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The inauguration of the Board of Peace by U.S. President Donald Trump at the World Economic Forum in Davos marks a significant attempt by the United States to reshape global conflict-management mechanisms, particularly in the context of the Israel–Hamas war. While the U.S. claims broad international support, the limited physical participation of countries and the absence of major powers such as India raise critical questions about legitimacy, effectiveness, and geopolitical intent.

India absent as Trump rolls out Board of Peace with 19 nations attending

Associated Press
Press Trust of India
DAVOS

U.S. President Donald Trump on Thursday inaugurated his Board of Peace to lead efforts at maintaining a ceasefire in Israel's war against Hamas, insisting that "everyone wants to be a part" of the body that could eventually rival the United Nations – despite many U.S. allies opting not to participate.

India was among the countries not present at the ceremony. Prime Minister Narendra Modi was among the numerous global leaders invited by Mr. Trump to join the Board.

New accord: U.S. President Donald Trump holds the founding charter of the Board of Peace in Davos on Thursday. REUTERS

India is yet to take a call on it, people familiar with the matter said when asked about the invite. Pakistan, Turkiye, Saudi Arabia, and the UAE are among the countries that have accepted Mr. Trump's invitation.

While Mr. Trump said 59 countries have signed onto the board, representatives of only 19 countries and the U.S. were present at the event at the World Economic Forum in Davos, Switzerland.

"You're the most powerful people in the world," Mr. Trump told the group, ranging from Azerbaijan to Paraguay to Hungary.

"This is not the United States, this is for the world," Mr. Trump said, adding, "I think we can spread it out to other things as we succeed in Gaza."

The event also saw Ali Shaath, former Palestinian Authority official from Gaza who is overseeing the Palestinian committee set to govern the territory under U.S. supervision, announcing that the Rafah border crossing, between Gaza and Egypt, will open in both directions next week.

Scepticism among allies

The U.S. President's attempt to create momentum for a project to map out a future for the war-torn Gaza Strip has been overshadowed this week, first by his threat to seize Greenland and then by a dramatic retreat from that push.

The board proposed by Mr. Trump was initially envisioned as a small group of world leaders overseeing the ceasefire but has morphed into something far more ambitious – and scepticism about its membership and mandate has led some countries usually closest to Washington to take a pass.

The countries that have accepted Mr. Trump's invitation to join the board are Argentina, Albania, Armenia, Azerbaijan, Bahrain, Belarus, Bulgaria, Egypt, Hungary, Indonesia, Jordan, Kazakhstan, Kosovo, Morocco, Mongolia, Pakistan, Qatar, Saudi Arabia, Turkiye, the United Arab Emirates, Uzbekistan, and Vietnam.

Mr. Trump has spoken about the board replacing some UN functions and perhaps even making that entire body obsolete one day. But he was more conciliatory in his remarks on the sidelines of the forum in the Swiss alps. "We'll do it in conjunction with the United Nations," Mr. Trump said, even as he denigrated the UN for doing what he said wasn't enough to calm some conflicts around the globe.

Secretary of State Marco Rubio said that some countries' leaders have indicated they plan to join but still require approval from their Parliaments.

EDITORIAL
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Board of Peace for Gaza

- It is a US-led intergovernmental body, established under UN Security Council (UNSC) Resolution 2803 (2025), to enact a comprehensive US peace plan for the reconstruction of Gaza.
- The initiative is not under UN command, but the "Comprehensive Plan to End the Gaza Conflict" it supports has UNSC endorsement, providing it international legitimacy.
- **Leadership & Structure:** It is proposed to be chaired by US President Donald J. Trump.
- Founding Executive Board: Comprising high-level figures with expertise in diplomacy, development, and economics, including former UK Prime Minister Tony Blair, US Secretary of State Marco Rubio, and others.
- **Gaza Executive Board:** A supporting operational body that coordinates on-the-ground activities.
- High Representative for Gaza: Bulgarian diplomat Nickolay Mladenov, serving as the primary on-the-ground liaison.
- **National Committee for the Administration of Gaza (NCAG)**: A 15-member committee of politically independent Palestinian technocrats, chaired by Ali Shaath (a former Palestinian Authority deputy minister), responsible for day-to-day civil administration.

Key Features of the Development

- The Board of Peace is projected as a multilateral body to oversee ceasefire arrangements in Gaza and potentially expand into other conflict zones.
- Although the U.S. President claimed endorsement from 59 countries, only 19 nations were represented at the founding ceremony.

Countries such as Pakistan, Saudi Arabia, Türkiye, and the UAE have accepted the invitation, while India has adopted a wait-and-watch approach despite an invitation being extended to Prime Minister Narendra Modi.

The Board is envisaged by Mr. Trump as an institution that could rival or even replace certain functions of the United Nations, though later statements suggested a more cooperative posture.

Strategic and Diplomatic Implications

Challenge to Multilateralism: The proposal reflects growing dissatisfaction, particularly within sections of U.S. political leadership, with existing multilateral institutions. Attempts to sideline or dilute UN authority could weaken established norms of collective security and international law.

Credibility and Representation Deficit: The absence of key global and regional powers—India, several EU states, and other close U.S. allies—undermines the Board's claim of being a truly representative global forum.

Middle East Geopolitics: With the Board focusing initially on Gaza and ceasefire management involving Israel and Hamas, the initiative places the U.S. at the center of post-conflict governance, potentially marginalising existing international and regional mediation efforts.

India's Calculated Restraint: India's absence reflects its preference for inclusive, UN-centric multilateralism and strategic autonomy. New Delhi traditionally avoids ad hoc global arrangements that lack clarity on mandate, accountability, and legal basis.

Domestic Constraints on Participation: Statements by U.S. Secretary of State Marco Rubio highlight that even interested countries face internal parliamentary and constitutional hurdles, indicating fragile consensus.

Conclusion

The Board of Peace represents an ambitious but controversial attempt by the U.S. to reassert leadership in global conflict resolution. However, limited participation, scepticism among allies, and implicit competition with the United Nations significantly constrain its legitimacy and prospects. India's cautious approach aligns with its long-standing commitment to rule-based multilateralism.

