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Table of Contents

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Page 01 : Prelims Fact

Hayat Tahrir al-Sham (HTS) militants seized Damascus, toppling President Bashar al-Assad's 13-year rule and marking a turning point in Syria's prolonged civil war.

- This shift diminishes Russian and Iranian influence while raising concerns about HTS's Islamist governance.

Militants in Syria capture Damascus as Assad flees

No sign of Army deployment as militants enter capital and declare ouster of President Assad; Prime Minister calls for free elections; Russian news agencies, citing Kremlin sources, say Assad and his family are in Moscow; militants also storm embassy of Iran, an ally of Assad's regime, in Damascus; U.S. says it will continue presence in eastern Syria

Reuters
AMMAN/BEIRUT/CAIRO

The militant group Hayat Tahrir al-Sham (HTS) in Syria declared President Bashar al-Assad's ouster after seizing control of Damascus on Sunday, ending his family's iron-fisted rule after more than 13 years of civil war in a seismic moment for West Asia.

Mr. Assad flew out of Damascus for an unknown destination earlier on Sunday, two senior Army members said, as militants said they had entered the capital with no sign of Army deployments.

Hours later Russian news agencies, citing a Kremlin source, said that Mr. Assad and his family are in Moscow.

The Islamist militants also dealt a major blow to the influence of Russia and Iran in the region, key allies who propped up Mr. Assad during critical moments in the conflict.

Iran's embassy was stormed by the militants following their capture of Damascus, Iran's English-language Press TV reported on Sunday.

As Syrians expressed joy, Prime Minister Mohammad Ghazi al-Jalali called for free elections so the people could choose who they want.

The HTS was formerly an al-Qaeda affiliate known as the Nusra Front until its leader Abu Mohammed al-Jolani, severed ties with the global jihadist movement in 2016.

'End of injustice'

"We celebrate with the Syrian people the news of freeing our prisoners and releasing their chains and announcing the end of the era of injustice in Sednaya prison," the HTS said, referring to a jail on the outskirts of Damascus where the government detained thousands. Syria's Army command notified officers on Sunday that Mr. Assad's rule had ended, a Syrian officer who was informed of the move, said.

But the Syrian Army later said it was continuing operations against "terrorist groups" in the key cities of Hama and Homs and in the Deraa countryside.

Complex future

Mr. Jalali said he had been in contact with al-Jolani to discuss managing the transitional period, marking a notable development in efforts to shape Syria's political future.

But that would require a smooth transition in a country with complex competing interests, from Islamists to groups with links to the U.S., Russia and Turkey.

The U.S. will continue to maintain its presence in eastern Syria and will take measures necessary to prevent a resurgence of the Islamic State, Deputy Assistant Secretary of Defense for the Middle East Daniel Shapiro told the Manama Dialogue security conference in Bahrain's capital on Sunday.

HTS is Syria's strongest militant group and some Syrians remain fearful it will impose draconian Islamist rule or instigate reprisals. Countries such as the UAE and Egypt, both close U.S. allies, see Islamist militant groups as an existential threat, so HTS may face resistance from the regional powers.

HTS militants said they have started an attack on U.S.-backed Kurdish-led forces in the northern Syrian town of Manbij, according to a statement posted on Sunday but dated Saturday on X by the Ministry of Defense of the Syrian Interim Government.

(With AFP inputs)

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» PAGES 12, & 15

Tense situation: Flames sweeping through the criminal security branch of Syria's Interior Ministry in Damascus on Sunday. AFP

'Indian embassy in Syrian capital operational'

NEW DELHI

Officials of the Indian embassy in the Syrian capital Damascus are safe and are in contact with Indians in the country, sources here said on Sunday. "Our embassy continues to remain operational in Damascus. Embassy is in touch with all Indian nationals, and they are safe," said a source in the Ministry of External Affairs. The Ministry had earlier said that around "90 Indian nationals" remain in Syria.

