



International Solar Alliance

01.11.2025

Why in news ?

At the 8th Assembly of the International Solar Alliance (ISA) in New Delhi on October 28, 2025, President Droupadi Murmu delivered a keynote address emphasizing India's bold vision for solar leadership

ISA Summit 2025: President Droupadi Murmu says India to lead solar innovation by 2050; calls for women-led green growth

TOI Business Desk / TIMESOFINDIA.COM / Updated: Oct 28, 2025, 18:16 IST



India aims to be a global solar hub by 2050, driving innovation and manufacturing. President Murmu highlighted the nation's impressive renewable energy achievements, including a 120 GW solar capacity, and emphasized the PM-KUSUM scheme's role in farmer energy security.

1. The vision in detail

Pillar	Core Statement	Target by 2050
Solar Leadership	India will aggregate global solar demand, drive innovation, scale manufacturing and export knowledge.	Become the global solar hub - not just a user, but a producer, innovator and financier of solar tech.
Women-Led Green Growth	Launch " Solar for She " - women as leaders, entrepreneurs and beneficiaries of solar transition.	Gender-just energy transition: Reduce carbon <i>and</i> gender inequality simultaneously.
Inclusive Metrics	Success = " lives illuminated ", not just GW installed.	Link solar to jobs, rural income, digital access, health, education.

2. Motives (Why India is Doing This)

Motive	Strategic Rationale	Evidence / Context
A. Geopolitical Leadership	Position India as indispensable climate partner for Global South.	ISA has 124 signatories , 40+ energy ministers present. India co-founded ISA with France (2015). India now presides over ISA (2024-26) via Minister Pralhad Joshi.
B. Energy Security	Reduce fossil fuel imports (India imports 85% of oil, 50% of gas).	Solar capacity: 120+ GW (2025) → targeting 500 GW non-fossil by 2030 .
C. Economic Opportunity	Create 10 million green jobs by 2030; solar manufacturing export hub.	India is 3rd globally in solar capacity, 4th in renewables . PLI scheme: ₹24,000 Cr for solar PV modules.
D. Climate Justice	Lead by example: net-zero by 2070 , but help poorer nations leapfrog coal .	OSOWOG (One Sun, One World, One Grid) — Modi's vision for global solar grid .
E. Gender Equity	50% of rural energy users are women — but only 11% of solar workforce .	"Solar for She" aims to train 1 million women in solar tech by 2030.

3. Mechanisms (How India Plans to Achieve It)

Initiative	How It Works	Launched / Expanded at ISA 2025
1. Demand Aggregation	ISA will pool solar procurement for 100+ countries → lower costs via bulk buying.	Global Solar Facility — \$100M fund for aggregated tenders.
2. Innovation Ecosystem	Global Solar Innovation Centre in India (Gurugram) — R&D in perovskite, bifacial, floating solar .	SUNRISE Program launched: India + France + Australia.
3. Manufacturing Scale-Up	Approved List of Models and Manufacturers (ALMM) + PLI Scheme → domestic solar module production.	India now produces 60 GW/year modules (from 2 GW in 2014).
4. Women-Centric Programs	Solar Sahelis, Solar Mamas, skill centers — train women as technicians, entrepreneurs.	“Solar for She” — \$50M fund for women-led solar startups.
5. Rural Integration	PM-KUSUM : Solar pumps for farmers → 3.5 million pumps by 2026.	Digital + Solar : Solar-powered village Wi-Fi, telehealth.
6. Global Grid	OSOWOG — 3 phases: (i) Intra-country, (ii) South Asia, (iii) Intercontinental solar grid .	Phase 1 operational (India–Nepal–Bangladesh cross-border).