UPSC Mains Exam Practice Question

Ques: India chose not to participate in the inauguration of the Board of Peace despite being invited. Analyse India's decision in light of its foreign policy principles of strategic autonomy and inclusive multilateralism. **(150 Words)**

Page 04 : GS III : Environment : Air Pollution / Prelims Exam

Delhi's winter air pollution has long been attributed to visible and politically salient sources such as stubble burning and vehicular emissions. However, a recent synthesis report prepared for the Commission for Air Quality Management (CAQM), following directions from the Supreme Court of India, brings a crucial scientific insight to the forefront: secondary particulate matter (SPM) is the single largest contributor to winter pollution in the National Capital Region (NCR). This finding has important implications for air-quality governance and policy design.

'Secondary particulate matter is the top cause of Delhi winter's pollution'

Jacob Koshy
NEW DELHI

A synthesis of studies on the causes of air pollution in Delhi, sought by the Commission for Air Quality Management (CAQM) in the National Capital Region, has found that the largest contributor to winter pollution is secondary particulate matter at 27%, followed by transport at 23%, biomass burning at 20% including municipal solid waste and crop-residue burning, dust at 15% and industry at 9%.

"While conducting the meta-analysis, the primary focus has been to bring a uniform and unanimous opinion on air pollution sources to help bridge the gap between existing data and actionable policies," the CAQM said in the report made public late on Wednesday.

The report does not identify any new sources of pollution. Experts compiled existing studies after the Supreme Court, on January 6, directed the CAQM to prepare a report and place on record the "major causes of worsening AQI" in the region.

People commute on their vehicles amid smog on a cold winter morning in New Delhi on Wednesday. SUSHIL KUMAR VERMA

Different approaches

However, the report notes that most studies had used "differing approaches" to analyse sources of pollution. It also indicated that a new emissions inventory and a source apportionment study are on the anvil, to be prepared by the Automotive Research Association of India, Pune, Indian Institute of Technology Delhi, The Energy Resources Institute, and the Indian Institute of Tropical Meteorology, Pune. The studies will be prepared with 2026 as the base year.

In late 2024, the CAQM had suspended the use of the Decision Support System for policy purposes, citing its inability to accurately forecast sharp drops in air quality.

Source apportionment studies identify activities that release chemicals such as nitrous oxides, sulphur dioxide and volatile organic compounds, which constitute primary particulate matter that can cause disease when inhaled or absorbed through the skin. Secondary particulate matter forms when these primary particulates interact in the atmosphere.

This interaction is largely driven by the presence of ammonia. The CAQM report also refers to the role of ammonia. "SO2 emissions (primarily from coal combustion and brick kilns) undergo oxidation on aerosol surfaces and gas-phase reactions... forming sulfuric acid (H_2SO_4). Further, NOx emissions undergo photochemical and nocturnal oxidation to form nitric acid (HNO_3). Both H_2SO_4 and HNO_3 react with ammonia (NH_3) to form ammonium sulfate and ammonium nitrate aerosols." Nearly 25% to 60% of total PM2.5 is composed of these sulphates and nitrates, the study notes.

Key Findings of the Report

Secondary particulate matter accounts for **27%** of Delhi's winter PM2.5 pollution, making it the dominant contributor.

Other major contributors include:

Transport: 23%

Biomass burning (crop residue + municipal solid waste): 20%

Dust: 15%

Industry: 9%

The report is a meta-analysis of existing studies, aimed at harmonising diverse datasets to guide actionable policy.

Understanding Secondary Particulate Matter

Secondary particulate matter is not emitted directly. It forms in the atmosphere through chemical reactions involving:

Sulphur dioxide (SO_2) from coal combustion and brick kilns,

Nitrogen oxides (NOx) mainly from vehicles and power plants,

Ammonia (NH_3) largely from agriculture, waste, and livestock.

These gases react to form ammonium sulphate and ammonium nitrate aerosols, which constitute 25–60% of PM2.5 in Delhi during winter. This highlights that pollution control cannot rely only on managing visible emission sources.

Institutional and Policy Dimensions

Fragmented Evidence Base: The report acknowledges that earlier studies used differing methodologies, leading to inconsistent policy signals. This underscores the need for standardised scientific frameworks.

Upcoming Scientific Interventions: A fresh **emissions inventory** and **source apportionment study** are proposed with **2026 as the base year**, to be undertaken by institutions such as:

Automotive Research Association of India

Indian Institute of Technology Delhi

The Energy Resources Institute

Indian Institute of Tropical Meteorology Pune

Limits of Existing Tools: The earlier suspension of the Decision Support System by CAQM reflects institutional challenges in real-time forecasting and adaptive policy-making.

Implications for Governance and Public Policy

Shift from Source-Specific to Systemic Control: Policies focusing only on vehicles or stubble burning are insufficient without controlling precursor gases like ammonia, SO_2, and NOx.

Inter-State and Sectoral Coordination: Since ammonia and industrial emissions extend beyond Delhi, effective mitigation requires regional and cross-sector governance.

Science–Policy Interface: The case illustrates how judicial intervention can catalyse evidence-based policymaking, a recurring theme in environmental governance in India.

Government Initiatives Related to Air Pollution

Graded Response Action Plan (Delhi)
System of Air Quality and Weather Forecasting and Research (SAFAR) Portal.
Air Quality Index
Turbo Happy Seeder (THS) Machine
National Air Quality Monitoring Programme (NAMP)
Polluter Pay principle
For Reducing Vehicular Pollution:
- BS-VI Vehicles,
- Push for Electric Vehicles (EVs),
- Odd-Even Policy as an emergency measure (for Delhi).

Key Terms Related to Air Pollution

Air Quality Index: It is an index for reporting daily air quality. It focuses on health effects one might experience within a few hours or days after breathing polluted air.
- AQI is calculated for eight major air pollutants which are; Ground-level ozone, PM10, PM2.5, Carbon Monoxide (CO), Sulphur dioxide(SO2), Nitrogen dioxide(NO2), Ammonia(NH3), and Lead (Pb).

Volatile Organic Compounds (VOCs): These are carbon-containing chemicals released by petrol and diesel vehicles. They impact air quality and human health
- However, VOCs can have a natural origin, too. Plants emit these chemicals to attract pollinators, defend themselves from pests and predators and adapt to environmental stress.

Ground-Level Ozone: Ground-level ozone, or tropospheric ozone, is a secondary pollutant formed when nitrogen oxides (NOx) and volatile organic compounds (VOCs) from vehicles, industries, and power plants react in the presence of sunlight, with levels rising especially during summer. It is a colourless gas forming just above the Earth's surface.

