Earth system.



Since Aditya-L1 is observing the Sun, it makes sense for it to be placed in L1.



Not to scale

# ADITYA-L1 MISSION

LAUNCH DATE: **2 Sep, 2023**



DISTANCE: **1.5 mn km**  
(from earth)

COST: **378.53 cr**

TIME: **4 months**

**7** (VELC, SUIT, SoLEXS, HELIOS, ASPEX, PAPA, Digital Magnetometers)

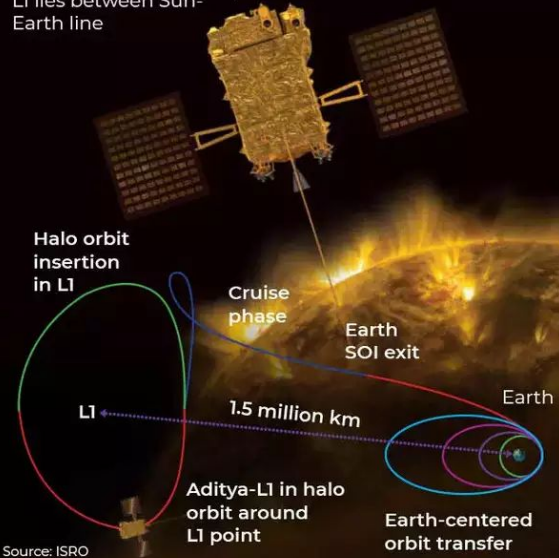
### MAJOR OBJECTIVES:

To understand corona, solar wind, solar atmosphere, sun flares, and near-earth space weather

- The first Indian space-based observatory-class solar mission

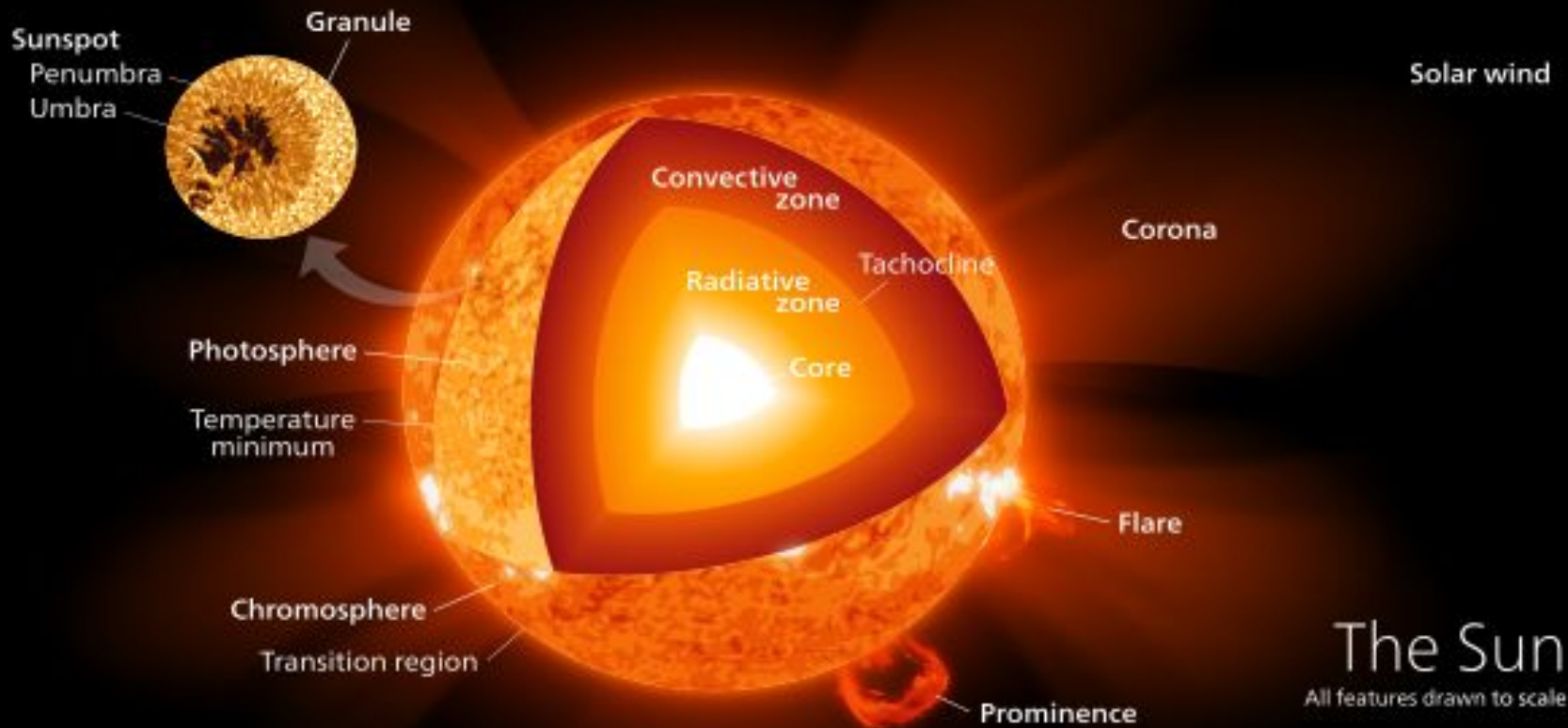
- To be launched by ISRO's PSLV XL rocket from Satish Dhawan Space Centre SHAR (SDSC-SHAR), Sriharikota

- Has to be deployed at L1 point where it can view the sun without any eclipse. L1 lies between Sun-Earth line



Source: ISRO





# The Sun

All features drawn to scale

## BIG SHOT



A street in the Paiporta municipality of Valencia, Spain, after floods hit large parts of the country. Spanish authorities confirmed on Friday that at least 200 people had died in the flooding that swept eastern and southern parts of the country starting October 29. The intense rainfall event is known as a “cold drop” or DANA weather system. GETTY IMAGES

# — Topic -- WHAT IS DANA/cold drop ??

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## Overview



Catastrophic Flash Flooding: A DANA weather phenomenon has led to severe flash flooding in Valencia, Spain, resulting in over 155 deaths and many missing.



Date of Incident: The flooding occurred on Tuesday, October 29, when some areas received a year's worth of rainfall in just a few hours.



Rainfall Amounts: Rainfall reached up to 20 inches (500 liters per square meter) in certain regions, causing widespread devastation

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## What is a DANA?

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- DANAs are intensified versions of what's known as a "cold drop," which occurs when a mass of warm air collides with a stagnant mass of cold air at an altitude of around 29,500 feet (9,000 meters).
  - In the upper atmosphere, there is a very strong wind current that surrounds Earth like a belt. Sometimes, this current begins to oscillate, appearing more like a snake than a belt.
  - When this happens, the oscillation can get "stuck," enabling the mass of cold air to remain in one place. On this occasion, it happened over southeast Spain.
-

- 
- **A DANA occurs when this cold air meets very warm air near the surface, especially above the warm waters of the Mediterranean.**
  - **This combination creates a significant temperature difference between the different layers of the atmosphere, which in turn causes the warm air to rise easily and become saturated with water vapor.**
  - **If this temperature contrast is combined with humidity and energy from the Mediterranean, which is very warm after the summer months, the result is heavy storms and torrential rain.**
-

 Climate Change Connection: The severity of recent DANA events is linked to climate change, though some experts call for deeper analysis.


 **Warming Mediterranean:** The Mediterranean Sea has warmed significantly, with a temperature increase of 2.7°F (1.5°C) since the 1980s, impacting weather patterns.


 **Altered DANA Timing:** The timing of DANA occurrences has shifted, now starting in May and lasting through November, compared to the previous September-October pattern.


 **Increased DANA Frequency:** There is a 15% to 20% increase in the formation of DANAs annually compared to six decades ago.

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 **Need for Better Communication:** Enhanced early warning systems and communication protocols are essential to prevent fatalities during extreme weather events.

 **Future Precipitation Events:** Climate change is expected to lead to more frequent and intense precipitation events, necessitating improved prevention and protection strategies.

 **Restructuring Vulnerable Areas:** There is an urgent need to adapt and restructure vulnerable regions to mitigate risks associated with extreme climate conditions.

Summary: Climate change is significantly impacting the Mediterranean region, leading to increased DANA events and necessitating improved communication and adaptation strategies

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## WHAT IS IT?

# Diffraction limit: what light can't show

The resolution of an instrument that uses light to see things can't improve beyond a point. This is called the diffraction limit.

The resolving ability of, say, a telescope says how well it can distinguish between two distant objects that are close to each other. The higher the telescope's resolution, the better its resolving ability.

In the late 1870s and early 1880s, a German engineer and physicist named Ernst Karl Abbe found a formula that connected the maximum resolution to the wavelength of light and a number called the numerical aperture:

$$d = w/2N$$

where  $w$  is the wavelength,  $N$  is the numerical aperture, and  $d$  is the maximum resolvable distance.

Thanks to the diffraction limit, scientists could use the light microscope to see cells but not the proteins inside them or a virus attacking them.

But there are optical microscopes today that can see inside cells and even things as small as atoms. This is because, from the 1980s onwards, scientists developed a new technique called super-resolution microscopy, and it wasn't



A close-up view of a light microscope. INDRA PROJECTS

bound by the diffraction limit.

Instead of sending light through the microscope to illuminate the cells, it attached special molecules to the cells. These molecules -- called fluorophores -- glowed when hit with radiation, and when they did, the microscope could also understand their surroundings.

In 2014, the developers of super-resolution microscopy were awarded the chemistry Nobel Prize for their work.

- Vasudevan Mukunth

### For feedback and suggestions


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# Topic → Super-Resolution Microscopy: Breaking the Diffraction Limit




## Understanding the Diffraction Limit

 Diffraction Limit: A fundamental limitation in the resolution of light-based instruments.

 Resolving Ability: Determines how well telescopes can distinguish between closely spaced distant objects.


## Historical Insights


 Ernst Karl Abbe's Contribution: In the late 19th century, Abbe formulated a relationship for maximum resolution:  $d = w/2N$ , where  $d$  is the resolution,  $w$  is the wavelength, and  $N$  is the numerical aperture.

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# Traditional vs. Super-Resolution Microscopy




 Traditional Microscopes: Capable of visualizing cells but not smaller structures like proteins or viruses due to the diffraction limit.

 Super-Resolution Microscopy: Developed from the 1980s, this technique allows visualization inside cells and down to the atomic level using fluorophores.

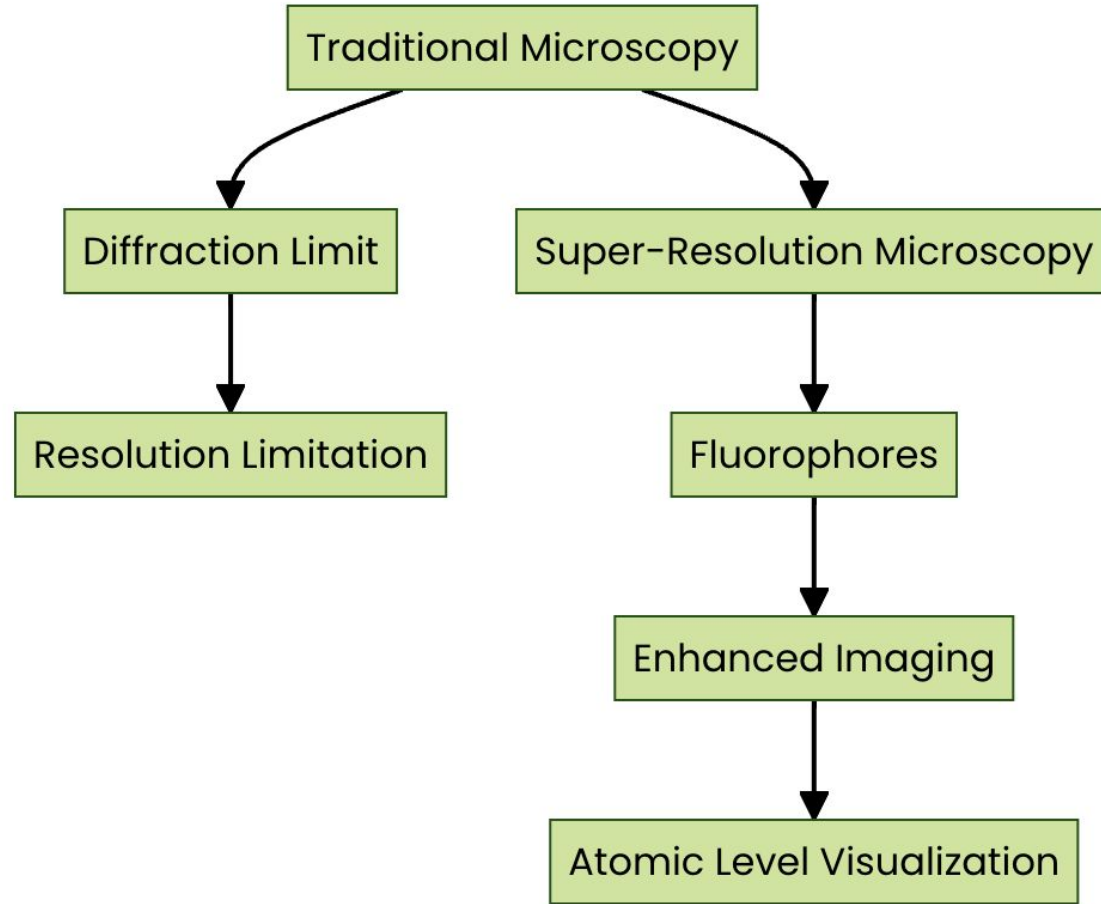
## Achievements and Recognition

 Nobel Prize 2014: Awarded to the developers of super-resolution microscopy for their groundbreaking work.