4. Challenges (Real Barriers & Risks)

Challenge	Details	Impact Level
1. Land Acquisition	Solar parks need 1.5–2 acres per MW . Competing with agriculture.	High — Protests in Rajasthan, Gujarat over farmland conversion.
2. Grid Integration	High solar penetration → grid instability (duck curve).	India’s grid lost 2.5 GW in 2024 due to frequency issues.
3. Storage Bottleneck	Battery storage < 5 GWh vs. needed 200 GWh by 2030 .	Lithium, cobalt supply chains dominated by China.
4. Financing Gap	\$500 Bn needed by 2030 ; only \$150 Bn mobilized .	High interest rates (8–10%) for renewable loans in India.
5. Gender Gap in Workforce	Women = 11% of solar jobs , <5% in technical roles .	Cultural barriers, safety, mobility issues in rural areas.
6. Global Supply Chain Risk	90% of solar polysilicon from China .	US–China tariffs, India’s 40% import duty → cost volatility.
7. Ecological Trade-offs	Large solar parks → habitat loss, water use (cleaning panels) .	Great Indian Bustard deaths in Rajasthan solar parks.
8. Policy Continuity	State-level policy flip-flops (e.g. andhra Pradesh reneged on PPAs in 2019).	Investor confidence shaken.

5. Critical path to 2050: A phased roadmap

Phase	Timeline	Key Milestones
Phase 1: Foundation	2025–2030	500 GW non-fossil
Phase 2: Export Hub	2030–2040	1 TW domestic solar
Phase 3: Global Leadership	2040–2050	Net-zero power sector

6. Success stories (Proof of Concept)

Example	Impact
Barefoot College (Rajasthan)	Trained 1,500+ “Solar Mamas” from 90 countries — now electrifying African villages.
Gujarat Hybrid Park (1,000 MW)	World’s largest solar-wind-storage hybrid — 30% cost reduction.
PM-KUSUM	1.5 million solar pumps → farmers earn ₹20,000 extra/year selling power.

7. Conclusion: Ambitious but grounded

President Murmu’s vision is not rhetoric - it’s a calculated geopolitical, economic and social strategy.

India is betting on solar to:

- Replace \$100 Bn annual oil imports
- Create 10 million jobs
- Lead the Global South
- Empower half its population (women)

But success hinges on:

- Land reforms + community ownership
- \$300 Bn in low-cost finance
- Battery storage breakthrough
- Gender-inclusive policies

What is the International Solar Alliance (ISA)?

1. Full Name & Tagline

International Solar Alliance (ISA)

“Let’s make the sun the source of prosperity for all.”



2. One-line definition

The ISA is a **global treaty-based organization** co-founded by **India and France** in 2015 to **accelerate solar energy adoption** in **sun-rich countries**, especially between the **Tropics of Cancer and Capricorn**.

3. Why it was created (The Problem It Solves)

Global Issue	ISA’s Solution
Solar-rich countries (near equator) get 2x more sunlight but use <5% solar .	Unlock their untapped solar potential .
High solar costs due to small, fragmented markets.	Bulk buying + shared tech → lower prices.
Poor nations can’t afford clean energy transition.	Cheap finance + capacity building .
Climate change needs tripling renewables by 2030 (IEA).	Make solar the backbone of global clean energy.

4. Founding & Structure

Detail	Fact
Launched	November 30, 2015 (Paris Climate Conference, COP21)
Founders	India (PM Narendra Modi) + France (President François Hollande)
Headquarters	Gurugram, India (National Institute of Solar Energy campus)
Legal Status	Treaty-based International Organization (like UN agencies)
Entry into Force	December 6, 2017 (after 15 countries ratified)
Current Leadership	President: India (2024–2026) – Union Minister Pralhad Joshi Director General: Dr. Ajay Mathur (ex-TERI chief)

5. Membership (As of October 2025)

Category	Numbers
Full Members	104 countries (ratified the treaty)
Signatory Countries	124 countries
Partner Countries	13 (e.g., USA, Germany — not in tropics but support)
Total Reach	137 countries (at ISA Summit 2025)

All countries between Tropics of Cancer & Capricorn are eligible. Others can join as “Partner Countries”.