Conclusion

The CAQM report reframes Delhi's air pollution crisis by identifying secondary particulate matter as the primary driver of winter smog. This shifts the policy discourse from isolated emission sources to complex atmospheric chemistry and precursor control.

UPSC Prelims Exam Practice Question

Ques : Which of the following pollutants are considered precursors for the formation of secondary particulate matter?

1. Sulphur dioxide (SO_2)

2. Nitrogen oxides (NOx)

3. Ammonia (NH_3)

4. Carbon monoxide (CO)

Select the correct answer using the code below:

(A) 1, 2 and 3 only

(B) 1 and 4 only

(C) 2 and 4 only

(D) 1, 2, 3 and 4

Ans: (A)

UPSC Mains Exam Practice Question

Ques : Recent studies suggest that secondary particulate matter is the dominant contributor to Delhi's winter air pollution. Explain the formation of secondary particulate matter and discuss its implications for air pollution control strategies in India. **(150 Words)**

Page 05 : GS III : Indian Economy

The statement by Union Minister Ashwini Vaishnaw at the World Economic Forum in Davos reflects India's official narrative on economic reforms and global investor confidence. His remarks underline how structural reforms undertaken over the past decade are being projected as key drivers of India's growth, resilience, and rising global stature.

India's structural reforms generating strong investor confidence, says Vaishnaw

The Hindu Bureau
NEW DELHI

Union Minister Ashwini Vaishnaw on Thursday said India's reform momentum is firmly on track, driven by deep structural reforms personally steered by Prime Minister Narendra Modi, which have transformed the Indian economy into a high-growth, resilient, and globally trusted destination.

Speaking on the sidelines of the World Economic Forum Annual Meeting at Davos, Mr. Vaishnaw said landmark reforms undertaken in the past few years, including labour code reforms, simplification of the Goods and Services Tax (GST), transformations in the energy sector, and the opening up of nuclear energy to the private sector were generating strong investor confidence across sectors.

He said a continuous reform process was under way across all sectors of the economy, adding that investors were enthused by the policy environment in India. He cited several instances, including IKEA announcing plans to double its investment and Qualcomm significantly expanding its workforce in India.

Highlighting India's macroeconomic fundamentals, he said India was today the fastest-growing major economy in the world, with a consistent growth trajectory of 6-8% projected over the next five years.

The combination of moderate inflation and high growth reflected the economic transformation achieved under Mr. Modi's leadership over the past decade, he said.

Noting that global perception of India at Davos had been overwhelmingly positive, with the country being widely regarded as a trusted nation demonstrating consistent economic growth, he said deliberations across panels reflected a broad consensus that India's emergence as the world's third-largest economy was now a matter of timing rather than possibility.

Union Minister Ashwini Vaishnaw with leaders in the fields of AI, robotics, and cybersecurity in Davos on Thursday. ANI

Key Claims and Reform Measures Highlighted

The Minister attributed strong investor confidence to a series of deep structural reforms, including:

Labour Code Reforms

Aimed at simplifying and rationalising labour laws.

Intended to improve ease of doing business while balancing worker protection.

GST Simplification

Streamlining tax compliance and creating a unified national market.

Reduction in cascading taxes, improving supply-chain efficiency.

Energy Sector Reforms

Expansion of renewable energy and restructuring of power distribution.

Greater emphasis on energy security and sustainability.

Opening Nuclear Energy to the Private Sector

Signals a shift from state monopoly towards public–private collaboration in strategic sectors.

Potential to boost clean energy capacity and advanced manufacturing.

Investor Confidence and Global Perception

Examples such as IKEA's plan to double investment and Qualcomm's workforce expansion were cited as evidence of sustained foreign investor interest.

At Davos, India was portrayed as a trusted and stable investment destination, contrasting with uncertainty in several advanced economies.

Macroeconomic Context

India is projected to maintain 6–8% growth over the next five years, positioning it as the fastest-growing major economy.

The combination of moderate inflation and high growth suggests macroeconomic stability, which is critical for long-term capital inflows.

Discussions at Davos reportedly reflected a consensus that India becoming the world's third-largest economy is a question of *when*, not *if*.

Analytical Assessment

Positives

Structural reforms enhance productivity, formalisation, and competitiveness.

Policy continuity under the leadership of Narendra Modi strengthens investor predictability.

India's demographic dividend and digital public infrastructure complement reform momentum.

Concerns and Caveats

Implementation gaps remain, particularly in labour reforms at the State level.

Growth must translate into inclusive development, addressing employment quality and income disparities.

External risks such as geopolitical instability and global economic slowdown could affect projections.

Conclusion

Ashwini Vaishnaw's remarks at Davos highlight India's confidence in its reform-led growth model and its aspiration to consolidate a leadership role in the global economy.

UPSC Mains Exam Practice Question

Ques: Structural reforms are critical for sustaining high economic growth and investor confidence. Discuss in the context of recent economic reforms undertaken in India. (150 Words)

Page 06 : GS III : Environment / Prelims Exam

The allegations by the Tribal Council of Little and Great Nicobar that officials are coercing indigenous communities to surrender ancestral land for the ₹92,000-crore Great Nicobar Island mega-infrastructure project have brought renewed focus on the tension between strategic development and tribal rights. The issue raises fundamental questions of constitutional safeguards, consent, environmental governance, and ethical development in ecologically and culturally sensitive regions.

Officials 'coercing' us to surrender land: tribals

Great Nicobar Island project includes forest lands where Nicobarese lived before 2004 tsunami; 'it is our ancestral land, we will have nothing for the future generations,' says council member

Abhinay Lakshman
NEW DELHI

With some sections of the ₹92,000-crore Great Nicobar Island mega-infrastructure project "nearing approval", members of the Tribal Council in Little and Great Nicobar on Thursday alleged that they are being pressured by the district administration to "surrender our ancestral lands" to make way for the project.

Parts of the project in Galathea Bay, Pemmaya Bay, and Nanjappa Bay require the diversion of forest lands on which the indigenous Nicobarese people had been living before the 2004 tsunami.

In an online briefing to journalists, Tribal Council members said they had been called for a January 7 meeting with Nicobar district administration officials, where they were orally asked to sign a "surrender certificate", giving up their ancestral tribal lands. Hours after the briefing, they were summoned for another meeting where they were asked if they would give up their claims on a portion of their lands if they were allowed to relocate to a different section of the coast.