 Technique Innovation: Bypasses the diffraction limit by using radiation to illuminate specially tagged molecules, enhancing imaging capabilities.

## Summary

Revolutionary Impact: Super-resolution microscopy has transformed the visualization of cellular structures beyond the diffraction limit, earning its developers a Nobel Prize in 2014



# The BRICS summit boost to India-Iran ties



**A**t the 16th BRICS Summit hosted by Russia in Kazan (October 22-24, 2024), there were a few meetings on the sidelines which created a buzz. One such meeting was between India and Iran, both close civilisational friends and looking to strengthen a stagnating partnership. Iran, which is now embroiled in the war in Gaza, is looking for Indian support in de-escalating the crisis. India, too, has supported having a ceasefire and de-escalation at the earliest. Globally, India is being widely sought after to facilitate a peaceful resolution to the conflict as it enjoys trust and goodwill across both ends of the conflict, with Israel and Iran.

## Much potential

The bilateral meeting between Prime Minister Narendra Modi and President of the Islamic Republic of Iran Masoud Pezeshkian was the first time that the leaders have met. During the meeting, they acknowledged the strong and untapped potential in the bilateral relationship. Mr. Pezeshkian appreciated India's growing role in the world and underlined its potential role in de-escalating the Gaza conflict. He also acknowledged the key role played by India in 2023 in Iran's entry into key multilateral organisations such as the Shanghai Cooperation Organisation (SCO) and BRICS. Both sides also discussed the possibilities of strengthening cooperation in key areas such as the Chabahar port and the International North-South Transport Corridor (INSTC).

Iran's importance for India, however, goes well beyond the Chabahar port and the connectivity options that it provides. Iran is vitally important due to its vast reserves of crude oil and natural gas. Its total oil reserves are estimated at 209 billion barrels and that of natural gas at 33,988 billion cubic metres, which at the end of 2021, accounted for 24% of the oil reserves of West Asia



## Rajeev Agarwal

a retired colonel, is a former Director in the Ministry of External Affairs, a former Director in Military Intelligence (International Relations) and a former research fellow, Manohar Parrikar Institute for Defence Studies and Analyses, New Delhi (IDSA), New Delhi

Energy cooperation and defence ties are just some of the possibilities that exist to strengthen a stagnating partnership

and 12% of the world. Despite crippling economic sanctions and the ongoing war in Gaza, Iran's crude production in May 2024 rose to 3.4 million barrels per day (bpd) while crude oil exports in March 2024 averaged 1.61 million bpd.

## Options for a closer partnership

The Chabahar port has been the driving force of the bilateral relationship in recent times. In a deal signed on May 13 this year, India and Iran signed a 10-year contract for the operation of the port. Chabahar port also provides easy and short access to India's Kandla and Mumbai ports. As it is located outside the Strait of Hormuz, it insulates India's trade from any threat of closure of sea lanes due to conflicts in the Persian Gulf region. In addition, a railway link of 700 km between Chabahar and Zahedan city is being fast-tracked, to be connected later to the railway network of Iran. A further road link from Zahedan to Zaranj in Afghanistan could provide seamless connectivity for humanitarian aid from India to Afghanistan.

Energy supplies are the next big possibility. Before May 2019, Iran met almost 12% of India's crude oil needs. As bilateral ties take better shape, oil and gas imports could re-commence from Iran which could then open up a new range of possibilities to fulfil India's energy needs.

The ambitious Iran-Oman-India gas pipeline has been under discussion since 1993. In May 2022, Iran and Oman agreed to develop two undersea gas pipelines and an oil field along their maritime borders. If this materialises, extending these to India could be an option.

Close military cooperation with Iran is also a possibility. The two countries had signed a defence cooperation agreement in 2001 but nothing came of it, mainly due to western sanctions on Iran. In recent years, Iran has developed modern weapons platforms such as

short and medium range ballistic missiles, hypersonic missiles, and armed drones. Iran is already supplying armed drones to Russia in its war with Ukraine. India too is looking to develop cheap and effective armed drones and could find an effective partner in Iran.

To combat the threat of terror groups operating from Pakistan, India and Iran could conduct joint counterterrorism exercises and develop intelligence-sharing mechanisms. On the naval front, port calls at Iranian ports and the development of logistical facilities in the Persian Gulf could prove extremely useful.


## Aspects of Indian diplomacy


India and Iran can achieve a lot together. There is recognition that too much time has already been lost. India's ability to de-hyphenate ties and engage independently with nations that are adversarial to each other, such as Iran and Israel, could be useful in driving the ties. Also, India's decision to exercise strategic autonomy in issues of national interest, as seen in its engagement with Russia during the Ukraine war, is a useful precedent to invigorate ties with Iran.


However, many a time, stray and 'out of context' comments have threatened to apply the brakes on ties. A statement by Iran's Supreme Leader on September 16 this year, comparing the "sufferings" of Indian Muslims to the residents of Gaza, drawing sharp comments from India. Both countries have to realise that the bilateral relationship is far more important and precious to be derailed by such stray comments.


India, under Modi 3.0, is looking to strengthen India's outreach and strategic convergence in West Asia. Similarly, Iran is looking to consolidate its diplomatic gains of recent years and considers India to be an important partner. The meeting at the BRICS Summit may have just given the right impetus for both.

### Key Events and Discussions


 The 16th BRICS Summit was held in Kazan, Russia from October 22-24, 2024.


 A notable bilateral meeting took place between Indian Prime Minister Narendra Modi and Iranian President Masoud Pezeshkian, marking their first encounter.

 India is being sought globally to facilitate a peaceful resolution to the Gaza conflict, leveraging its goodwill with both Israel and Iran.

 Discussions included enhancing cooperation in strategic areas like the Chabahar port and the International North-South Transport Corridor (INSTC).

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—  Iran holds substantial energy resources, with 209 billion barrels of oil and 33,988 billion cubic meters of natural gas, representing 24% of West Asia's oil reserves.

 Despite sanctions and conflict, Iran's crude oil production reached 3.4 million barrels per day in May 2024, with exports averaging

1.61 million barrels per day in March 2024.

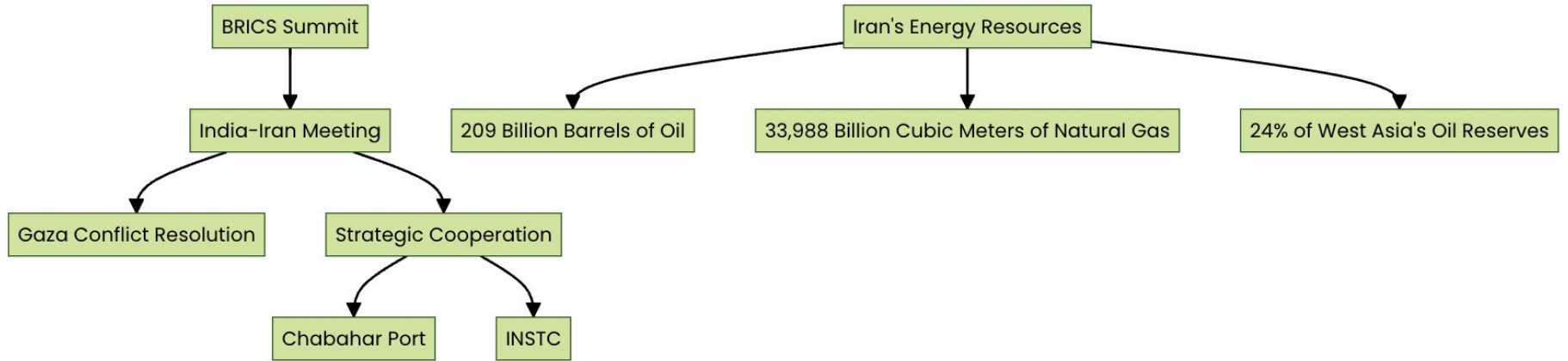
 Both nations expressed a desire to strengthen their partnership and acknowledged the untapped potential in their bilateral relationship.

## Summary

The 16th BRICS Summit in Russia featured a pivotal meeting between India and Iran, focusing on enhancing cooperation and addressing the Gaza conflict, while highlighting Iran's significant energy resources.

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## Energy and Cooperation Overview:





## Chabahar Port Agreement

10-year contract signed on May 13 for the operation of Chabahar port.  
Aims to enhance bilateral relations between India and Iran.



## Strategic Location

Provides direct access to India's Kandla and Mumbai ports.  
Avoids the Strait of Hormuz, reducing trade risks from regional conflicts.



## Rail and Road Connectivity

700 km railway link between Chabahar and Zahedan is being expedited.  
Plans for a road link to Zaranj in Afghanistan to facilitate humanitarian aid.

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## **Energy Supply Potential**

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Iran previously supplied 12% of India's crude oil needs.

Renewed ties could lead to the resumption of oil and gas imports.

Discussions on the Iran-Oman-India gas pipeline.



## **Military Cooperation**

Exploration of closer military ties, including joint defense initiatives.

Potential collaboration on armed drone development.



## **Counterterrorism Collaboration**

Establishment of joint counterterrorism exercises and intelligence-sharing.

Address threats from terror groups in Pakistan.

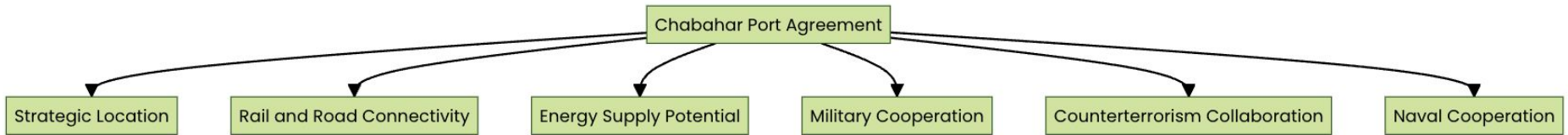


## **Naval Cooperation**

Enhancing naval cooperation through port calls and logistical support. Strengthening security and operational capabilities in the Persian Gulf.

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## Strategic Initiatives:




## Aspects of Indian diplomacy


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-  Strengthening Ties: India and Iran have significant potential for collaboration, recognizing the need to overcome past delays.
  -  Strategic Autonomy: India's independent engagement with nations like Iran and Israel showcases its ability to navigate complex international relations.
  -  National Interest: India's approach during the Ukraine war exemplifies its commitment to strategic autonomy in foreign policy.
  -  Diplomatic Sensitivity: Out-of-context remarks, such as those from Iran's Supreme Leader, can jeopardize bilateral relations and should be handled carefully.
-

—  Modi 3.0 Initiatives: The current Indian government aims to enhance outreach and strategic partnerships in West Asia, with Iran as a key player.

 BRICS Summit Impact: Recent meetings at the BRICS Summit may provide a renewed impetus for India-Iran relations.

 Bilateral Importance: Both nations must prioritize their relationship over individual comments to maintain a strong partnership.