6. Core objectives (The 5 Pillars)

Pillar	Goal
1. Demand Aggregation	Pool solar needs of 100+ countries → bulk procurement → 30-40% cost drop .
2. Innovation & R&D	Fund next-gen solar (perovskite, floating, agri-voltaics).
3. Affordable Finance	Mobilize \$1 trillion by 2030 via green bonds, risk insurance .
4. Capacity Building	Train 1 million solar professionals (engineers, technicians, women).
5. Standards & Policy	Create global solar quality standards , model laws.

7. Flagship programs (What ISA Actually Does)

Program	What It Is	Impact (2025)
STAR-C	Solar Technology Application Resource Centres in member countries	35 centres in Africa, Pacific, Latin America
Solar for She	Women-led solar entrepreneurship & training	50,000+ women trained
OSOWOG	One Sun, One World, One Grid (Modi's vision)	Phase 1 live (India-Nepal-Bangladesh)
Global Solar Facility	\$100M fund for aggregated solar tenders	First tender: 5 GW for Africa
SUNRISE	Solar Utilities for Net-zero with Resilience & Storage	Launched 2025 with India, France, Australia

8. Funding & Budget

Source	Amount
India	₹175 crore (~\$21M) for HQ + programs
France	€300M pledge (2016-2030)
Member Contributions	\$1-5M per country
Private Sector	Bloomberg, SoftBank, World Bank
Total Mobilized (2025)	\$2.5 billion

9. Key achievements (2017-2025)

Milestone	Details
1 GW → 1,000 GW ambition	Helped deploy 1,000 GW solar globally (ISA claim)
Cost Reduction	Solar prices down 89% since 2010 — ISA aggregation helped
Insurance for Solar Risk	Solar Risk Mitigation Initiative with World Bank
Solar Parks in Africa	500 MW in Togo, Mali, Niger via ISA funding
ISA CARES	Solar for health clinics in 15 countries

Why Did Delhi's Artificial Rain Experiment Fail?

01.11.2025

Why in News?

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Why Delhi's experiment to fix toxic smog with artificial rain failed

Key points:-

- Delhi's air quality has persistently remained in the "Severe" category.
- Rising levels of smog and particulate matter (PM2.5, PM10) prompted the Delhi Government to attempt **artificial rain (cloud seeding)** to control pollution.
- The experiment was conducted by **IIT Kanpur** on **29 October 2025**, but it failed due to insufficient humidity.

Despite its failure, the attempt is significant because:

- It was **India's first large-scale cloud seeding experiment** using **indigenous (home-grown) technology**.
- The goal was *pollution control*, not *drought relief*.
- It provides valuable data that could shape India's future **Weather Modification Policy**.

Cloud seeding is a weather modification process, dispersing chemicals such as silver iodide into clouds to enhance their ability to produce rain. For the Delhi trial, IIT-Kanpur used a modified Cessna-206H



8 flares with silver iodide and sodium chloride compounds were fired in each of the two phases

Phase 2 flight path



Areas affected

Khekra, Burari, north Karol Bagh, Mayur Vihar, Sadakpur, Meerut, and Bhojpur, govt said

What took place today

Delhi government and IIT-Kanpur hold two cloud seeding trials

PHASE-1

1.15pm An aircraft departs from IIT-Kanpur

2pm Seeding carried out in Burari

3pm Aircraft lands in Meerut

PHASE-2

4pm Aircraft departs and carries out the activity till 5pm in the same area, then departs

How cloud seeding works



Aircraft disperses silver iodide and sodium chloride compounds above the clouds



These particles provide a surface around which water vapour condenses to form larger droplets, stimulating rain



Raindrops capture polluting particulates by washing them from the air

What is Cloud Seeding?

Cloud seeding is a scientific process to induce artificial rainfall by dispersing chemical agents into clouds to stimulate precipitation.