Tribal Council members say they were asked to sign a surrender certificate, giving up their ancestral lands. FILE PHOTO

Deputy Commissioner of Nicobar Amit Kale Marutirao, and Assistant Commissioner (Campbell Bay) Keshav Narendra Singh, have not responded to *The Hindu*'s requests for comment.

"At [the January 7] meeting, a few officials of the district were present along with a representative of the administration's Andaman Adim Janjati Vikas Samiti. We were shown various maps regarding the project and we were asked about our opinion on the development project. And then we were asked to sign the surrender certificate," Tribal Council chairman Barnabas Manju said, adding that the meeting, held at the Andaman Public Works Department guesthouse in Nicobar's Campbell Bay, lasted about 10 minutes. The Tribal Council members told the officials that they would have to discuss it amongst themselves.

At the press briefing, Titus Peter, Ist Captain of Pulobhabi village and a member of the Council, said, "We cannot sign a surrender document like this. It is our ancestral tribal land. We will have nothing for the future generations." Mr. Manju noted that it had been 21 years since they were displaced by the 2004 tsunami and are yet to hear from the administration about their requests to return to the location of their ancestral villages that had been destroyed by the tsunami.

Council members said they were not told any specifics about the "surrender certificate", though Mr. Manju noted that "the officials said they would help us draft it if needed." The Tribal Council is the apex representative body of the Nicobarese community, which is recognised as a Scheduled Tribe.

"It is not clear what parts of our ancestral land the officials are referring to. Our understanding is that they want the surrender certificate to mention areas that are covered under what used to be our villages before we were displaced by the tsunami," said Mr. Peter, pointing to the west coast on a map of Great Nicobar Island.

Background and Context

The project is proposed on Great Nicobar Island, including areas such as Galathea Bay, Pemmaya Bay, and Nanjappa Bay.

These areas overlap with forest lands traditionally inhabited by the Nicobarese, many of whom were displaced after the 2004 Indian Ocean tsunami.

The Tribal Council of Little and Great Nicobar, the apex representative institution of the Nicobarese community, alleges that district officials sought oral consent and signatures on a "surrender certificate" without clarity or due consultation.

Core Issues Involved

1. Tribal Rights and Constitutional Safeguards

The Nicobarese are recognised as Scheduled Tribes, protected under Article 244, the Fifth Schedule, and relevant provisions of the Forest Rights Act, 2006.

Any diversion of forest land requires free, prior, and informed consent of Gram Sabhas, a principle reinforced by Supreme Court jurisprudence.

2. Consent vs Coercion

Allegations of pressure to sign surrender documents, especially without written details, undermine the legitimacy of consent.

Asking communities to relinquish land in exchange for relocation raises concerns of indirect coercion and violation of participatory governance norms.

3. Displacement Without Rehabilitation

Council members highlighted that even 21 years after the tsunami, they have not been rehabilitated to their original village sites.

Proceeding with fresh displacement without resolving past rehabilitation failures contradicts principles of just and humane development.

4. Environmental and Strategic Dimensions

Great Nicobar Island is ecologically fragile and strategically important.

While the project is justified on grounds of national security, connectivity, and economic growth, it intensifies debates on whether strategic imperatives can override indigenous rights.

Broader Implications

Governance: Challenges of implementing development projects in Scheduled Areas.

Environment & Ecology: Forest diversion, coastal ecology, and sustainability.

Social Justice: Protection of vulnerable communities and intergenerational equity.

Ethics in Public Administration: Transparency, informed consent, and accountability of district administration.

Conclusion

The controversy surrounding the Great Nicobar Island project exemplifies the classic development dilemma in India: balancing national strategic and economic interests with constitutional protections for indigenous communities. Allegations of coercion, if substantiated, point to serious governance lapses and risk undermining India's commitment to tribal welfare and inclusive development.

UPSC Prelims Exam Practice Question

Ques: Which of the following principles is most directly violated if tribal communities are forced to surrender land without informed consent?

(a) Cooperative federalism

(b) Free, Prior and Informed Consent (FPIC)

(c) Doctrine of separation of powers

(d) Principle of subsidiarity

Ans: b)

UPSC Mains Exam Practice Question

Ques: Strategic infrastructure projects in ecologically sensitive regions often generate conflict between development and environmental justice. Examine this statement with reference to the Great Nicobar Island project. (**150 Words)**

Page 07 : GS II : Social Justice / Prelims Exam

The World Malaria Report 2025, released five years ahead of the 2030 deadline, presents a mixed assessment of malaria elimination efforts in the Asia-Pacific region. While substantial reductions in cases across several countries signal progress, emerging challenges—particularly drug resistance and shrinking financial support—raise doubts about whether the region is fully on track to meet the elimination target.

Is Asia-Pacific on track towards elimination of Malaria by 2030?

World Malaria Report 2025, launched in December, provided a mixed bag; while fall in estimated cases in southeast Asia offer hope, rising cases of resistance to artemisinin-based frontline treatment and reduction in funding for malaria programmes raise concern

Ramya Kannan

The World Malaria Report 2025, launched in December, provided a bag of mixed news, five years ahead of the 2030 malaria elimination deadline. While the reduction in estimated cases in southeast Asia provided definite hope, of serious concern were rising cases of resistance to artemisinin-based frontline treatment for malaria, and falling funding for malaria programmes.

Notably, it is the Asia Pacific region that posted much of the good news. The significant reduction was driven by 10 of the region's 17 malaria-endemic countries, bringing estimated cases down from over 9.6 million in 2023 to approximately 8.9 million in 2024. The major reduction in estimated cases happened in Pakistan, and historic lows were reported in Cambodia, Lao PDR and Vietnam, the second year running. Among the successes being platformed against one of the most crucial emerging threats against malaria treatment also comes from this region, with the Greater Mekong Subregion's success in tackling antimalarial drug resistance finding mention in the report.

The Asia Pacific Leaders Malaria Alliance (APLMA) unites 22 governments that are committed to the goal of eliminating malaria by 2030. Sarthak Das, CEO, APLMA, says the "Asia Pacific region has made tremendous progress over the past two decades, but it is not entirely on track to meet the 2030 malaria elimination target."

He goes on to explain the current position: "Progress continues to stay uneven – while some countries have experienced a resurgence of cases, others reported substantial declines, and several have successfully attained malaria-free status. Sri Lanka, China, and most recently Timor-Leste have demonstrated that malaria elimination is achievable with sustained political commitment and consistent delivery."