Analysis of the news:

- Hayat Tahrir al-Sham (HTS) militants seized control of Damascus, ending President Bashar al-Assad's 13-year rule in Syria after a prolonged civil war.
- President Assad reportedly fled Damascus, with Russian sources stating he and his family are now in Moscow.
- The ouster marked a significant blow to the influence of Russia and Iran, Assad's key allies during the conflict.
- Iran's embassy in Damascus was stormed by HTS militants following their capture of the capital.
- Prime Minister Mohammad Ghazi al-Jalali called for free elections and engaged with HTS leader Abu Mohammed al-Jolani to discuss a transitional government.
- HTS, formerly an al-Qaeda affiliate, severed ties with the group in 2016 and is Syria's strongest militant group.
- Concerns persist over HTS's potential for Islamist rule and attacks on Kurdish-led forces, drawing resistance from the U.S. and regional powers.

Places in news

- **Damascus:** Syria's capital, a historic city, became the center of a power shift as HTS militants seized control.
- **Hama:** Syrian city where the Army claims to be continuing operations against militant groups despite losing other key territories.
- **Homs:** A major city in Syria, recently captured by militants, marking a significant advance in the civil war.
- **Deraa:** Southern Syrian region where Army operations against "terrorist groups" are reportedly ongoing amid militant advances.
- **Manbij:** Northern Syrian town under attack by HTS militants targeting U.S.-allied Kurdish-led forces.
- **Saydnaya:** Site of a notorious prison near Damascus, where detainees were freed by HTS militants during their takeover.
- **Aleppo:** Syria's largest city, recently captured by HTS, symbolizing a major militant victory during their rapid advances.

UPSC Mains Practice Question

Ques : Discuss the evolution of Hayat Tahrir al-Sham (HTS) and its role in the Syrian conflict. Evaluate the international community's response to its activities and its implications for regional stability. (150 Words /10 marks)

Page 06 : Prelims Fact

India has reached over $1 trillion in Foreign Direct Investment (FDI) from April 2000 to September 2024.This achievement highlights India's growing stature as a secure and attractive investment destination globally.

Foreign direct investment inflows into India cross $1 tn

Foreign direct investment (FDI) inflows into India have crossed the $1 trillion milestone in the April 2000-September 2024 period, firmly establishing the country's reputation as a safe and key investment destination globally. According to data from the Department for Promotion of Industry and Internal Trade (DPIIT), the cumulative amount of FDI, including equity, reinvested earnings and other capital, stood at $1,033.40 billion during the said period. PTI

Analysis of the news:

- Foreign direct investment (FDI) inflows into India have surpassed $1 trillion during the April 2000 to September 2024 period.
- The cumulative FDI amount, including equity, reinvested earnings, and other capital, stands at $1,033.40 billion.
- This milestone reinforces India's reputation as a safe and preferred global investment destination.
- The Department for Promotion of Industry and Internal Trade (DPIIT) reported the latest figures, reflecting strong investor confidence.

- India's consistent FDI growth is driven by reforms in the business environment, ease of doing business, and market potential.
- The sectors attracting significant FDI include services, computer software, telecommunications, and construction.
- India's strong economic growth, large consumer market, and political stability contribute to this sustained investment inflow.

UPSC Prelims PYQ : 2017

Ques : Discuss With reference to Foreign Direct Investment in India, which one of the following is considered its major characteristic?

(a) It is the investment through capital instruments essentially in a listed company.
(b) It is a largely non-debt-creating capital flow.
(c) It is the investment which involves debt-servicing.
(d) It is the investment made by foreign institutional investors in the Government securities.
Ans: (b)

Page 07: GS 3 : Environment – Important species

The Indian star tortoise, a protected species, is increasingly threatened by illegal wildlife trade and unethical pet ownership.

- Despite legal protections, the species faces significant conservation challenges, including improper release practices.
- Recent research highlights the need for more targeted conservation efforts based on genetic diversity.