Common chemical agents used:

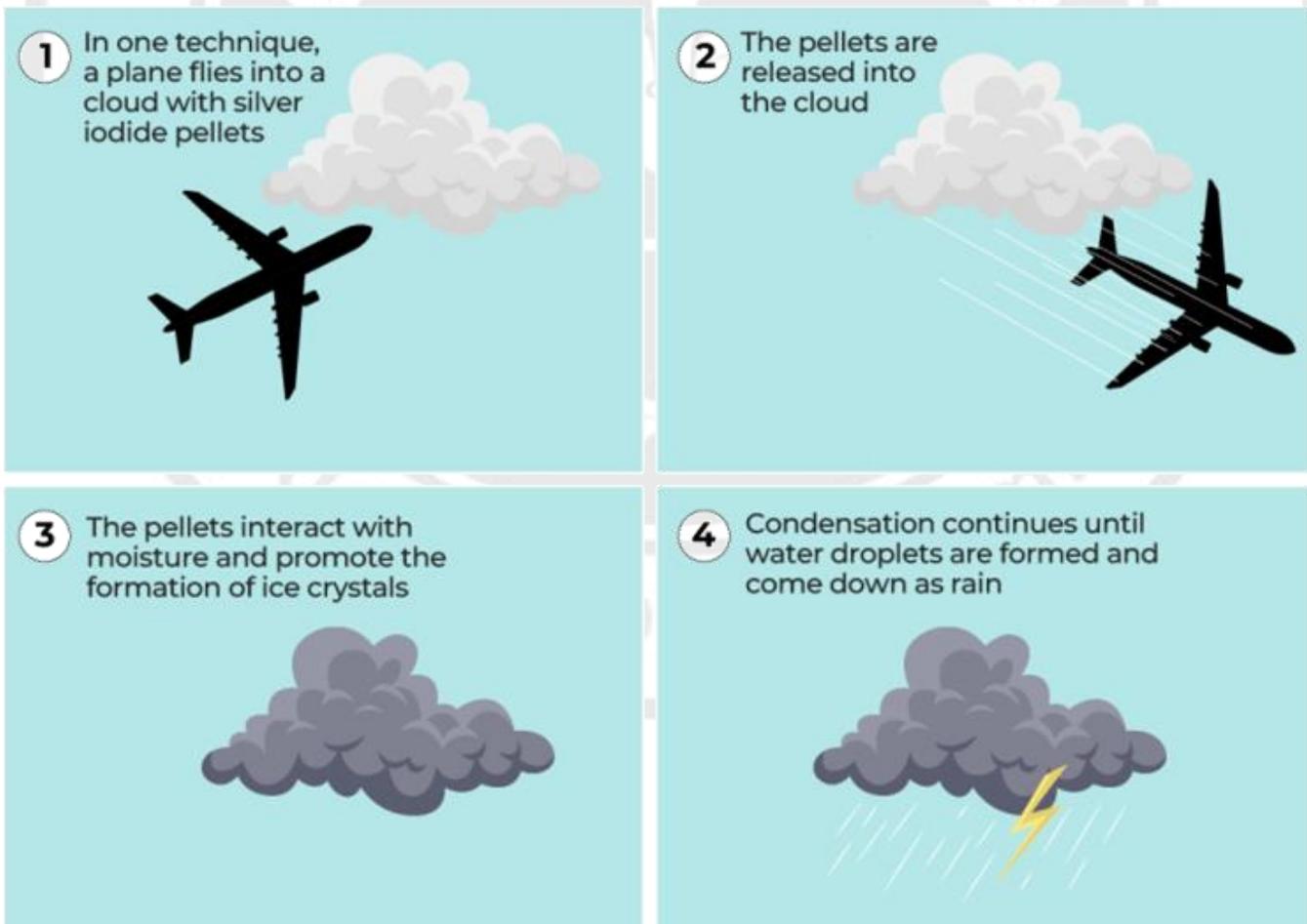
- Silver Iodide (AgI)
- Potassium Iodide (KI)
- Sodium Chloride (NaCl)

These particles act as **condensation nuclei**, around which water vapor condenses to form droplets. When enough droplets combine, they fall as rain.



How does cloud seeding work?