However, Dr. Das points out that these successes coexist with a concerning plateauing of progress and, in particular, reversal in larger, more complex settings.

He explains that significant risks still persist, primarily due to two major challenges: securing sustainable long-term financing and ensuring last-mile execution in high-burden countries. "The challenges more often are in ensuring disciplined last-mile programme delivery, which is further compounded by the increasing financing shortfalls. The report shows that only about 42% of global malaria financing needs were met in 2024, and funding cuts in 2025 have widened this gap further."

But is the elimination goal within target at all? In fact, India has set itself the target of achieving zero indigenous cases of malaria by 2027, ahead of the 2030 target. Dr. Das says India's target is ambitious, but attainable. "India has made extraordinary progress since 2015, achieving steep reductions in cases and deaths, with many districts sustaining zero transmission for multiple years. India has also demonstrated proof-of-concept for elimination through indigenous projects," he said. However, recent data shows that progress has plateaued and cases have even rebounded in parts of the country, indicating that India is currently off the elimination trajectory required to meet the 2027 milestone, he points out.

Need for action: A health worker using a fogging machine in Assam as part of preventive measures against vector-borne diseases. RITU RAJ KONWAR

Dr. Das explains that to make the leap from control to elimination, three shifts are essential: "First, surveillance must become the central intervention. India needs real-time, case-based surveillance everywhere – including systematic reporting from the private sector, defence services, railways and urban health systems, so that every infection is detected, classified and responded to rapidly."

Secondly, he adds: "Today, five States and the northeast account for nearly 80% of the malaria burden. Success will depend on focused, project-mode execution in these remaining hotspots, while near-elimination States must invest in preventing resurgence."

Thirdly, the continuity of financing and operational discipline must be restored. India must treat malaria elimination as a time-bound national mission, with accountability, sharp targeting and sustained investment through the last mile.

Vaccines for malaria

While factors such as surveillance, vector control and effective case management, have been essential to the achievements of the past years, it was the vaccines that marked a significant breakthrough. Dr. Das says "Both RTS,S and the newer R21 vaccines represent important milestones. Large-scale pilot implementations in Africa have shown that RTS,S, when delivered through routine immunisation systems, can reduce severe malaria and contribute to measurable declines in child mortality. R21 has shown comparable or higher efficacy in controlled trials."

These vaccines have understandably been prioritised for rollout in Africa, where the burden of Plasmodium falciparum malaria and childhood mortality is highest. The countries in the Asia Pacific and the APLMA are actively evaluating how these vaccines could complement existing tools for targetted implementation.

The recent WHO report indicates that while artemisinin resistance has emerged as a serious threat to global malaria control, it has not yet been established in India. Artemisinin-based combination therapies remain the go-to first line of treatment as they are still highly effective.

India, which otherwise has a huge anti-microbial resistance burden on the other hand, "has taken a precautionary approach by institutionalising regular therapeutic efficacy studies, strengthening pharmacovigilance, and rapidly updating national treatment policies when early warning signals emerge." India's emphasis on universal parasitological diagnosis, strict adherence to combination therapy, and avoidance of oral artemisinin monotherapy has been central to preserving drug efficacy at scale, he adds.

Early detection through routine efficacy monitoring, strict regulation of antimalarial use, strong community-level case management – and critically – regional coordination to prevent cross-border spread are the need of the hour, Dr. Das insists. Resistance cannot be managed country by country; it requires collective action. Protecting artemisinin is not just a technical task – it is a strategic imperative for global malaria elimination, he adds.

Funding constraints

The greatest threat today to the success of the malaria elimination programme, however, is not even with artemisinin, it is dwindling financing. Dr. Das says: "At a time when malaria programs are entering the most difficult and expensive phase of elimination, overall international funding has declined. This shortfall is already forcing countries to scale back proven interventions, increasing the risk of resurgence and reversing hard-won gains."

In Asia Pacific, the impact is especially pronounced in high-burden areas that face persistent social and logistical challenges, including those prevalent among mobile and migrant populations and geographically remote communities. Such groups are particularly vulnerable because they often have limited access to health services and are difficult to reach with conventional malaria control measures.

Dr. Das suggests that a fundamental shift in how malaria elimination is financed and owned is required. Global funding will remain important, but it can no longer carry the full burden. National agencies must step up to fill the existing funding gaps, which the APLMA supports by strengthening budget advocacy efforts and building evidence-based investment cases.

Dr. Das adds: "This is not simply a cost, but an investment. Evidence consistently shows that every dollar invested in malaria elimination delivers multiple dollars in economic return through reduced healthcare costs, increased productivity, and stronger community resilience. Conversely, underinvestment at this stage is far more expensive: resurgence, emergency responses, and avoidable deaths carry a heavy and recurring price."

(ramya.kannan@thehindu.co.in)

THE GIST

- While the Asia Pacific region posted good news, experts say that significant risks persist, primarily due to two major challenges: securing sustainable long-term financing and ensuring last-mile execution in high-burden countries
- India has set itself the target of achieving zero indigenous cases of malaria by 2027. India's target is ambitious, but attainable, say experts. They add that shifts are essential to make the leap from control to elimination
- Experts say that a fundamental shift in how malaria elimination is financed is required. National agencies must step up to fill the existing funding gaps. Underinvestment at this stage is far more expensive, they say

Progress in the Asia-Pacific Region

The Asia-Pacific has emerged as a relative success story in global malaria control.

Estimated malaria cases declined from 9.6 million (2023) to 8.9 million (2024), driven by progress in 10 of the 17 malaria-endemic countries in the region.

Countries such as Cambodia, Lao PDR, and Vietnam have reported historic lows, while Pakistan has seen a sharp reduction in cases.

The Greater Mekong Subregion has demonstrated notable success in containing antimalarial drug resistance, offering valuable lessons for global malaria control.

Persistent and Emerging Challenges

Uneven Progress

Gains coexist with stagnation and resurgence in larger, complex, and high-burden settings.

Elimination has been achieved in countries such as Sri Lanka, China, and Timor-Leste, but replication elsewhere remains difficult.

Artemisinin Resistance

Resistance to artemisinin-based combination therapies (ACTs) is a major global concern.

While resistance has not yet been established in India, its spread in parts of Southeast Asia threatens frontline treatment effectiveness and demands regional coordination.

Financing Constraints

Only about 42% of global malaria financing needs were met in 2024, with further cuts in 2025.