Summary: India and Iran have the potential for a robust partnership, but must navigate diplomatic sensitivities and prioritize their bilateral relationship

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# On the new coastal zone plan of Kerala



What does the Coastal Zone Management Plan for 10 coastal districts of Kerala entail? How has the no development zone, an area which is left untouched around tidal water bodies, been altered? Will the new plan affect mangrove forests?

## EXPLAINER

K.S. Sudhi

### The story so far:

The Union Ministry of Environment, Forest and Climate Change has approved the Coastal Zone Management Plan (CZMPs) of 10 coastal districts of Kerala namely Kasaragod, Kannur, Kozhikode, Malappuram, Thrissur, Ernakulam, Kottayam, Alappuzha, Kollam and Thiruvananthapuram. The plan, prepared in tune with the provisions of the Coastal Regulation Zone Notification, 2019, permits the coastal districts to take advantage of the relaxed Coastal Regulation Zone (CRZ) rules and initiate development activities including construction of buildings towards the seaward side.

### What is the process?

The Ministry has asked the State government to make available the signed copies of the approved CZMPs of all the 10 coastal districts in the public domain through the Kerala Coastal Zone Management Authority website within one month. The Ministry has clarified that all applications seeking CRZ clearance received after the approval of the CRZ 2019 shall be considered as per the CRZ Notification, 2019. The union government had initiated the process of declaring the designated areas as Coastal Regulation Zone (CRZ) to conserve and protect the “unique environment of coastal stretches and marine areas, besides providing livelihood security to the fisher communities and other local communities in the coastal areas and to promote sustainable development based on scientific principles taking into account the dangers of natural hazards, sea level rise due to global warming.”

### What does it mean for Kerala?

Kerala has a coastline of around 590 km and nine of its 14 districts are located on



Roaring waters: Waves attack the coast in Chellanam, Kochi, in 2020. THULASI KAKKAT

the coast of the Arabian Sea. The 2011 Census put the population density of Kerala at 859 persons per square kilometre, which is more than double the national average of 382 people per square kilometre. The coastal areas of the State are marked by a high density of population when compared to other parts of the State. It is estimated that five corporations, 36 municipalities and 245 grama panchayats will come under the CRZ regime in the State in the 10 districts.

The high demographic pressure on land had resulted in rampant violations of the CRZ rules along the coast. Thousands of land modifications, which include the illegal reclamation of wetlands and encroachments, have been reported along the Kerala coast. Hundreds of constructions have come up along the

coast in blatant violation of the rules. The focus of the CRZ 2011 regime, which was in force till the approval of the CZMP, was on the conservation of the coastal ecosystem, which in turn protected the livelihood of millions of fishers and coastal communities.

### What are the benefits?

The approval of the CZMP would directly benefit around 10 lakh people, according to an estimation of the State government as the earlier restrictions for the construction of new houses and repair of existing homes will be relaxed. The approval of the CZMP was made a pre-condition for the States to make the CRZ 2019 applicable and enjoy its benefits.

The new regime will see the No

Development Zone (NDZ) – the area which has to be left untouched – around the tidal-influenced water bodies reduced to 50 metres from the earlier 100 metres from the High Tide Line in at least 122 local bodies in the State. The decision will see 37 village panchayats categorised as CRZ-III A, where the NDZ has been reduced to one-fourth of the earlier regime. The CRZ-III A are densely populated rural areas with a population density of 2,161 per square kilometre as per the 2011 Census. The NDZ in the category is 50 meters from the High Tide Line against 200 meters as specified by CRZ 2011 notification. The new regime will see 66 village panchayats being included in the CRZ-2 category paving way for the construction of both commercial and residential buildings along the building line of authorised structures.

The NDZ in the CRZ areas of Kerala will be reduced to half. It will be 108.397 sq. km against the earlier 239.431 sq. km, as fixed by the CRZ 2011 notification.

### What about mangroves?

Vast tracts of mangrove vegetation, which has an important role in the coastal ecosystem and are also considered breeding grounds for a large number of fishes and other organisms, would be exposed to exploitation as the 2019 notification has limited the legal protection of government holdings of an extent over 1,000 sq. metre to 50-metre buffer zones. The changes in rules will see a reduction in the buffer zones of mangroves to 2,500 hectares from the earlier 4,300 hectares in the State.

The new regime has also taken away the mandatory buffer zone around mangrove vegetation located in private holdings. Though the owners of private holdings in which the mangrove patches have survived may rejoice at the decision, it could leave a disastrous impact on the fast-depleting mangrove vegetation. The decision could lead to the wiping out of large tracts of mangrove vegetation, it's feared.

## THE GIST

▼ Kerala has a coastline of around 590 km and 10 of its 14 districts are located on the coast of the Arabian Sea. The 2011 Census put the population density of Kerala at 859 persons per square kilometre, which is more than double the national average of 382 people per square kilometre.

▼ The new regime will see the No Development Zone (NDZ) – the area which has to be left untouched – around the tidal-influenced water bodies reduced to 50 metres from the earlier 100 metres from the High Tide Line in at least 122 local bodies in the State.


▼ The new regime has also taken away the mandatory buffer zone around mangrove vegetation located in private holdings.


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## Topic → Coastal Zone Management Plan

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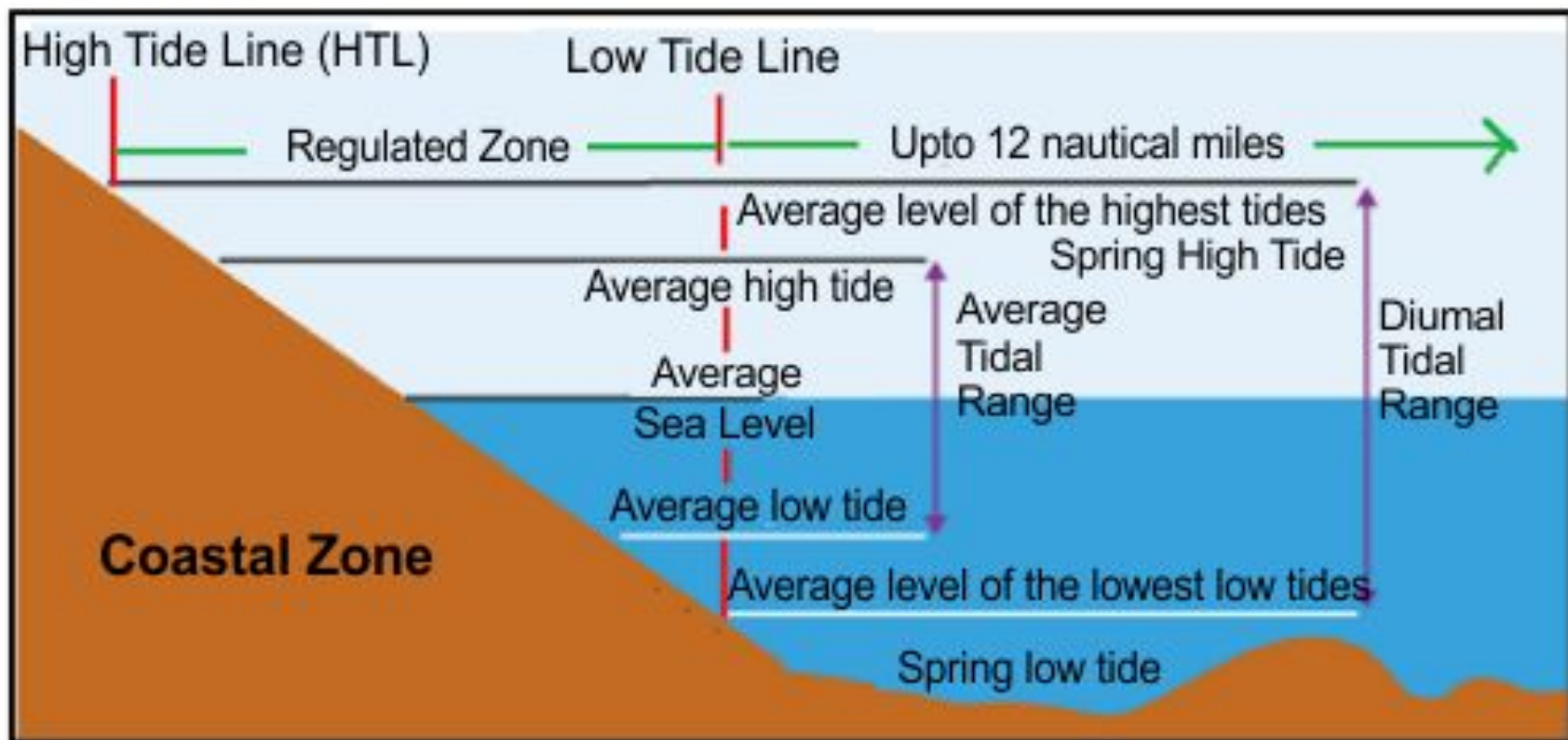


 The Union Ministry of Environment, Forest and Climate Change has approved the Coastal Zone Management Plan (CZMP) for 10 coastal districts in Kerala.

 The districts included are Kasaragod, Kannur, Kozhikode, Malappuram, Thrissur, Ernakulam, Kottayam, Alappuzha, Kollam, and Thiruvananthapuram.


 The CZMP is aligned with the Coastal Regulation Zone Notification of 2019.


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 The plan allows these districts to benefit from relaxed Coastal Regulation Zone (CRZ) rules.

 Development activities, including construction of buildings, are now permitted towards the seaward side.





 The approval aims to facilitate sustainable development in coastal areas.


 The initiative reflects a balance between environmental protection and economic growth.


Summary: The Union Ministry has approved a Coastal Zone Management Plan for 10 Kerala districts, allowing relaxed regulations for coastal development

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## Key Benefits and Changes

-  Direct Benefits: The approval of the CZMP will benefit approximately 10 lakh people by relaxing construction restrictions.
-  Housing Development: New regulations will allow for the construction of new houses and repairs to existing homes in previously restricted areas.
-  Reduced No Development Zone: The No Development Zone (NDZ) around tidal-influenced water bodies will be reduced from 100 meters to 50 meters in at least 122 local bodies.
-  CRZ-III A Classification: 37 village panchayats will be categorized as CRZ-III A, with a significantly reduced NDZ of 50 meters, impacting densely populated rural areas.

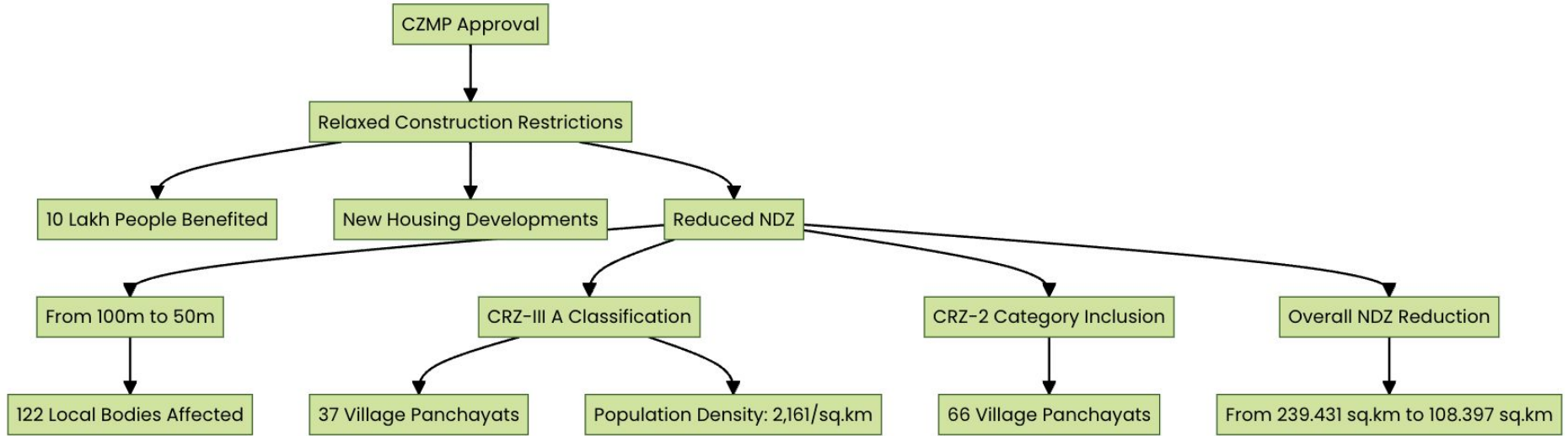
—  Population Density: The CRZ-III A areas have a population density of 2,161 people per square kilometer, according to the 2011 Census.