Cloud seeding is a method, first pioneered in the 1940s, used to enhance precipitation from clouds, typically to increase rainfall or reduce hail.



The Delhi Experiment: Key Facts

Aspect	Details
Implementing Agency	IIT Kanpur
Funding	Delhi Government – ₹3.21 crore
Date	29 October 2025
Aircraft Used	Cessna
Flight Path	IIT Kanpur → Meerut Airstrip
Target Areas	Burari, Karol Bagh, Mayur Vihar, Sadhakpur, Bhojpur, Khekra, etc.
Process	Hygroscopic salt flares released into clouds
Objective	Activate moisture-bearing clouds to cleanse air pollutants through <i>wet deposition</i>

Why Did the Attempt Fail?

1. Lack of Humidity

- Cloud seeding requires **70–80% relative humidity** for success.
- On that day, Delhi's humidity was **below 50%**, preventing cloud condensation and rainfall.

2. Stable Atmospheric Conditions

- During winter, Delhi's atmosphere remains *stable* with little vertical air movement.
- This limits upward convection necessary for droplet formation.

3. Unsuitable Cloud Type

- According to IIT Kanpur, **Cumulus clouds** (ideal for rain) were absent.
- Instead, **Stratus clouds**—thin and layered—were dominant, which rarely produce rainfall.

4. Technical Limitations

- It was India's **first indigenous cloud seeding system**, still in the experimental phase.
- Limited calibration and lack of historical meteorological data further constrained success.

Expert Opinion

Prof. Manindra Agrawal (Director, IIT Kanpur) stated: "If success is measured by rainfall, the experiment failed. But scientifically, it succeeded because we gathered valuable data about humidity, temperature, and cloud structure for future trials."

He confirmed that the technique would be retried under favorable conditions.

Did Pollution Levels Improve?

- The Delhi Government claimed a **minor drop in PM2.5 levels** in areas where seeding occurred.
- However, **CPCB's real-time data (28–29 Oct)** showed **no significant improvement**.
- Without actual rainfall, released chemical particles failed to remove airborne pollutants effectively.

Economic and Implementation Aspects

Parameter	Details
Funding	₹3.21 crore (Delhi Government)
Implementing Agency	IIT Kanpur
Objective	Pollution control and AQI improvement
Status	First phase unsuccessful; data collected
Next Phase	Likely to be retried in February 2026

Global Experiences with Cloud Seeding

Country	Purpose	Technology Used	Outcome
China	Drought control, pollution reduction, weather regulation	Drones, AI, Silver Iodide	World's largest program (targeting 5.5 million km ²)
UAE	Increase rainfall in deserts	Aerial salt flares, nanotech spray	~30% success rate
USA	Agriculture, wildfire control	Aircraft and rockets	Regular use in several states
Israel	Water scarcity relief	Aerial + ground systems	Discontinued in 2021 (low effectiveness)
Saudi Arabia	Desert conservation	Chemical seeding	Recently launched, results under study



Cloud Seeding in India: A Brief History

- **1970s:** Trials in Maharashtra & Tamil Nadu for drought relief.
- **2003–2010:** Karnataka, Andhra Pradesh & Madhya Pradesh conducted experiments.
- **2018:** IIT Kanpur proposed using cloud seeding for pollution mitigation.
- **2025:** First **indigenous technology-based** pilot in Delhi.

Scientific and Environmental Limitations

1. **Weather Dependency:** Ineffective without sufficient moisture or suitable clouds.
2. **Environmental Concerns:** Repeated use of Silver Iodide may cause soil and water contamination.
3. **High Cost, Limited Impact:** Each operation is expensive with only local and short-term effects.
4. **Low Success Rate:** Globally, success averages only **30–40%**.

Potential Benefits

- Temporary improvement in **Air Quality Index (AQI)**
- Helpful in drought mitigation and agriculture
- Valuable data for **weather modification research**
- Boosts India's **Make-in-India** initiative in weather technology

Conclusion

Although Delhi's **cloud seeding experiment failed to produce rain**, it represents a **significant milestone** in India's scientific and environmental innovation journey.