Underfunding is particularly damaging during the elimination phase, which requires intensive surveillance, targeted interventions, and sustained effort.

India's Position: Ambition vs Reality

India has set an ambitious target of zero indigenous malaria cases by 2027, ahead of the global 2030 goal.

Strengths:

Sharp reductions in cases and deaths since 2015.

Several districts have sustained zero transmission.

Strong regulatory framework preserving drug efficacy through surveillance and avoidance of monotherapy.

Concerns:

Recent plateauing and localised resurgence indicate India is currently off the trajectory needed to meet the 2027 milestone.

Nearly 80% of the burden is concentrated in five States and the northeast, requiring focused, project-mode interventions.

Key shifts required include real-time surveillance, targeted hotspot management, and sustained financing treated as a national mission rather than a routine programme.

Role of Vaccines and Regional Cooperation

New malaria vaccines such as RTS,S and R21 mark a scientific breakthrough, though current prioritisation remains Africa-centric due to higher mortality burdens.

For Asia-Pacific, vaccines are likely to act as complementary tools, not substitutes for surveillance, vector control, and case management.

Drug resistance and cross-border transmission underscore the need for regional cooperation, as malaria elimination cannot be achieved in isolation.

Conclusion

The Asia-Pacific region has made meaningful progress toward malaria elimination, but it is not fully on track to meet the 2030 goal. Scientific challenges such as drug resistance, combined with declining funding and uneven last-mile implementation, threaten to reverse hard-won gains. For India and the wider region, the path forward lies in sustained political commitment, robust surveillance, targeted interventions in high-burden areas, and a renewed financing strategy.

UPSC Prelims Exam Practice Question

Ques : India has set which of the following targets related to malaria elimination?

(A) Zero malaria deaths by 2025

(B) Elimination of malaria by 2030

(C) Zero indigenous malaria cases by 2027

(D) Eradication of malaria by 2025

Ans: c)

UPSC Mains Exam Practice Question

Ques : The Asia-Pacific region has made significant progress in malaria control, yet elimination by 2030 remains uncertain. Discuss the key challenges that threaten malaria elimination in the region, with special reference to India. **(150 Words)**

A dangerous march towards a Himalayan ecocide

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In 2025, which saw nearly 331 days of near-continuous climate impacts, the human cost was staggering: over 4,000 deaths attributed to climate-induced disasters in 2025 alone, with Himachal Pradesh and Uttarakhand bearing the heaviest toll. Towns such as Dharali, Harsil, Uttarkashi, Chamoli, Kullu, Mandi and Kishtwar were ravaged by sudden cloudbursts, landslides, and avalanches that morphed into deadly flash floods, obliterating lives and livelihoods.

This onslaught of scorching heat, catastrophic floods and land subsidence appears to be the new normal. And yet, how does one explain the government's decision to endanger Dharali and Harsil – areas recently devastated by an avalanche-turned-flash-flood – by pushing forward a massive infrastructure project that would fell nearly 7,000 Devdar trees and countless native species?

Pushing infrastructure in a disaster zone

On November 12, the Uttarakhand Forest Department approved the felling of these trees, diverting 43 hectares of forest land for the Char Dham road-widening project, with 10 hectares meant for muck dumping. This decision again relies on the flawed DL-PS (double-lane with paved shoulder) standard that mandates a 12-metre paved surface in an area demonstrably prone to disasters.

The region, located north of the Main Central Thrust (MCT), is classified as a critical zone where major infrastructure is explicitly discouraged. There are also hanging glaciers and the area is fed by the Gangotri, one of the world's fastest receding glaciers, which sustains several unstable, moraine-laden glaciers in the valley. One of these glacier avalanches contributed to the disaster in Dharali.

This raises a pivotal and urgent question: what is the true value of these trees for this region?

The Devdar (Deodar) forests are crucial ecological assets in the delicate Himalayan landscape. Their extensive root systems stabilise slopes, prevent landslides and serve as natural barriers against avalanches and glacial debris flows, safeguarding downstream communities. These forests are also essential for the water quality of the Ganga. This is important as they are situated within the Bhagirathi Eco-Sensitive Zone, a nearly 4,000-square-kilometre buffer that was established in 2012 to protect the river's last pristine stretch.

The unique antimicrobial qualities of Devdar trees (from terpenoids, essential oils, and phenolic compounds found in the wood, bark and resin) fundamentally influence river ecology. As leaf litter and organic material enter mountain streams, they inhibit harmful bacteria while promoting the development of beneficial microbial communities, resulting in a naturally regulated, biologically active river system, especially in the upper reaches where industrial pollution remains limited.

These forests also maintain cooler microclimates, regulate water temperature in snowmelt-fed streams, and help sustain dissolved oxygen levels essential for aquatic life.

In the ecologically vulnerable Himalayas, disaster resilience must take precedence over disaster-prone projects and infrastructure

Deforestation would trigger warmer air and water, reduced oxygen, diminished bacteriophage activity, and an irreversible shift in the river's ecological character. This is why the Supreme Court, in its judgment, discouraged the felling of precious deodar trees in the area.

However, recent proposals by forest departments suggest "translocating" these ancient trees – an ecologically flawed notion. Uprooting centuries-old Devdars is tantamount to cutting them down. Their complex, site-specific ecological functions cannot be replicated elsewhere, and no suitable alternative terrain exists. Their preservation is not a matter of convenience but of environmental necessity.

A project built on falsehoods

The Char Dham Road Widening Project has been built on falsehoods. Its execution is a case study in how not to build in the Himalayas. This is evident in the bypassing of a comprehensive Environmental Impact Assessment, through project fragmentation, the adoption of an incorrect road-width standard contrary to its own mandate, the destabilising practice of vertical hill-cutting on fragile slopes, and the indiscriminate dumping of muck in vital water sources.

These are the consequences – along the nearly 700 kilometres of widened road, over 800 active landslide zones have emerged. Key border routes have been closed for extended periods, and the government's touted "all-weather road" is now derisively called an "all-*paidal* (all-pedal") road by locals.

To prevent such damage, the government needed only to regulate road width and prioritise stability over excessive widening, as warned by experts. Yet the Union Minister's recently proposed remedy, which is belated and inadequate – to retrofit slopes with Swiss fibreglass bolts and wire mesh – comes eight years after large-scale destabilisation.