 CRZ-2 Category Inclusion: 66 village panchayats will be included in the CRZ-2 category, allowing for the construction of commercial and residential buildings along authorized structures.


 Overall NDZ Reduction: The total NDZ in Kerala's CRZ areas will be halved, decreasing from 239.431 sq. km to 108.397 sq. km.


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## Impact of CZMP Approval:




**Summary:** The approval of the CZMP in Kerala will significantly relax construction restrictions, benefiting 10 lakh people and reducing the No Development Zone around water bodies.


 Importance of Mangroves: Mangroves play a crucial role in coastal ecosystems and serve as breeding grounds for numerous fish and other organisms.


 Legal Protection Changes: A 2019 notification has reduced legal protections for government-held mangrove areas, limiting buffer zones to 50 meters.


 Buffer Zone Reduction: The buffer zones for mangroves have decreased from 4,300 hectares to 2,500 hectares in the state.

 Impact on Private Holdings: The new regulations have removed mandatory buffer zones around mangroves on private properties, potentially endangering these ecosystems.

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—  Risk of Depletion: The changes in regulations could lead to significant loss of mangrove vegetation, raising concerns about environmental impacts.

 Mixed Reactions: While private landowners may benefit from reduced restrictions, the overall consequences for mangrove conservation are alarming.

 Future Concerns: There are fears that the decision could result in the widespread destruction of mangrove habitats.

Summary: Recent regulatory changes threaten mangrove ecosystems by reducing legal protections and buffer zones, potentially leading to significant environmental degradation

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# What are major challenges faced by Indian cities?

What is the theme for this year's World Cities Day? What led to India's rapid urbanisation? How big of a threat does climate change and rising inequality pose to urban growth?

**Tikender Singh Panwar**

**The story so far:**

October 31 is observed every year as World Cities Day. The world's urban population has reached an estimated 4.7 billion, or 57.5% of the world's total population, with projections to double by 2050. The theme for this year's World Cities Day is 'Youth Climate Changemakers: Catalysing Local Action for Urban Sustainability'.

**What are challenges faced by cities?**

The UN underscores that cities face unprecedented challenges, especially climate change. While strides have been made towards Sustainable Development Goals (SDGs), urban centres remain plagued by poverty, inequality, and environmental degradation. In the Global South, these challenges are intensified by

rapid urbanisation, inadequate infrastructure, and limited resources. Cities here often suffer from housing shortages, poor access to clean water and sanitation, and increased vulnerability to climate-related events.

**What about Indian urbanisation?**

India's urbanisation trajectory differs from the cities in the Global North. In Western countries, urbanisation followed industrialisation, which created jobs that absorbed rural labour. Their urbanisation was sustained also because of massive economic transfers from colonies. Economist Utsa Patnaik has highlighted that India alone contributed over \$45 trillion to England's economy during colonial rule. In contrast, India's urbanisation is largely driven by economic distress, resulting in "poverty-driven urbanisation," with both rural-to-urban and urban-to-urban

migration. During the COVID-19 pandemic, the strain on urban planning became apparent, as reverse migration trends highlighted gaps in infrastructure.

**What are urban challenges in India?**

Without a 2021 Census, India lacks precise data on its urban population. World Bank estimates suggest around 40% of India's population live in urban areas, in around 9,000 statutory and census towns. The main challenges Indian cities face include inadequate spatial planning, climate change, massive migration, growing inequality and social segregation, and governance limitations.

Urban planning agencies have struggled due to two main issues. First, spatial and temporal plans are often outdated and fail to accommodate population growth. Since the 1980s, deindustrialisation has led to job losses in cities like Ahmedabad, Delhi, Surat, and

Mumbai. Many workers displaced by this trend moved to peri-urban areas, where they live in overcrowded conditions. Currently, 40% of India's urban population resides in slums. Second, plans often focus on capital growth rather than people's needs, leading to a lack of local ownership and engagement in the planning process. Additionally, inequality is widening, with exclusive developments catering to the wealthy while millions lack basic housing. Similarly, climate change severely impacts Indian cities. Cities face severe pollution and are increasingly subject to urban flooding and "heat island effects." Among the 10 most polluted cities in India, eight are in the NCR region around Delhi.

Despite the 74th Constitutional Amendment, most Indian cities remain controlled by undemocratic bodies. Though cities have elected representatives, they rarely control urban planning, which is often outsourced to parastatals and private entities. For example, less than three of the 18 functions outlined in the 12th Schedule have been universally transferred to urban governments, and cities receive a mere 0.5% of the GDP in intergovernmental transfers. As we observe World Cities Day, these challenges highlight the need for comprehensive national interventions. *The writer is former deputy mayor, Shimla, and Member, Kerala Urban Commission.*

## THE GIST

▼ The world's urban population has reached an estimated 4.7 billion, or 57.5% of the world's total population, with projections to double by 2050.

▼ India's urbanisation trajectory differs from the cities in the Global North. In Western countries, urbanisation followed industrialisation, which created jobs that absorbed rural labour.

▼ The main challenges Indian cities face include inadequate spatial planning, climate change, massive migration, growing inequality and social segregation, and governance limitations.





# Topic → World Cities Day: Urban Sustainability Focus


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## Key Highlights

 World Cities Day: Celebrated annually on October 31, emphasizing the importance of urban sustainability.

 Urban Population Growth: The global urban population stands at approximately 4.7 billion, accounting for 57.5% of the total population, with expectations to double by 2050.

 Theme for 2024: This year's theme is 'Youth Climate Changemakers: Catalysing Local Action for Urban Sustainability'.

 Urban Challenges: Cities face significant issues such as climate change, poverty, inequality, and environmental degradation, particularly in the Global South.

 Indian Urbanisation: Unlike the Global North, India's urbanisation is driven by economic distress, leading to "poverty-driven urbanisation" and migration patterns.

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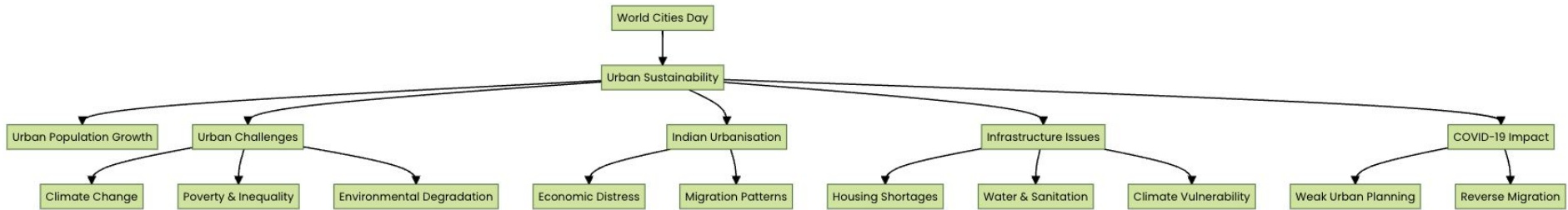
Infrastructure Issues: Indian cities struggle with housing shortages, inadequate access to clean water and sanitation, and vulnerability to climate-related events.



Impact of COVID-19: The pandemic exposed weaknesses in urban planning and infrastructure, highlighted by reverse migration trends

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## Urbanisation and Challenges:





**Urban Population:** Approximately 40% of India's population resides in urban areas, encompassing around 9,000 statutory and census towns.



**Inadequate Planning:** Urban planning is impeded by outdated spatial and temporal plans, failing to accommodate population growth.



**Slum Dwellings:** 40% of the urban population lives in slums, indicating severe housing shortages and overcrowding.

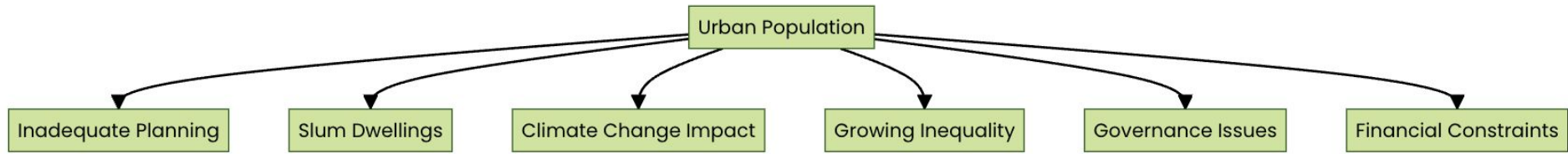



**Climate Change Impact:** Indian cities face challenges from climate change, including pollution, urban flooding, and heat island effects.


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## Urban Challenges Overview:



—  Growing Inequality: Urban developments often favor the wealthy, increasing inequality as millions lack access to basic housing.

 Governance Issues: Many cities are governed by undemocratic bodies, limiting local governance and effective urban planning.

 Financial Constraints: Cities receive only 0.5% of GDP in intergovernmental transfers, restricting their ability to address urban challenges.

Summary: Indian cities face significant urban challenges, including inadequate planning, climate change impacts, and governance issues, necessitating comprehensive national interventions.

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# Rejuvenating the millet market in rural India by tackling challenges



Stakeholders in the millet industry contend that there is a need to recalibrate their policies and strategies to tap new opportunities; they, however, can't bombard the rural market with the same products that they are selling in urban areas; firms must mull different price points for rural areas

## NEWS ANALYSIS

K.V. Kurmanath

**B**. Dayakar, CEO of ICAR's Indian Institute of Millets Research's Nutrihub, insists it's a misconception millet consumption in rural areas is low. Traditional grains have not lost their appeal at all, recent research by the institute shows.

"Rural consumers are also consuming millets on par with their urban peers," he asserts, while countering this narrative of rural decline for millets at the recently-held international conference on millets in Hyderabad.

While factors like rising incomes and changing dietary preferences have contributed to an increase in urban millet consumption, rural India has steadfastly held onto its millet traditions, growing and consuming certain millet varieties and cuisines that are peculiar to those areas.

What does this mean for companies and start-ups that produce millet-based products? A lot, says experts in the ecosystem.

S Sivakumar, who heads ITC's Agri Business segment, argues millet consumption continued in rural India over decades.

"While it is significantly lower than what it used to be, it is still much larger than the consumption in



**Spread the word:** Millet players must raise awareness about their nutritional value. THE HINDU

urban India. In rural areas where millets are grown, it is part of the regular diet, primarily in the form of centre-of-plate staples" he says.

States with sizeable production such as Rajasthan, Uttar Pradesh, Maharashtra and Karnataka grow and consume millets at varying proportions for food, fodder and industrial uses.

In order to expand the opportunity in rural markets, millet players could look at all consumption occasions and formats similar to the approach in urban areas besides raising awareness about their nutritional value.

Stakeholders in the millet industry contend that there is a need to recalibrate their policies and



The success of TruGood underscores the importance of aligning pricing strategies with the economic realities of rural consumers

strategies to tap new opportunities. They, however, can't bombard the rural market with the same products that they are selling in urban areas.

"You have to have a different pricing strategy for rural markets. It should be affordable for rural buyers. Think of price points at ₹5, or a maximum of ₹10," Raju Bhupati, serial entrepreneur and CEO of Troo Good, says.

market.

K.S. Narayanan, or KS as he's known in the food industry, suggests that encouraging rural consumers to continue their traditional millet consumption practices is key. This involves supporting local entrepreneurs who are developing millet-based products that resonate with local palates.

"Historically, millet consumption was prevalent in rural areas, especially with home-made recipes. This is still continuing in those areas. However, with the green revolution and the rise of wheat and rice, millet consumption declined, even in rural areas," he explains. He suggests introducing ready-to-cook and ready-to-eat millet products in smaller, more affordable packs for rural markets. Like Mr. Bhupati does, Mr. Narayanan also suggests different kind of price points for rural areas to be successful.

### Supply chain 'missing'

Vishala Vuyyala, founder-CEO of Millet Bank, too insists millet products for the rural markets should be price sensitive. She says despite a lot of noise around millet production and consumption, several knotty issues need to be solved. "Supply chains connecting the growers to the markets is missing by and large. We can leverage technology to connect

farmers and consumers, facilitating direct sales and promoting local produce," she says.