Study brings Indian star tortoise to evidence-based conservation

Researchers have identified two genetically distinct groups of the species. The genetic divergences showed up as differences in physical features that could inform strategies on where and how to release and conserve rescued tortoises, Subhasree Sahoo, a Ph.D. student and first author of the study, says

Sanjukta Mondal
BENGALURU

The Indian star tortoise (*Geochelone elegans*) is a sight to behold, with its obsidian shell and the striking sun-yellow star patterns adorning it. These tortoises are hardy herbivores and are popular as exotic house pets – but they shouldn't be. It's illegal to own one in India but also unethical since they are vulnerable in the wild.

Endemic to the subcontinent, Indian star tortoises reside in arid pockets of northwest India (bordering Pakistan), South India, and Sri Lanka. However, members of the species have also been found in people's homes as far afield as Canada and the U.S. The increasing demand for them as pets has entangled them in one of the largest global wildlife trafficking networks.

The Indian star tortoise is listed in Appendix I of the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) and in Schedule I of the Wildlife (Protection) Act 1972, which provides the highest level of protection to animals in Indian law. Despite this, officials have already seized hundreds of tortoises being smuggled through the Chennai and Singapore airports and across the India-Bangladesh border this year.

Wildlife biologist Sneha Dharwadkar, co-founder of an NGO called Freshwater Turtles and Tortoises of India, is worried that unscientific releases of the seized tortoises could worsen their fate. "We can no longer simply take confiscated tortoises and release them in nearby forests," Dharwadkar wrote in an email.

To find an alternative, researchers from the Wildlife Institute of India and Panjab University explored the diversity and natural distribution in India by sequencing the genomes of Indian star tortoise in zoos, wildlife reserves, and protected areas.

The study identified two genetically distinct groups of Indian star tortoises: northwestern and southern.

The genetic divergences showed up as differences in physical features that could inform strategies on where and how to release and conserve rescued tortoises, Subhasree Sahoo, a PhD student at the Wildlife Institute of India, Dehradun, and first author of the study, said.

Same but different

Millions of years ago, *Geochelone*, the group that includes the Indian star tortoise, spread across the Indian subcontinent after the latter split from the Gondwana supercontinent and collided with Eurasia.

Over time, parts of the subcontinent became arid and encouraged the growth of savannahs and open grasslands in northwestern and peninsular India, which are now the tortoises' natural habitats.

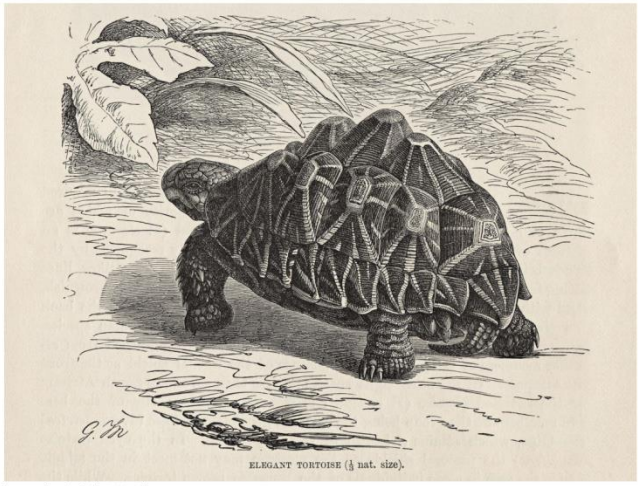
But the creation and expansion of savannahs came at the expense of humid forests: the increasingly seasonal nature of the monsoons restricted them to parts of southwest India and Sri Lanka. This separation of humid and dry areas paralleled the splitting of the tortoises into northern and southern groups about 2 million years ago.

To find genetic evidence of this split, the researchers of the new study collected tortoise tissue samples from 14 locations.

"These tortoises are very rare to encounter, so I chose the rainy season because that's the breeding season. They're the most active. That's also what poachers do," Sahoo said. With the help of frontline forest staff and local communities living near the tortoises' natural range, she was able to collect 38 samples from northwestern India and 44 from southern India.

Researchers prefer tortoises' blood samples for genetic testing but even small mistakes when drawing blood can cause profuse bleeding. This is manageable in controlled environments like zoos or wildlife reserves, and less so in the wild.