The fundamental failure lies not in the absence of reinforcement, but in the original engineering decision to execute excessively steep hill cuts. Cutting slopes at angles that violate the natural "angle of repose" of Himalayan geology is a profound act of either ignorance or hubris. No amount of anchoring later can rectify this intrinsic flaw that was engineered into the landscape from the outset.

The Union Government's current developmental initiatives directly contradict a key policy framework: the National Mission for Sustaining the Himalayan Ecosystem (NMSHE). Approved in 2014 under the National Action Plan on Climate Change, the NMSHE was established to protect the fragile Himalayan ecology. Its mandate includes monitoring glaciers and biodiversity, mitigating natural hazards and securing sustainable livelihoods for Himalayan communities. It was designed to build scientific capacity and guide policymakers toward genuinely sustainable development.

The government, therefore, owes the nation a clear explanation on why its actions violate its own flagship environmental policy. When *Devbhoomi* (the land of the gods) is turned against the *Devdaaru*, which are believed to be abodes of the deities, this is not development. It is a profound betrayal of traditional culture, ecology and scientific reason. Better sense must prevail, and those who enable these prejudiced, mindless, and disaster-prone projects must be held accountable.

The vulnerability of the Himalayan – one of the world's most climate-sensitive landscapes – is escalating. The current snowless winters and raging forest fires in this area resonate with the conclusion of a recent study, revealing that high-altitude areas have been warming 50% faster than the global average since 1950. This accelerated warming means extreme weather events such as the Dharali disaster will become increasingly frequent and severe.

If border security, connectivity and national interest are our true objectives, then disaster resilience must take precedence over disaster-prone infrastructure. This is not a matter of ideology; it is a scientific, ecological, and economic necessity.

The primary catalyst for disasters is unsafe land use: cutting into unstable slopes for wide highways, drilling massive tunnels without adequate geological surveys, and constructing large-scale hydropower projects. These activities have been repeatedly flagged by the National Green Tribunal and other bodies. Crucially, the clearance of deodar forests removes the natural anchors that bind fragile soils, directly accelerating erosion and amplifying the risk of landslides and floods.

While this development provides the fuse, climate change acts as a powerful "risk multiplier." It intensifies the threat by creating erratic rainfall patterns, supercharging weather events and accelerating glacial melt. This leads to a dangerous "water peak phase" of increased run-off and catastrophic flash floods, which, once the glaciers have fully retreated, inevitably gives way to a prolonged phase of water scarcity and drought.

These physical pressures are compounded by unsustainable human behaviours, including unregulated tourism, unchecked vehicular traffic in fragile zones, and the absence of carrying capacity assessments or functional solid waste management plans. These symptoms point to deeper, systemic governance failures: a persistent prioritisation of short-term, economic gains over long-term disaster resilience, and a chronic inability to plan and implement genuine, science-based sustainable development policies.

The subcontinent's foundation

This ground reality solidifies the axiom that "without the Himalayas, there is no India." The range is more than just a geographical entity; it is the very foundation of the subcontinent's existence. The Himalayas have shaped India into a fertile and habitable land, while also forging a syncretic cultural identity as enduring and majestic as the mountains themselves. The continuing sequence of disasters in the Himalayas is a non-negotiable lesson in earth system science and a loud reminder that India exists because of the Himalaya.

GS Paper III : Environment & Ecology

UPSC Mains Practice Question: Evaluate the contradictions between India's infrastructure development initiatives in the Himalayas and its commitments under climate and environmental policy frameworks such as the National Mission for Sustaining the Himalayan Ecosystem (NMSHE). **(250 Words)**

Context :

The article "A dangerous march towards a Himalayan ecocide" raises serious concerns about the trajectory of infrastructure-led development in the fragile Himalayan ecosystem, particularly in Uttarakhand and Himachal Pradesh.

Recurrent climate-induced disasters in 2025, including cloudbursts, avalanches, landslides and flash floods, underline the growing mismatch between ecological vulnerability and policy choices. The push for large-scale infrastructure projects such as the Char Dham road widening, despite scientific warnings and recent disasters, highlights a deeper governance and sustainability crisis.

Core Arguments and Issues

1. Himalayan Fragility and Climate Change

The Himalayas are among the world's most climate-sensitive regions, warming around 50% faster than the global average since 1950.

Snowless winters, forest fires, glacial retreat, and intense rainfall events indicate a shift towards extreme climate variability.

Climate change acts as a risk multiplier, intensifying disasters triggered by unsafe land use.

2. Infrastructure Development as a Disaster Catalyst

Road widening under the Char Dham project follows the DL-PS (double-lane with paved shoulder) standard, involving steep hill cutting and large-scale deforestation.

Over 800 active landslide zones have emerged along the widened road stretches, undermining the very objective of "all-weather connectivity."

Vertical hill cutting violates the natural angle of repose of Himalayan geology, making slopes inherently unstable.

3. Ecological Role of Deodar (Devdar) Forests

Deodar forests play a critical role in slope stabilisation, avalanche control, and landslide prevention.

They regulate microclimates, maintain stream temperatures, support dissolved oxygen levels, and contribute to the unique ecological character of the upper Ganga basin.

Located within the Bhagirathi Eco-Sensitive Zone, these forests were meant to be protected under a precautionary conservation framework.

4. Governance and Policy Contradictions

The project execution allegedly bypassed a comprehensive Environmental Impact Assessment (EIA) through fragmentation.

Government actions contradict the National Mission for Sustaining the Himalayan Ecosystem, approved under the National Action Plan on Climate Change.

Remedial measures such as slope retrofitting with foreign technology address symptoms rather than the flawed design philosophy.

5. Unsustainable Human Pressures

Unregulated tourism, rising vehicular load, lack of carrying-capacity assessments, and poor waste management further strain fragile ecosystems.

These reflect systemic governance failures where short-term economic gains are prioritised over long-term disaster resilience.

Significance of Himalayan Region of India

Strategic and Geopolitical Importance: The Himalayas form a natural defense barrier, crucial for India's security, especially amid rising border tensions with China.

- With increasing Chinese incursions along the LAC, India has ramped up military infrastructure in Ladakh and Arunachal Pradesh.
- The recent India-China standoff in Eastern Ladakh led to the expansion of the Border Roads Organisation (BRO) projects, including the strategic Atal Tunnel and the Zoji La Tunnel.
- A 2022 report stated that India has built 2,088 kilometers of roads in areas bordering China in the last 5 years.

Water Tower of India (Hydrological Significance): The Himalayas are the source of major rivers like the Ganga, Brahmaputra, and Indus, supporting agriculture, drinking water, and hydropower.