She cites the example of Millet Farmers Hub, a Facebook page that she started, encouraging millet farmers and FPOs (Farmer Producer Organisations) that provide a platform to connect with both millet companies and end consumers.

### Government initiatives

ITC's Sivakumar says one needs to understand the millet consumption scenario in the country in totality. Some consumers shifted to millets by appreciating its nutritional value. Farmers growing millets consume them as a matter of habit over generations. There is a significant consumption of millets through various government initiatives as well. "Each has its own context," he points out.

Part of the demand for millets is driven by various Central and State government initiatives. Ms. Vuyyala highlights the success of initiatives by the public distribution system (PDS) in States like Odisha and Karnataka, where millets are procured and distributed at subsidised rates. "Odisha is even procuring millets from other States to ensure that millets are distributed its PDS," she points out.

*(The writer is with The Hindu businessline)*





# TOPIC → Millet Consumption Dynamics


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## Key Insights

 Misconception of Low Consumption: Dayakar, CEO of ICAR's Nutrihub, challenges the belief that millet consumption is low in rural areas.


 Urban vs. Rural Consumption: Studies reveal that rural millet consumption is on par with urban levels, despite increasing urban demand.


 Changing Dietary Preferences: Urban areas show a rise in millet consumption due to higher incomes and evolving dietary habits, while rural areas continue traditional practices.


 Regional Production: States such as Rajasthan, Uttar Pradesh, Maharashtra, and Karnataka are key producers and consumers of millets, used for both food and fodder.

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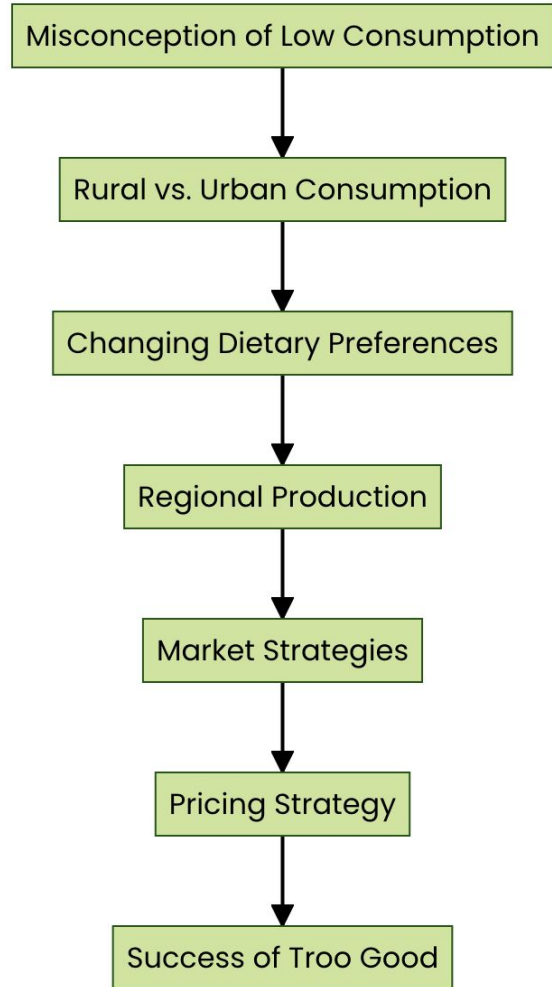
 **Market Strategies:** Experts recommend that millet companies tailor their strategies for rural markets, emphasizing affordability and diverse consumption occasions.

 **Pricing Strategy:** A specific pricing strategy is crucial for rural markets, with suggestions to price millet products between ₹5 and ₹10 to ensure they remain affordable.

 **Success of Troo Good:** Troo Good has become India's largest chikki maker, successfully selling millet chikkis at ₹5 each, proving the potential of low-cost products in rural markets.

**Summary:** Rural millet consumption is robust, and companies need to adjust their strategies and pricing to effectively engage this market.

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# Through music, art, and craft, Malawi festival unites refugees and locals

**Agence France-Presse**  
DOWA

A 72-year-old singer with tinted hair, oversized sunglasses and a flashy tracksuit hobbled up onto the main stage at the Tumaini Festival in Malawi as the crowd erupted with joy. “*Ine ndi ndani?*” (Who am I?) she said, addressing the crowd of some 12,000 people, who roared back: “*Ine ndi Jetu!*” (I am Jetu!) Billed as the world’s only music festival at a refugee camp, Tumaini, which runs from Thursday to Saturday and has been held annually since 2014, brings together refugees and locals to share music, art, and crafts.

Only a few kilometres outside Malawi’s capital Lilongwe, Dzaleka Refugee Camp was a prison before it was transformed into a camp following a massive influx of refugees from Africa’s Great Lakes region in 1994.

The camp is home to people originating from the Democratic Republic of Congo (DRC), Rwanda, Burundi, Ethiopia, and Somalia, amongst others.

## Home to 60,000

The camp was meant to accommodate about 10,000 refugees but is now home to more than 60,000 people.

“Not many people my age get to go on stage and

perform to such a crowd. I am really grateful,” Ms. Jetu, a great-grandmother, said after her performance.

Established by Congolese poet Menes La Plume, the event draws thousands of visitors and artists from across Malawi, but also from South Africa and Zimbabwe.

For Mr. Menes, Tumaini is more than just a festival, it is a platform for connection, hope and coexistence.

“This is a unique space where refugees and locals celebrate each other’s cultures, exhibit their crafts, and show the world their resilience,” said Mr. Menes.

“Tumaini is proof that



Refugees perform a traditional cultural dance during the Tumaini Festival at Dzaleka Refugee Camp in Malawi on Saturday. AFP

art and humanity can thrive even in the most challenging circumstances.”

Festival manager Tammy Mbendera said that this year’s festival was put together by the young people

of the camp, most of whom were born there.

“It is inspiring to see these young kids do this,” she said, adding that “the results speak for themselves”.

“The crowd is happy,

the people of the festival are happy, the people within the camp are happy... everybody feels like they have been listened to.”

South African musician Maveriq Mavo, who performed on Saturday evening, said he was “touched” by the initiative.

“Some things, you don’t do for the money, you do them for the cause. That is why I am here,” he said, adding that he wrote a song “specially dedicated to the refugees here”.

“It is about time we say thank you to Malawi because not every country is taking refugees,” said Mr. Mavo.

Other artists who performed at Tumaini includ-

ed Malawi’s top hip-hop musician Mfumu Hyphen but also Vankson Boy V., a Congolese refugee from the camp.

“I am glad that I was able to show off my talent at Tumaini,” Boy V said.

## Changes perception

Festival goer Yasintha Kanyoza hailed the event for humanising refugees, saying that it was the only time that refugees and Malawians were able to mingle. “I feel Tumaini gives a chance for both sides to interact and get to know each other and understand each other better,” she said.

Refugees “are usually demonised and portrayed

as violent, hungry, desperate,” she said, adding that the festival changed her perception.

“I have been able to see for myself that these are people with the same needs and desires as I have,” said Ms. Kanyoza.

Mr. Menes, who initially conceptualised the festival as a way to connect refugees with people from the surrounding villages, never thought the event would become this popular.

“We see people from all the corners of Malawi coming to Dzaleka to celebrate with the community here,” he said, adding that he hoped to replicate the festival in other countries in Africa.

# TUMAINI FESTIVAL

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- **Tumaini Festival is Tumaini Letu's flagship program, it is a unique cultural event which uses entertainment and artistic expression to promote intercultural harmony, mutual understanding, and peaceful coexistence between refugees and their host community.**
  - **It is the only festival of its kind in the world that is held within a refugee camp. Tumaini Festival was founded in 2014.**
  - **It is an extraordinary example of a large-scale cultural event within a refugee camp, created and run by refugees in collaboration with the surrounding host community, for the benefit of both. It also serves as a platform for advocacy on refugee rights.**
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# How is Tamil Nadu bracing for heatwaves?



What is a heatwave condition? Why are Indian cities, towns and villages vulnerable both in the hills and the plains? Will notifying it as a State-specific disaster help? Why is it important to have a focused management plan in place?

**Ramya Kannan**

## The story so far:

**T**he Tamil Nadu government, last week, notified a heatwave as a State-specific disaster. This would entail providing relief to people affected by heatwaves, solatium for the family of those who have died of heat-related causes, and to launch interim measures to help manage the heat. Expenditure for this will be incurred from the State Disaster Response Fund.

## Is heat a crisis now?

The World Meteorological Organization declared that 2023 was the hottest year on record. The frequency of heatwaves has increased in recent years, consistent with anthropogenic climate change, as per the Sixth Assessment Report of the Intergovernmental Panel on Climate Change, 2023. Closer home, in India, people are already reeling under the impact of intense heatwaves. In a paper in the journal *Environment International*, titled 'Impact of heatwaves on all-cause mortality in India: A comprehensive multi-city study', the authors Jeroen de Bont et al record India's heatwaves that have been occurring with increased frequency during the last decades. In May 1998, India experienced a severe heatwave over a two-week period considered to be the worst in the preceding 50 years. During the summer of 1999, India experienced unprecedented heat in April, with maximum temperatures of 40°C or above for more than 14 days.

Another heatwave in 2003 was estimated to have caused more than 3,000 deaths in Andhra Pradesh, the paper recounts. In May 2010, a heatwave in Ahmedabad led to approximately

Children, senior citizens, pregnant women, and people forced to work in the open are more susceptible to the impact of heat

1,300 deaths. In 2016, 2018, 2019 and 2023 extreme heatwaves have been observed across India. In the summer of 2024, a severe and long heatwave impacted India, blistering plains and hills, causing deaths and heat strokes. May 2024 was the worst, with Churu in Rajasthan recording a maximum of 50.5°C, recorded as the highest temperature in India in eight years. As per records, there were 219 deaths, including election officials on duty in the districts; over 25,000 people suffered from heatstroke.

## How is a heatwave defined?

A heatwave is defined generally as a prolonged period of unusually and excessively hot weather, which may also be accompanied by high humidity, but is primarily determined by regions for themselves. The India Meteorological Department (IMD), which determines heatwave conditions, has specified the following criteria: a heatwave need not be considered till maximum temperature of a station reaches at least 40°C for plains and at least 30°C for hilly regions. In the regional context, heatwave management has already emerged as a problem requiring focused attention. During April, May 2024, many parts of Tamil Nadu recorded temperatures above 40°C.

Eun-Soon Im et al, in a paper on 'Deadly heatwaves projected in the densely populated agricultural regions of South Asia' featured in *Science Advances*, stated that the crisis is all the more significant in South Asia, a region inhabited by about one-fifth of the global human population, where there exists an unprecedented combination of severe natural hazards and acute vulnerability. "The most intense hazard from extreme future heatwaves is concentrated around densely populated agricultural regions of the Ganges and Indus river basins," the paper forecasts.

## How does heat impact health?

Extreme heat conditions have a definite deleterious impact on human health, life and productivity. In their paper, Jeroen de Bont et al say they found strong evidence of the impact of heatwaves on daily mortality. Longer and more intense heatwaves were linked to an increased mortality risk. This makes it a public health problem that governments must tend to. They further add that heat-related morbidity and mortality can be caused by the direct effects of exposure to extreme heat, including a spectrum of heat-related illnesses from heat exhaustion to heat stroke. "Equally challenging from a public health perspective are the indirect effects of extreme heat exposure, occurring when heat exposure stresses underlying physiological systems and results in other specific

manifestations such as renal insufficiency, acute cerebrovascular and cardiovascular disease, and exacerbations of pulmonary disease," the paper notes. Further, existing vulnerabilities such as poverty, lack of access to shelter and health care, unplanned cities and working out in the open, add to the burden in mid and low middle income communities. Children, senior citizens, pregnant women, those with pre-existing comorbidities, and people forced to work in the open, as in construction and agriculture industries, are more vulnerable to the impact of heat. According to the WHO, heat-related mortality for people over 65 years of age increased by approximately 85% between 2000-2004 and 2017-2021.

A working paper from the Early Childhood Scientific Council on Equity and the Environment, Harvard University, (Extreme Heat Affects Early Childhood Development and Health: Working Paper No. 1., 2023) details the effect extreme temperatures can have during pregnancy and early childhood, including on learning, sleep quality, and mental and behavioural health.