"When I was in Kakatiya Zoo in Telangana, a zookeeper told me, 'Madam, why do you want to take blood? You can take the scutes, right? They come off very easily'," Sahoo said. Scutes are keratin layers found on the tortoises' limbs, neck, and shell. "I peeled off some scute from the zoo in Kakatiya and tested [it] in the lab, and it worked just fine."



An engraving of an Indian star tortoise. THE ROYAL NATURAL HISTORY (1896)

The increasing demand for them as pets has entangled them in one of the largest global wildlife trafficking networks

Once collected, the researchers extracted DNA from the tissue samples. Then they sequenced the mitochondrial genes cytochrome B and NADH dehydrogenase 4. The gene for cytochrome B is highly conserved and used to identify subspecies-level differentiation and later to detect smaller genetic variations between the samples.

The researchers also screened 10 microsatellite markers: short DNA sequences that repeat in a particular location in the genome. They serve as a genome's fingerprint and are helpful to identify how individuals of the same species are related, how they mate, and recent changes in their population.

The results revealed that even after illegal poaching and unscientific releases, the northwestern group remains largely genetically unchanged whereas the southern group is highly diverse.

"For a long time, on-ground practitioners have suspected the presence of at least two evolutionarily significant units, or ESUs – populations of organisms considered distinct for conservation purposes," Dharwadkar said. "This paper provides a reliable confirmation of that."

Restoring natural order

Sandeep Kumar Gupta, nodal officer at the Wildlife Institute of India, Dehradun, and corresponding author of the study said that since different Indian star tortoises are found in different areas, it's crucial to not mix the populations during release. Doing so might lower their genetic diversity and depress breeding rates.

Sahoo also raised the concern of shell-pyramiding in captive-bred star tortoises. These tortoises develop pyramid-shaped shells instead of the dome-like shells in the wild due to nutritional deficiencies, and can further complicate mating and breeding issues.

Gupta also emphasised greater public awareness of the legality of keeping certain species as pets and the importance of adhering to national laws on this front.

Overall, the team expressed belief in its paper that the findings could benefit both national and international agencies with evidence-based conservation of the Indian star tortoise.

(Sanjukta Mondal is a chemist-turned-science-writer with experience in writing popular science articles and scripts for STEM YouTube channels. sanjuktamondal.sm@gmail.com)

THE GIST

Endemic to the subcontinent, Indian star tortoises reside in arid pockets of northwest India (bordering Pakistan), South India, and Sri Lanka

The Indian star tortoise is listed in Appendix I of the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) and in Schedule I of the Wildlife (Protection) Act 1972

Officials have already seized hundreds of tortoises being smuggled through the Chennai and Singapore airports and across the India-Bangladesh border this year

Indian Star Tortoise

- **Appearance**
  - The Indian star tortoise (Geochelone elegans) is known for its striking obsidian shell adorned with sun-yellow star patterns.
  - The shell itself is quite domed and can grow up to 10 inches long.

- They have strong, sturdy legs to help them navigate their dry, scrubland habitats.
- Their coloration helps them blend in with their surroundings, providing camouflage from predators.
- It is a herbivore and popular as an exotic pet, though it is illegal and unethical to own one in India, as the species is vulnerable in the wild.

Habitat and Global Presence

- Endemic to northwest India, South India, and Sri Lanka, the species has been found in countries as distant as Canada and the U.S.
- Increasing demand as pets has led to its involvement in one of the largest global wildlife trafficking networks.

Legal Protection

- The Indian star tortoise is listed in Appendix I of CITES and in Schedule I of India's Wildlife Protection Act, 1972, ensuring the highest legal protection.
- Despite this, hundreds of tortoises have been seized at airports and borders, highlighting the persistent trafficking problem.

Concerns Over Unscientific Release

- The unscientific release of confiscated tortoises is a concern, as it could worsen their fate.
- The focus is now on finding alternative methods of releasing and conserving them.
- A study was conducted to understand the diversity and natural distribution of the tortoises through genomic sequencing of samples from various locations.