- The Hindu Kush Himalayas are called the water towers of Asia as they are the source of 10 major rivers including Ganges, Indus and have the largest snow and ice deposits outside the two poles.
- Approximately 1,20.00,000 million cubic meters of water flows down the Himalayan rivers annually and nourishes the millions living in the plains.

Ecological and Biodiversity Hub: The Himalayas are one of 36 biodiversity hotspots, with around 3,160 rare, endemic and sensitive plant varieties that hold special medicinal properties.

- It is home to rare species like the snow leopard, red panda, and medicinal plants.
- It has a number of climate types and ecological zones, from tropical to alpine ecosystems including ice and rocks in the uppermost zone, enriching the biodiversity of the region.

Cultural and Religious Significance: The Himalaya mountain is a prominent geographical feature revered in various spiritual traditions, including Tibetan Buddhism and Hinduism.

- They are deeply embedded in India's cultural and spiritual traditions, with sacred sites like Kedarnath, Badrinath, Amarnath, and Hemkund Sahib.
- The region attracts millions of pilgrims annually, but unregulated tourism and poor waste management threaten its ecological balance.

Economic and Livelihood Significance: The Himalayas support millions of livelihoods through tourism, agriculture, and forest-based industries.

- Organic farming, eco-tourism, and renewable energy are driving sustainable economic growth.
- In states like Uttarakhand, West Bengal, Tripura, Assam, and Meghalaya, the tourism sector has been contributing more than 10% to the GDP.

The Sikkim organic farming model (though, recently facing issues), which made it India's first organic state, is a successful example of sustainable agriculture.

The Dark Sky Reserve will be located at Hanle village in Eastern Ladakh as a part of Changthang Wildlife Sanctuary. It will boost Astro-tourism in India.

Renewable Energy Potential (Hydropower & Solar Energy Hub): The Himalayan rivers provide immense hydropower potential, crucial for India's energy security and green transition.

India's Northeastern states, with their mountainous topography and perennial streams, have the largest hydropower potential in all of India.

The Arunachal Pradesh 13,000 MW hydropower project agreement (2023) in Lohit Basin aims to boost clean energy.

Critical for Monsoon and Climate Regulation: The Himalayas play a key role in influencing the Indian monsoon by acting as a barrier to cold Central Asian winds and trapping moisture-laden monsoon winds.

Without the Himalayas, the region would have been a cold desert. Any disruption in the Himalayan ecosystem, such as glacial melting or deforestation, affects monsoon patterns, leading to unpredictable weather and droughts.

While monsoon is considered the cleanest season, with relatively low air pollution, experts say air pollution is likely to reduce the southwest monsoon rainfall by 10%-15% for the entire country.

Measures India Can Adopt for Sustainable Development and Resilience of the Himalayan Region

1. Eco-Sensitive and Climate-Resilient Infrastructure

Infrastructure development in the Himalayan region must be aligned with ecological fragility and disaster vulnerability. All projects should strictly adhere to Environmental Impact Assessments (EIA) and incorporate nature-based solutions such as bio-engineering, slope stabilization through vegetation, and climate-resilient road designs.

Promotion of zero-emission public transport and electric vehicle corridors in high-altitude towns can significantly reduce air and noise pollution. Disaster-resistant building codes tailored to seismic and landslide-prone zones must be enforced. Further, scientific carrying capacity assessments should precede approval of large-scale infrastructure and hydropower projects.

2. Sustainable Tourism and Waste Management

Tourism needs to transition from mass tourism to regulated, low-impact eco-tourism. Carrying-capacity based tourism planning, permit-based entry systems in ecologically fragile areas, and responsible visitor behavior frameworks can prevent environmental degradation.

Decentralized waste management systems—especially for biodegradable waste—and strict plastic bans should be implemented in pilgrimage and trekking zones. Green certification of hotels and homestays can incentivize sustainable practices, while community-managed tourism models can ensure equitable economic benefits without ecological exploitation.

3. Integrated Water Management and Glacier–Wetland Conservation

An integrated approach to water governance is essential. Establishing a Himalayan River Basin Management Authority can enable coordinated river conservation, hydropower optimization, and transboundary cooperation.

Innovative measures such as artificial glacier recharge (e.g., ice stupas) and expansion of Ramsar-designated wetlands can address seasonal water scarcity. Strengthening glacial lake monitoring and Early Warning Systems (EWS) is crucial to mitigate risks of Glacial Lake Outburst Floods (GLOFs). River embankment projects should prioritize bio-engineering over excessive concretization.

4. Reforestation and Biodiversity Conservation

Afforestation programs should focus on native species that enhance soil stability, biodiversity, and carbon sequestration. Eco-Sensitive Zones (ESZs) around wildlife corridors must be strictly enforced to prevent habitat fragmentation.

Community-led conservation initiatives—such as Van Panchayats and eco-task forces—should be expanded to ensure participatory forest management. Promotion of agroforestry and medicinal plant cultivation can provide sustainable livelihoods while reducing pressure on forests.

5. Disaster Risk Reduction and Early Warning Systems

A comprehensive Himalayan Disaster Resilience Framework should integrate satellite-based remote sensing for real-time monitoring of landslides, earthquakes, avalanches, and floods. Local governments must be empowered with disaster-resilient infrastructure planning and climate adaptation strategies.

Community-based disaster preparedness programs can improve response capacity in remote regions. Additionally, cross-border cooperation with Nepal, Bhutan, and China is essential for coordinated disaster risk management in the Himalayan ecosystem.

6. Sustainable Livelihoods and Climate-Adaptive Agriculture

Promotion of organic farming, permaculture, and climate-resilient high-altitude crops can enhance food security and soil health. Livelihood diversification through eco-friendly handicrafts, herbal products, and adventure tourism can reduce dependence on natural resource extraction.

Decentralized renewable energy solutions—such as micro-hydropower and solar grids—should be expanded to provide clean energy access in remote villages. Skill development in green jobs (sustainable tourism, forest conservation, eco-construction) will further strengthen local resilience.

Conclusion

The Himalayan crisis described in the article is not merely an environmental issue but a civilisational challenge. The repeated disasters underscore a fundamental truth: development that ignores ecological limits becomes self-defeating. If national security, connectivity and economic growth are genuine objectives, they must be anchored in disaster resilience, ecological sensitivity and scientific reasoning.