## What is wet bulb temperature?

Wet bulb temperature is the lowest temperature to which a surface can be cooled by water evaporating from it, or the lowest temperature to which the surface of the skin can be cooled by sweating. Beyond this threshold, the human body can no longer cool itself, leading to heat stroke or even death. This temperature accounts for not only the degrees but also helps measure humidity and understand how much evaporation can occur.

This is particularly significant to India, which has a vast coastline in the east and west, and where rising humidity levels are of concern. Steven C. Sherwood et al in the paper 'An adaptability limit to climate change due to heat stress' point out that peak heat stress, quantified by the wet-bulb temperature, is surprisingly similar across diverse climates today. Exceeding a wet bulb temperature of 35°C for extended periods would induce hyperthermia in humans, as dissipation of heat becomes impossible.

## What should governments do?

The long-term goal is addressing the anthropogenic causes for climate change, and at the same time, tackling systemic shortfalls like poverty, unplanned cities, access to health care and nutrition. However, there is much that governments can do even in the interim, during periods of intense heat, as indicated by the Tamil Nadu government. These include keeping in readiness health centres, maternity and children hospitals to provide treatment for citizens, stockpiling adequate quantities of ORS and medicines that will be useful at hospitals, providing water and shelter to those who have to brave the elements and rescheduling work hours to protect outdoor workers.




**Hellfire:** A road worker, braving the heat and dust, repairing a damaged road in Palayamkottai, Tirunelveli on July 9. SHAIKHMOHIDEEN. A





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## Topic -- HEATWAVES



 Definition of Heatwave: A heatwave is a prolonged period of unusually hot weather, often with high humidity, defined regionally.


 IMD Criteria: The India Meteorological Department specifies that a heatwave is recognized when temperatures reach at least 40°C in plains and 30°C in hilly areas.


 Recent Temperatures: In April and May 2024, parts of Tamil Nadu experienced temperatures exceeding 40°C.


 Research Findings: A study by Eun-Soon Im et al. highlights the severe impact of heatwaves in densely populated agricultural regions of South Asia.

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 Population Vulnerability: South Asia, home to about one-fifth of the global population, faces significant risks from extreme heat due to its combination of natural hazards and vulnerability.

 Affected Regions: The most intense heatwave hazards are projected for the Ganges and Indus river basins, which are densely populated and agriculturally significant.

 Future Projections: The study indicates that future heatwaves will pose increasing threats to these vulnerable regions.


Summary: Heatwaves, defined regionally, pose significant risks in South Asia, particularly in agricultural areas, with recent temperatures in Tamil Nadu exceeding 40°C.


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## Wet bulb temperature


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Wet bulb temperature is the lowest temperature a surface can be cooled by water evaporation or sweating.

 Health Risks: Exceeding this temperature can lead to heat stroke or death due to the body's inability to cool itself.

 Humidity Measurement: It helps measure humidity levels and the potential for evaporation.

 Relevance to India: Rising humidity levels in India, with its extensive coastline, make wet bulb temperature particularly significant.

 Research Findings: A study by Steven C. Sherwood et al. indicates that peak heat stress, measured by wet bulb temperature, is consistent across various climates.

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🔥 **Critical Threshold:** A wet bulb temperature exceeding  $35^{\circ}\text{C}$  for prolonged periods can cause hyperthermia in humans.

🌍 **Climate Change Impact:** The concept of wet bulb temperature is crucial in understanding the adaptability limits to climate change due to heat stress.

**Summary:** Wet bulb temperature is a critical measure for assessing heat stress and humidity, with significant implications for human health, especially in humid regions like India.

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# takeaways from COP-16?

Is a bigger corpus going to be available for the conservation and preservation of biological diversity?

Jacob Koshy

The story so far:

The 16th edition of the Convention of Biological Diversity (CBD) in Cali, Colombia which was to have concluded on November 1 after two weeks of negotiations and involving about 100 countries, saw representatives of countries trying to iron out a conclusive deal well past the deadline.

What is the convention about?

This convention follows meetings in 2002 at Montreal, Canada. At that time, countries agreed to protect 20% of land and water by 2010, known as the '20/20 agreement', at a time when less than 17% of land and 10% of marine areas were protected. In 2012, the Kanning-Montreal Global Biodiversity Framework (BMGF), as it is formally known, set 23 action-oriented global targets for urgent action in the decade to 2030. The actions listed in each target needed to be initiated immediately and completed by 2030. Other than the 20/20 goal, targets include reducing the introduction of invasive alien species by 50% and minimising their impact by 2030. It also aimed to reduce pollution risks and the negative impact of pollution from all sources to sustainable levels by 2030, set up a mechanism for "benefit sharing from the use of digital sequence information on genetic sources", and traditional knowledge, and

India has said that to meet the higher financing requirements for tracking targets on conservation of plants and animals, it would require funds from sources beyond routine government allocation mechanisms to implement these targets as well as discuss work to regenerate funding. While there were calculations that about \$200 billion would be required annually to achieve these targets, less than tenth of this money has actually been committed.


What are some decisions taken at COP-16? Though a final approved text is still in the works, negotiators have decided on setting up a subsidiary body that will include indigenous groups and people in discussion around conservation and biodiversity, according to a report by the Associated Press on Saturday. In the run-up to COP-16, one of the most contentious issues was on the Digital Sequence Information (DSI) agreement. The deals with "benefit-sharing" or how, for example, medicines and drugs made from analysing the DNA of living organisms, stored in databases and which are used in commercial products, can be shared with the local communities where such organisms are found. There were plans to create a "multi-lateral mechanism", but no agreement was forthcoming on which countries or corporations ought to be contributing, and how. The major texts that have so far been formally adopted by the convention include agreements on biodiversity and climate change, mainstreaming biodiversity, putting a check on invasive species and the technical needs to support the implementation of the BMGF.


What was India's contribution to COP-16? India has been a consistent participant at the biodiversity COPs. This year too a delegation, led by the Minister of Science and Environment Jitendra Singh, participated at the proceedings in Cali. India presented an "updated" biodiversity plan where it stated that it expects to spend around \$4.64 crore from 2023-30 (7%) on biodiversity and conservation. From 2018-23 (7%), India spent \$2,307 crore on biodiversity and conservation, and to meet the higher financing requirements, it would require funds from sources beyond routine government expenditure, it said.

The expenditure from 2018-2022 was solely made by the Centre, through allocations to various Ministries or statutory bodies for conservation and biodiversity linked programmes. Indian officials at the conference said international finance would be necessary to meet these goals. "I would like to mention that it is necessary to provide stream of implementation including financial resources, as laid down in target D1 of the Kanning as well as from DSI, for implementation of the NBSAP (National Biodiversity Strategy and Action Plan)," Mr. Singh said in a statement. Target D1 calls for mobilising \$200 billion per year for biodiversity from all sources, including \$20 billion through international finance. In the updated assessment, which is a 200-page document, India has cited the "significant step in global wildlife conservation" it has taken by establishing the International Big Cat Alliance which is aimed at protecting the world's largest felids or cat species, as their presence is indicative of a healthy ecosystem and rich biodiversity. India had coined its Ramsar sites, which are wetlands of ecological importance under the Ramsar Convention, from 26 to 85 since 2002. It is soon projected to reach 100.



### Overview

 The 16th edition of the Convention on Biological Diversity (CBD) was held in Cali, Colombia, with participation from around 190 countries. The event extended beyond its initial deadline of November 1.

 This convention follows the 2022 meetings in Montreal, where the '30-by-30 agreement' was established to protect 30% of land and water by 2030.

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## Key Targets and Challenges

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The Kunming-Montreal Global Biodiversity Framework (KMGBF) set forth 23 action-oriented global targets for urgent action by 2030.



Targets include:

Reducing invasive alien species by 50%.

Minimizing pollution risks.

Integrating biodiversity into various policies and development processes.





An estimated \$200 billion is needed annually to achieve these targets, yet less than 10% of this funding has been committed.

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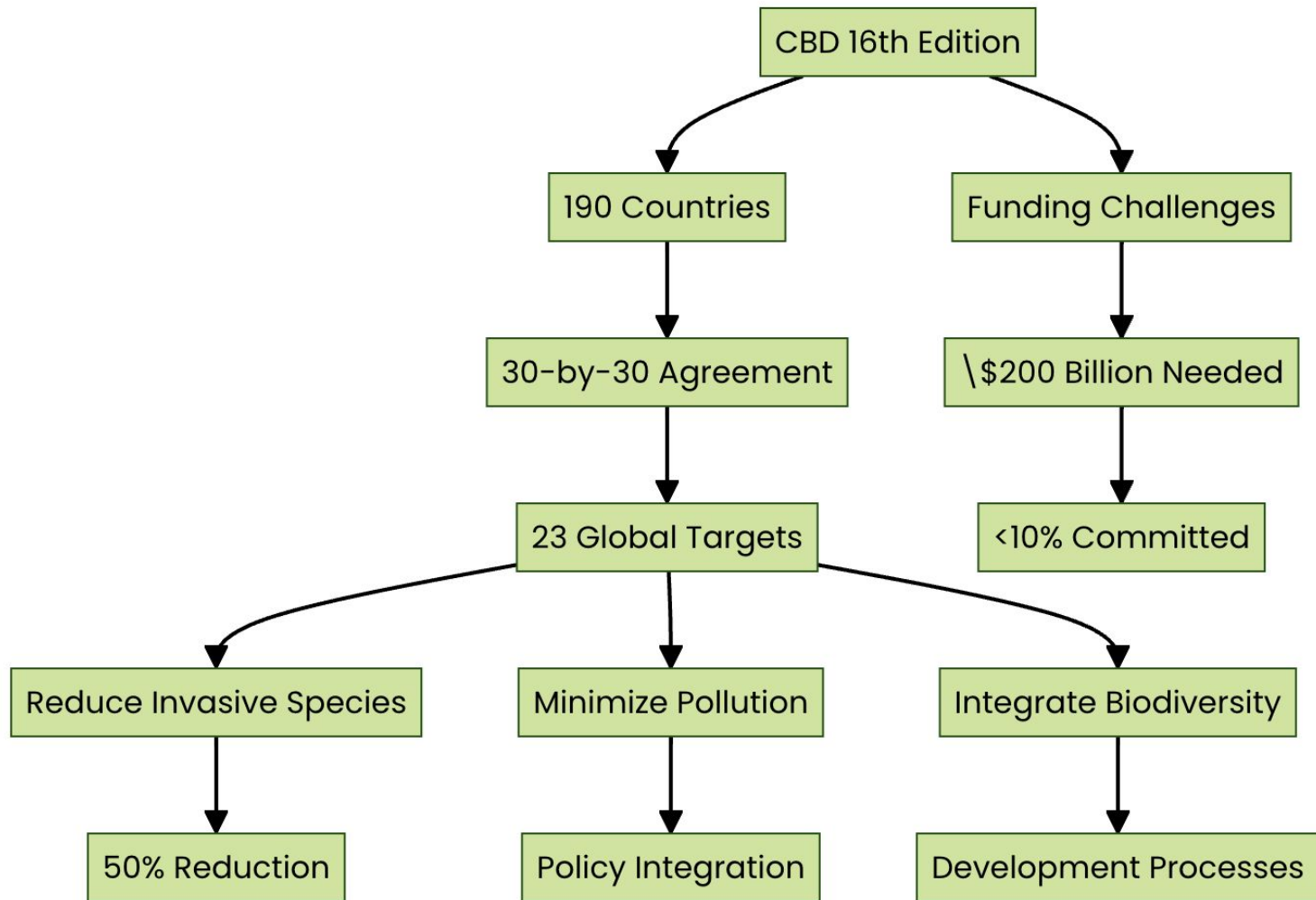
## Focus and Goals

 A primary focus of COP-16 was to establish mechanisms for implementing the targets and organizing funding.








 The convention aims to tackle urgent biodiversity issues and promote sustainable practices for the future.

Summary: The 16th CBD in Colombia aimed to finalize agreements on biodiversity protection targets, including the ambitious '30-by-30' initiative, while facing significant funding challenges.