Genetic Differentiation of Tortoise Groups

- The study identified two genetically distinct groups of Indian star tortoises: one from the northwestern region and the other from the southern region of India.
- The genetic divergences correspond to differences in physical features, which can guide the strategies for conserving and releasing rescued tortoises.

Evolutionary History

- Millions of years ago, the Indian star tortoise group spread across the subcontinent after it separated from Gondwana.
- This led to the splitting of the species into northern and southern groups about 2 million years ago.

Findings and Conservation Implications

- The study revealed that the northwestern group remains genetically stable, while the southern group has higher genetic diversity.
- The findings confirm the presence of two distinct evolutionary significant units (ESUs), which are important for conservation efforts.
- It is essential to avoid mixing these populations during releases, as it could reduce genetic diversity and affect breeding success.

Conclusion

- The study's findings provide vital information for both national and international conservation efforts, helping to ensure a scientifically sound approach to the conservation of the Indian star tortoise.

UPSC Mains Practice Question

Ques : Discuss the conservation challenges faced by the Indian star tortoise, focusing on the implications of illegal wildlife trade, unscientific releases. Highlight the importance of genetic research in formulating conservation strategies. (150 Words /10 marks)

In News : Prelims Fact : Moths Use Plant Sounds to Choose Egg-Laying Sites, Study Finds

A recent study has discovered that moths can detect and interpret sounds emitted by plants, using this ability to decide where to lay their eggs.

- This finding reveals a novel interaction between insects and plants, demonstrating how acoustic signals influence ecological behavior.

A moth species called Egyptian cotton leafworm can hear sounds emitted by stressed plants, the study said. *Wikimedia Commons*

Analysis of News:

Study Overview

- **Research and Objectives**
  - The study, conducted by a team of 17 researchers from Israel, examined how Egyptian cotton leafworm moths respond to the ultrasonic clicks emitted by stressed plants.
  - This research builds on previous findings that plants emit ultrasonic sounds when dehydrated or under stress.
- **Experimental Setup**
  - Researchers placed two healthy tomato plants in an experimental arena, one emitting recorded distress sounds and the other silent.
  - They observed the oviposition (egg-laying) behavior of female moths to understand their decision-making process.

Key Findings

- **Preference for Silent Plants**
  - The study found that moths consistently preferred to lay their eggs on the silent plant.

- This behavior suggests that moths are not only capable of detecting plant-generated sounds but also interpreting these signals as indicators of plant health.

Ecological Implications

- By avoiding stressed plants, moths enhance the survival chances of their offspring, as healthy plants are more likely to provide adequate nourishment for the larvae.
- This highlights the evolutionary significance of such acoustic communication.

Expert Opinions and Unanswered Questions

Validation of Findings

- Experts have praised the robustness of the study, emphasizing the strong evidence provided for moths' responsiveness to plant sounds.

Open Questions

- While the study establishes that moths attend to these sounds, the exact reason for this behavior—whether it is a direct response to stress signals or a learned association—remains unclear and requires further investigation.

In News : Khorlochhu Hydropower Project

Tata Power has commenced construction on the Rs 6,900 crore Khorlochhu Hydropower Project in Bhutan, with commissioning expected by 2029.

About Khorlochhu Hydropower Project:

- Situated on the Kholongchhu River in Eastern Bhutan's Trashiyangtse district, the project seeks to meet Bhutan's rising electricity demands and aid India's renewable energy transition.
- It is the first-ever energy project to be developed through a joint venture (JV) partnership between India and Bhutan.
- It will be constructed by Khorlochhu Hydro Power Limited (KHPL), a strategic partnership between Bhutan's Druk Green Power Corporation (DGPC) and India's Tata Power.
- The 600 MW project is expected to be commissioned in September 2029.
- The project will feature a 95m-high concrete gravity dam measuring 165m in length and 6m in width. The dam will create a 1.4 km long reservoir with 2.9 million cubic metres (MCM) of gross storage capacity.
- The electricity generated from the Kholongchhu hydroelectric project will be transmitted to the NEWNE grids of Bhutan and India via 400 kV transmission lines.