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### Key Highlights


-  **Subsidiary Body:** A new body will be formed to include indigenous groups in conservation and biodiversity discussions.
  -  **Negotiations:** Finalization of the approved text for COP-16 is ongoing.
  -  **DSI Agreement:** Focuses on benefit-sharing from commercial products derived from local organisms.
  -  **Benefit-Sharing Mechanism:** Plans for a multi-lateral mechanism were discussed, but no consensus on contributions from countries or corporations was reached.
  -  **Major Agreements:** Adoption of measures on biodiversity, climate change, and invasive species.
  -  **Technical Needs:** Addressed in the adopted texts for implementing the KMBGF.
  -  **Local Communities:** Emphasized in the conservation dialogue.
-

### Key Highlights

 India's Participation: Active involvement in COP-16, led by Minister of State for Environment Kirti Vardhan Singh.


 Biodiversity Funding: Planned expenditure of approximately ₹81,664 crore on biodiversity and conservation from 2025-30, following ₹32,207 crore spent from 2018-22.


 Funding Sources: Emphasis on the need for international finance to supplement government expenditure for biodiversity initiatives.


 International Big Cat Alliance: Establishment of the alliance to protect seven major big cat species, underscoring India's commitment to global wildlife conservation.

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 Ramsar Sites Expansion: Increase in Ramsar sites from 26 to 85 since 2014, with a projection to reach 100 soon, highlighting efforts in wetland conservation.

 Financial Goals: Target 19 of the KMGBF aims to mobilize \$200 billion annually for biodiversity, including \$30 billion from international finance.

 Updated Biodiversity Plan: A comprehensive 200-page document outlining India's strategies and goals for conservation.

Summary: India presented an updated biodiversity plan at COP-16, committing significant funding and emphasizing the need for international support to enhance conservation efforts.

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# Why is Brazil weighing options on BRI?



What has President Lula's chief adviser on foreign policy indicated with respect to China's Belt and Road Initiative? What is the status of Brazil-China ties? What reasons did India give when it decided not to join the initiative? Has China's global infrastructure project hit a roadblock?

**Suhasini Haidar**

**The story so far:**

**T**he Brazilian government indicated this week that it may not want to join China's Belt and Road Initiative (BRI), which would make it the second member of the BRICS grouping (Brazil, Russia, India, China, South Africa) after India to decline joining the trillion-dollar Chinese global infrastructure project that was started in 2013.

**What may have prompted the decision?**

The decision was conveyed in an interview to a Brazilian newspaper by Celso Amorim, Chief Adviser on Foreign Policy to Brazilian President Luiz Inacio Lula Da Silva. The interview has raised questions about Brazil-China ties, as well as about the BRI, which was launched as a modern-day version of the ancient Silk Road.

In the interview to *O Globo*, Mr. Amorim said that rather than sign an "accession contract" with China, Brazil would prefer to explore "synergy" in various nationally determined infrastructure projects. "The key word is synergy. It's not about signing something like an insurance policy. We're not entering into an

There is an underlying concern about growing dependence in the Community of Latin American and Caribbean States on Chinese investment

accession treaty. It's a negotiation of synergies," Mr. Amorim said, adding that while China could give the relationship any name, for Brazil any partnership would involve projects defined and decided by Brazil.

He did not, however, reject the BRI outright or forswear Chinese funding for a number of projects, mainly on infrastructure, but also in other areas, ranging from solar energy to hybrid or electric cars. Mr. Amorim also suggested that such projects would engage not only Brazil but also other South American countries. Finally, Mr. Amorim pointed to more geopolitical collaborations that Brazil and China can further, such as the six-point peace plan for Ukraine.

**Why is the timing important?**

Unlike most of its neighbours, Brazil is one of only four South American countries not to join the Chinese initiative. Mr. Lula's predecessors Jair Bolsonaro and Michel Temer had been positive on Chinese investments but demurred at Beijing's multiple attempts at getting Brazil to sign an MoU on the BRI. As of December 2023, about 150 countries worldwide have done so, with India and Brazil being notable exceptions in the developing world, especially given their common membership of the BRICS. Russia also has some BRI projects under development for energy and roads, but it has not signed the MoU, only inking a China-Eurasian Economic Union MoU on the BRI.

In July, however, Mr. Lula had told a news conference that Brazil was studying the benefits of joining the BRI. "As China wants to discuss this Silk Road, we will have to prepare a proposal to assess 'What do we gain? What's in it for Brazil if we participate in this thing?'," he said. However, the decision conveyed in the *O Globo* interview, which comes after the BRICS summit in Russia and a visit to China by Mr. Amorim, appears to indicate that Brazil has concluded that the gains do not outweigh the risks of such a move.

**What were India's reasons to stay out of BRI?**

In its decision announced in May 2017 to stay out of the BRI, India was more forthright, and had outlined three issues: the corridor

disregards sovereignty and territorial integrity of nations, particularly referring to projects in Pakistan-occupied Kashmir; it would push smaller economies into debt traps and environmental hazards; and there was a lack of transparency, indicating India was wary of the BRI's larger geopolitical aims. In Brazil, officials say that there is an underlying concern about growing dependence in the CELAC (Community of Latin American and Caribbean States) region on Chinese investment, although Brazil-China trade has reached robust levels of \$180 billion and Chinese investment of \$3 billion a year in Brazil is the highest in the continent. With all that is at stake, all eyes are on what President Lula says later this month, when he hosts the G-20 in Rio De Janeiro (November 18-19), followed by a state visit by Chinese President Xi Jinping to Brasilia on November 20.

**Has the BRI lost its sheen?**

More than a decade after it was launched by Mr. Xi, the Belt and Road Initiative is no longer the "project of the century" it was once touted as. Of the 150 countries that have either signed an MoU or contracted for BRI projects, 44 are in Sub-Saharan Africa, 17 in the European Union, 17 others in Europe and Central Asia, 31 in East Asia and South East Asia, 22 in South America and 19 in West Asia-North Africa.

One of the reasons the BRI's charms have dimmed is China's own slowing economy and Beijing's unwillingness to be as generous with its loans in the second half of the decade, especially after the COVID-19 pandemic. Another is the discomfort in many countries over the terms for the loans, which involve hiring Chinese companies and engaging Chinese workers, while often demanding heavy collateral, as Sri Lanka found out after losing control of the Hambantota port. The U.S.'s heavy lobbying against the BRI has also had some effect: Italy's Giorgia Melloni announced in December 2023 that it would not renew the BRI MoU. The Brazilian Foreign Adviser's statement follows a visit by U.S. Trade Representative Katherine Tai who asked Brazil to think carefully through an "objective lens" before signing on to the BRI. The remarks raised a protest from the Chinese Embassy in Brasilia which called them "disrespectful" of Brazil's sovereign right to choose its partners. With some ambiguity still apparent in Brazil's stand, some have suggested that President Lula may be keeping his options open, at least until the outcome of the U.S. elections on November 5.




**Rocky road:** Brazil's Special Adviser to the President Celso Amorim, speaks at a meeting with China's Foreign Minister Wang Yi, on September 27. AP

# Topic → Brazil's Stance on China's Belt and Road Initiative





## Overview

 Brazil may choose not to join China's Belt and Road Initiative (BRI), potentially becoming the second BRICS member after India to make this decision.

 Celso Amorim, Chief Adviser on Foreign Policy, shared this perspective in an interview with the Brazilian newspaper O Globo.

## Brazil's Approach

 Brazil is interested in exploring "synergy" in infrastructure projects rather than committing to an "accession contract" with China.

 Amorim stressed that any partnership would prioritize projects defined and decided by Brazil, rather than being dictated by China.

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# Open to Collaboration

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☀️ Brazil remains receptive to Chinese funding for various projects, including infrastructure, solar energy, and electric vehicles.

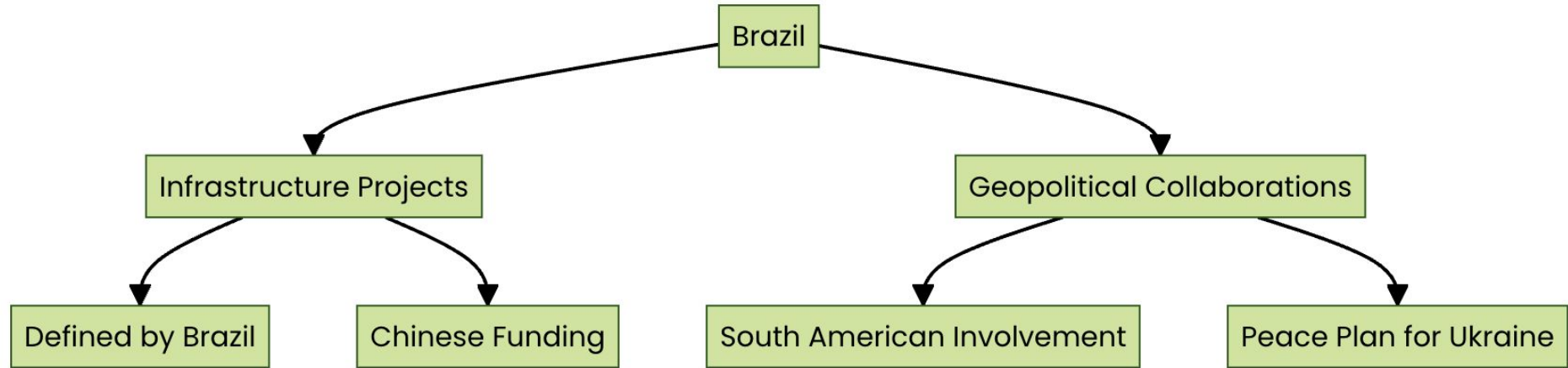
🌍 The potential collaboration could extend beyond Brazil, involving other South American countries in these initiatives.

## Geopolitical Considerations

🕊️ Amorim mentioned possible geopolitical collaborations, including a six-point peace plan for Ukraine

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## Brazil's Strategic Considerations:




**Summary:** Brazil is cautious about joining China's Belt and Road Initiative, opting to negotiate infrastructure projects independently while remaining open to collaboration and funding opportunities.


# The Belt and Road Initiative: Current Challenges and Global Impact

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## Overview


 The Belt and Road Initiative (BRI), launched by Xi Jinping over a decade ago, is losing its initial appeal.


 150 countries are involved in BRI projects, with 44 in Sub-Saharan Africa, 17 in the EU, and others in regions like East Asia, South America, and West Asia-North Africa.


## Challenges and Influences


 China's slowing economy and reduced loan generosity post-COVID-19 have contributed to the BRI's declining attractiveness.

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—  Many countries are uncomfortable with BRI loan terms, which often require hiring Chinese firms and providing heavy collateral, as seen in Sri Lanka's Hambantota port situation.

 U.S. lobbying against the BRI has influenced countries like Italy and Brazil, with Italy deciding not to renew its BRI MoU.

 Brazil's stance on the BRI remains ambiguous, with President Lula possibly waiting for the outcome of the U.S. elections before making a decision.

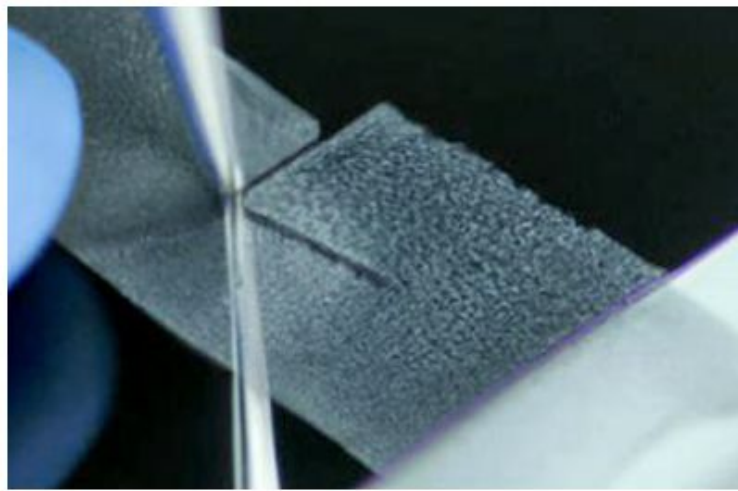
 Recent diplomatic tensions have arisen, with the Chinese Embassy in Brazil criticizing U.S. remarks as disrespectful to Brazil's sovereignty.

## Summary

The Belt and Road Initiative is losing momentum due to China's economic slowdown, unfavorable loan terms, and U.S. lobbying, affecting countries' participation.