- The project is estimated to cost £488.14 m (INR 46.32bn), which is being financed under a debt-equity ratio of 70:30. The Government of India is providing DGPC's share of equity.

The issue of India's economic growth versus emissions

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A look at the claim made in the Economic Survey (2023-24), of India having decoupled its economic growth from greenhouse gas emissions

The Indian economy has consistently showcased its robust growth over the past few decades. But higher economic growth is believed to have come with increasing environmental pressure, notably through higher greenhouse gas (GHG) emissions. However, India's Economic Survey (2023-24) claims that India has decoupled its economic growth from GHG emissions, as between 2005 and 2019, India's GDP grew at a compound annual growth rate (CAGR) of 7%, while emissions rose at a CAGR of just 4%. This raises a crucial question: has India really decoupled its economic growth from GHG emissions? And, what does this mean for sustainable development?

What it means

Decoupling refers to breaking the link between economic growth and environmental degradation. Historically, economic growth is found to be positively related with environmental degradation, as this growth is believed to be a driver of GHG emissions. However, with the growing climate crisis, the imperative to reduce emissions while ensuring continued economic growth has gained global traction.

Decoupling has largely been classified into two types: absolute decoupling and relative decoupling. Absolute decoupling occurs when the economy grows, while emissions decrease. This is the ideal form of decoupling, where countries grow economically without increasing environmental harm. However, relative decoupling happens when both GDP and emissions grow, but the rate of GDP growth surpasses the rate of emissions growth. While this signifies progress, at the same time, it acknowledges that emissions continue to rise.

Decoupling of economic growth and GHG emissions is important. On one hand, it offers a path to sustainable growth and development, a way for nations to grow and improve living standards without exacerbating climate change. On the other, it comes as a response to rising demand for degrowth and sparks the ongoing debate between green growth and degrowth. Proponents of green growth argue that it is possible to maintain or even increase economic growth while reducing environmental harm. In contrast, degrowth advocates suggest that economic growth itself is the primary driver of ecological degradation and should be curbed in favour of reducing resource consumption. But proponents of degrowth overlook the fact that countries, in addition to tackling rising GHG emissions and the climate change, are also required to tackle low standards of living, energy poverty and ensure a decent life, which could be taken care of through economic growth.

The claim

The claim of India's decoupling made in the Economic Survey comes from comparing GDP and emissions growth rates between 2005 and 2019. The Survey does not specify whether this represents absolute or relative decoupling. Using various decoupling indicators discussed in OECD (2002), we examine the status of the economy-wide and sector-wise decoupling status for India. Since the 1990s, with significant trade liberalisation, India has been experiencing steady and stable economic growth. Hence, we are examining how GDP and emission generation are growing in India with respect to the levels of 1990. While there has been no absolute decoupling in India, since 1990, GDP in India has grown at a much higher pace than the GHG emissions in the country, indicating economy-wide relative decoupling. Since, the agriculture and manufacturing sectors are among the major contributors of emission generation in India, it is also important to understand whether these sectors have also achieved decoupling or not, which has been assessed by comparing rate of growth of GVA of the respective sector with the rate of growth of GHGs emitted by the sector. From 1990, India's GDP has grown six-fold, while GHG emissions have only tripled.

Efforts must continue

From the data, it seems that India may have achieved relative decoupling, where emissions are still rising but at a slower pace than the economy. This achievement, while commendable, falls short of the ultimate goal of absolute decoupling, where economic growth can continue even as emissions fall. While most countries fall short of achieving absolute decoupling and still experience rising emissions as GDP increases, many countries have at least managed to achieve a declining rate of growth of emissions. Given that India is a developing country which has not even peaked its emissions yet, emissions are expected to increase with economic growth. Hence, achieving absolute decoupling is not going to happen anytime soon. While India's relative decoupling is a step in the right direction, the path to absolute decoupling is still a long and complex journey. Efforts must still be taken and it will be a significant challenge. This remains a necessary target if India is to meet its long-term climate commitments. Policies and measures that support renewable energy, emission mitigation, and sustainable development will be crucial in ensuring that economic growth and environmental preservation can coexist, ensuring a prosperous and sustainable future for India.

The views expressed are personal

GS Paper 03 : Indian Economy

PYQ: (UPSC CSE (M) GS-3 2023) : The adoption of electric vehicles is rapidly growing worldwide. How do electric vehicles contribute to reducing carbon emissions and what are the key benefits they offer compared to traditional combustion engine vehicles? (250 words/15m)

UPSC Mains Practice Question: Examine India's progress in decoupling economic growth from greenhouse gas emissions. Discuss the challenges of achieving absolute decoupling and suggest measures to balance economic growth with environmental sustainability. (250 Words /15 marks)

Context :

- India's Economic Survey 2023-24 highlights the country's progress in decoupling economic growth from GHG emissions, showcasing a GDP CAGR of 7% against an emissions CAGR of 4% (2005–2019).
- While India demonstrates economy-wide relative decoupling, achieving absolute decoupling remains a challenge.
- Sustained efforts are essential for meeting long-term climate commitments.

India's Economic Growth and GHG Emissions: Decoupling Dynamics

Economic Growth and Environmental Pressure

- India's economy has consistently grown over the past few decades, but this growth has been accompanied by rising environmental pressure, particularly greenhouse gas (GHG) emissions.
- Between 2005 and 2019, India's GDP grew at a compound annual growth rate (CAGR) of 7%, while GHG emissions rose at a slower CAGR of 4%, suggesting potential decoupling of economic growth from emissions.

Understanding Decoupling

- **Definition:** Decoupling refers to breaking the link between economic growth and environmental degradation.
  - Historically, economic growth has been associated with increased environmental harm, including higher GHG emissions.
- **Types of Decoupling:**
  - **Absolute Decoupling:** Economic growth occurs while emissions decline.
  - **Relative Decoupling:** Both GDP and emissions grow, but GDP grows at a faster rate than emissions.

Importance of Decoupling

- Decoupling is critical for achieving sustainable growth, improving living standards, and addressing climate change.
- It contributes to the ongoing debate between green growth and degrowth:
- Green growth emphasizes the possibility of economic expansion alongside reduced environmental harm.
- Degrowth advocates argue for reduced resource consumption and question the necessity of continuous economic growth.

- Developing countries like India face the dual challenge of tackling emissions while addressing energy poverty and improving living standards.

India's Decoupling Status

- The Economic Survey (2023-24) suggests India may have achieved relative decoupling, where GDP growth outpaces emissions growth.
- Since 1990, India's GDP has grown six-fold, while GHG emissions have only tripled, indicating relative decoupling at the economy-wide level.
- **Sectoral Insights:**
  - Agriculture and manufacturing are major contributors to GHG emissions.
  - Decoupling in these sectors is assessed by comparing the growth rates of Gross Value Added (GVA) with GHG emissions.
  - Despite progress, India has not achieved absolute decoupling, as emissions continue to rise.

Challenges in Achieving Absolute Decoupling

- Most countries, including India, experience rising emissions alongside GDP growth.
- Absolute decoupling, where emissions decline despite economic growth, remains a distant goal for India.
- As a developing country yet to peak its emissions, India's emissions are expected to rise with continued economic expansion.

The Path Forward

- Relative decoupling is a commendable achievement, but absolute decoupling is necessary to meet long-term climate goals.
- Policies and measures promoting renewable energy, emission mitigation, and sustainable development are essential.
- Continued efforts toward reducing the emissions growth rate while sustaining economic development will be crucial in balancing environmental and developmental priorities.

Conclusion

- India's relative decoupling demonstrates progress but highlights the need for further action to achieve absolute decoupling.
- Ensuring sustainable economic growth without exacerbating climate challenges will require innovative policies, long-term commitments, and a focus on renewable and sustainable practices.