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## Layer of graphene oxide halts frost formation on flat areas

Northwestern University engineers have developed a new strategy that prevents frost formation before it begins. The researchers discovered that tweaking the texture of any surface and adding a thin layer of graphene oxide prevents 100% of frost from forming on surfaces for one week or even longer. This is 1,000 times longer than current, state-of-the-art anti-frosting surfaces. The new scalable surface design also is resistant to cracks, scratches and contamination.


## Topic --. Graphene oxide

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 Northwestern University engineers have created a new strategy to prevent frost formation before it starts.

 The method involves modifying the texture of surfaces and applying a thin layer of graphene oxide.

 This new approach can prevent 100% of frost formation for one week or longer.

 The duration of frost prevention is 1,000 times longer than existing anti-frosting technologies.

 The new surface design is scalable and resistant to cracks, scratches, and contamination.

 This innovation could have significant implications for various industries requiring frost prevention.

 The research highlights the potential of graphene oxide in enhancing surface properties.

Summary: Northwestern University engineers have developed a groundbreaking anti-frost strategy using textured surfaces and graphene oxide, achieving unprecedented frost prevention duration and durability.



## Remission of diabetes found a decade after bariatric surgery

Ten years after undergoing bariatric surgery as teens, over half of study participants demonstrated sustained weight loss and also resolution of obesity-related conditions, such as type 2 diabetes, high blood pressure and high cholesterol, a study finds. It found that 55% of the participants who had type 2 diabetes as teenagers and underwent surgery were still in remission of their diabetes at 10 years. It was a follow-up of a previous study which found major improvements in type 2 diabetes three years after the surgery.

## — Topic → **Bariatric surgery**

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Bariatric is an adjective that means relating to, or specializing in, the treatment of obesity. It can also refer to a person who is obese and may be a candidate for weight-loss surgery.

### **Bariatric surgery**

A general term for weight-loss surgeries that alter the stomach or digestion process to help with weight loss. Bariatric surgery is not a permanent solution, but it can be a major part of a new lifestyle

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# Glacial lakes rise as glaciers retreat



**SPEAKING OF  
SCIENCE**

**D. Balasubramanian**

Glaciers are enormous bodies of dense ice on mountains. They move under the influence of gravity and their own weight, in the process eroding the land beneath. The grinding action pulverises the rock underneath, reducing it to a mixture called moraine: a material ranging in size from room-sized boulders to extremely fine 'rock flour'. Moraine gets deposited on the sides and at the terminus of the glacier.

When the melting of ice causes a glacier to retreat, the cavernous hole left behind fills with water. The rocky material piled at the terminus of the glacier often serves as a natural dam

for creating a lake. Glacial lakes are hydrological buffers – they check the natural flow of water from melting ice. This can cause occasional hardships to communities that live downstream of the lakes.

The blue color of glacier lakes can be quite startling. A pale comparison is swimming pools with painted bottoms. The effect is due to the scattering of light by ultra-fine particles of rock flour that are suspended in lake water. Our Himalayas have some stunning examples of turquoise-colored glacial lakes.

The Gurudongmar lake is located in Northern Sikkim, and at 5,430 msl is one of the highest lakes in the world. A moraine-dammed lake, the outlet stream of the lake feeds into water bodies that go on to form the river Teesta. The Pangong Tso, a 134-



**Growing:** From 17 hectares in 1977, the South Lhonak lake has grown to 167 hectares by 2023. REUTERS

km chain of lakes, is part of the disputed buffer zone between Ladakh and China. The much-photographed Samiti Lake, at around 4,300 msl in Sikkim, lies en route to Kanchenjunga.

A consequence of global warming is the retreat of glaciers. This leads to an increase in the chances of

the breaching of the moraine barriers that help create these lakes.

One of Sikkim's glacial lakes, the moraine-dammed South Lhonak lake, has shown what the consequences of rising temperatures can be. Fed by three glaciers, the lake's volume has risen at an unusually high rate. The lake

is of very recent origin – it first appeared in satellite images in 1962. Covering a mere 17 hectares in 1977 and growing, the lake was regarded as a potential hazard. By 2017, three eight-inch diameter pipes were installed to continuously pump water out of the lake. They proved to be quite inadequate.

The lake had grown to 167 hectares by 2023. Rains last year caused the moraine dam to give way. The resulting glacial lake outburst caused water levels in the Teesta River to rise by six meters, leading to the collapse of the Teesta III dam, and widespread destruction.

Modeling of a future outburst from this lake, by scientists at IIT-Roorkee and others, has led to the prediction that a major breach could lead to a discharge of over 12,000 cubic meters of water per second – a very scary prospect for human settlements located downstream. Such monitoring will help in disaster mitigation and an understanding of these mystical blue wonders of nature.

*(The article was written in collaboration with Sushil Chandani, who works in molecular modelling)*

# Topic → **Glaciers and Their Impact on Landscapes**


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## Key Features of Glaciers and Glacial Lakes





Glaciers: Massive, dense ice bodies that move due to gravity, shaping the land beneath.

 Moraine Formation: Glaciers grind rocks into moraine, ranging from large boulders to fine rock flour.

 Glacial Lakes: Formed when glaciers retreat, leaving cavities that fill with water, often acting as natural dams.

 Hydrological Buffers: These lakes regulate water flow from melting ice, affecting downstream communities.

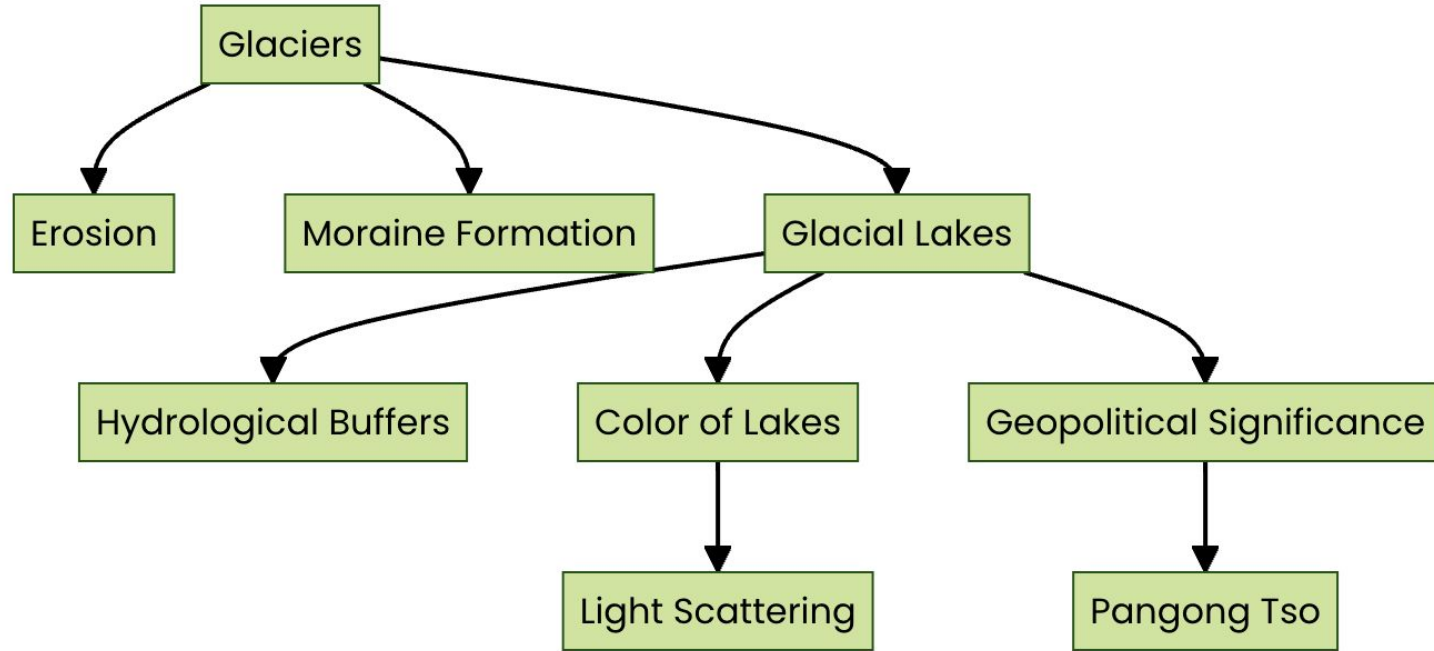
 Color of Glacial Lakes: The vibrant blue is due to light scattering by ultra-fine rock flour in the water.

 Himalayan Lakes: Examples include Gurudongmar Lake (5,430 msl), Pangong Tso (134-km chain), and Samiti Lake (4,300 msl).

 Geopolitical Significance: Pangong Tso is in a disputed area between Ladakh and China.

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## Glacial Impact Overview:







Global Warming Impact: The retreat of glaciers due to global warming increase risk of moraine barrier breaches, which can create glacial lakes.



**South Lhonak Lake:** This glacial lake in Sikkim, formed from three glaciers, has rapidly increased in volume since its first appearance in satellite images in 1962.



**Lake Growth:** The lake expanded from 17 hectares in 1977 to 167 hectares by 2023, indicating significant environmental changes.



**Inadequate Mitigation:** In 2017, three eight-inch diameter pipes were installed to pump water out of the lake, but they were insufficient to manage the rising water levels.

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Recent Flooding: Heavy rains in the previous year caused the moraine dam to fail, resulting in a glacial lake outburst that raised the Teesta River's water levels by six meters.



Dam Collapse: The outburst led to the collapse of the Teesta III dam and caused widespread destruction in the surrounding areas.



Future Predictions: Modeling by IIT-Roorkee predicts that a major breach could discharge over 12,000 cubic meters of water per second, posing a significant threat to downstream human settlements.

Summary: The rapid growth of Sikkim's South Lhonak Lake due to global warming poses severe risks, including potential dam failures and catastrophic flooding.





## Question Corner

# Adaptation

### Who do langurs drink salt water?

A new study shows the remarkable adaptability of the critically endangered Cat Ba langurs. Despite low genetic diversity, the langurs have retained key genetic traits that help them survive in their isolated environment on Cat Ba Island in Vietnam. One of the remarkable adaptations is the ability to drink salt water. Due to the dramatic decline of its population, the species suffers from genetic impoverishment, high inbreeding, and a potentially increased susceptibility to disease. Analysis of their genetic


genetic diversity has been maintained in functionally important areas of their genetic information. This enables the Cat Ba langurs (*Trachypithecus poliocephalus*) to continue to cope adequately with changing environmental conditions. The researchers show that changes in certain genes have probably increased tolerance to salt water. These genetic adaptations enable langurs to cope with the high sodium content of salt water and thus contribute to their survival in this unique environment.


Readers may send their questions / answers to


## Topic → The Cat Ba langurs


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 Critically Endangered Status: The Cat Ba langurs are classified as critically endangered, highlighting their vulnerable population status.

 Salt Water Adaptation: They possess a remarkable ability to drink salt water, which is crucial for their survival in their isolated habitat.

 Low Genetic Diversity: Despite having low genetic diversity, the langurs have retained essential genetic traits that aid in their survival.


 Genetic Analysis: Studies indicate that genetic diversity is maintained in functionally important areas, allowing them to adapt to environmental changes.


 Health Risks: The species faces challenges such as genetic impoverishment, high inbreeding, and increased susceptibility to diseases due to population decline.



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 Environmental Coping Mechanism: Genetic adaptations have likely enhanced their tolerance to high sodium levels, aiding their survival in a unique ecosystem.

 Population Decline: The dramatic decline in their population has raised concerns about their long-term viability and genetic health.

Summary: The Cat Ba langurs exhibit remarkable adaptability and genetic resilience despite being critically endangered and facing significant health risks.

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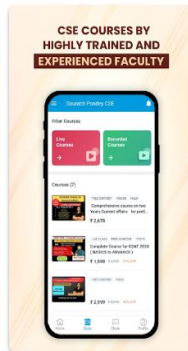
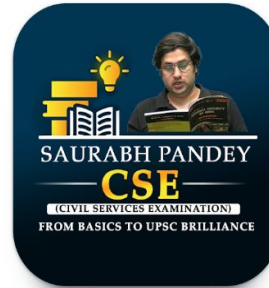
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## Target Mains -2025/26 -

**Q "Growth in per capita income will demand changes in agriculture as well" Discuss**

**Connect with sir  
9057921649**

**send your answer - Saurabh pandey  
upsc telegram channel**

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