It reflects a shift from a **reactive** to a **scientific approach** in pollution control and provides foundational data for future experiments.

If future attempts combine **scientific expertise, favorable weather, and inter-agency coordination**, cloud seeding could become an **important supplementary tool** for air pollution management in India.

Q. What was the main objective of the recent "*Cloud Seeding*" experiment conducted in Delhi for pollution control?

- A) To provide relief from drought
- B) To artificially induce rain and reduce air pollution
- C) To lower the temperature
- D) To prevent dust storms

Q. Which of the following chemical substances is used in the *cloud seeding* process?

- A) Silver Iodide
- B) Ammonium Nitrate
- C) Calcium Carbonate
- D) Lithium Chloride

47th ASEAN Summit 2025: Strategic, Economic and Geopolitical Significance for India

02.11.2025

Why in News?



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Watch: What are the major events that defined the 47th ASEAN Summit in Malaysia?

The 47th ASEAN Summit, held in Kuala Lumpur from October 26–28, 2025, saw Timor-Leste join as the 11th member, the adoption of the Kuala Lumpur Peace Accord, and renewed focus on Myanmar's crisis and regional economic cooperation.

Key points

The **47th ASEAN Summit (Association of Southeast Asian Nations)** and related high-level meetings were held in **Kuala Lumpur, Malaysia, from October 26–28, 2025.**

This summit was historic for several reasons:

- **Timor-Leste** was officially inducted as the **11th ASEAN member.**
- **India's active participation** highlighted its growing role in the Indo-Pacific.
- The summit took place amid the ongoing **US-China trade tensions**, with ASEAN's **balancing diplomacy** drawing global attention.

Prime Minister **Narendra Modi** addressed the summit virtually, while **External Affairs Minister Dr. S. Jaishankar** represented India. PM Modi announced that **2026 will be celebrated as the "Year of ASEAN-India Maritime Cooperation."**

Asean Summit 2025 Highlights: Jaishankar, Rubio meet in Kuala Lumpur; discuss India-US ties

ASEAN Summit 2025 in Malaysia Highlights: ASEAN Summit 2025 LIVE Updates: Ahead of US President Donald Trump and Chinese President Xi Jinping's meeting in South Korea, US Treasury Secretary Scott Bessent said that the 100% tariff on China is "effectively off the table".

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ASEAN Summit 2025 LIVE Updates: EAM Jaishankar and US State Secy Marco Rubio.

What is ASEAN?



Parameter	Details
Full Form	Association of Southeast Asian Nations
Founded	8 August 1967, Bangkok
Founding Members	Indonesia, Malaysia, Philippines, Singapore, Thailand
Current Members (2025)	11 – Brunei, Cambodia, Indonesia, Laos, Malaysia, Myanmar, Philippines, Singapore, Thailand, Vietnam, and Timor-Leste
Headquarters	Jakarta, Indonesia
Theme (2025)	“ASEAN: Building Unity for a Sustainable Future”
Chair Country (2025)	Malaysia
Economic Size (2025)	~\$4 trillion GDP; 700+ million population

Evolution of ASEAN

- Founded in **1967** primarily as a response to the threat of communism, ASEAN has evolved into the **world’s fourth-largest economic bloc** (after the EU, US, and China).
- **Intra-ASEAN trade** constitutes about **30%** of total trade — making it one of the most integrated regional economies after the European Union.

India–ASEAN Relations: Historical Evolution

Period	Initiative / Policy	Key Feature
1992	<i>Look East Policy</i>	India began formal dialogue partnership with ASEAN.
2002	<i>ASEAN–India Summit Mechanism</i>	Annual high-level summits initiated.
2009	<i>ASEAN–India FTA in Goods</i>	Free Trade Agreement in goods implemented.
2014	<i>Act East Policy</i>	Strengthened strategic and security cooperation.
2022–2025	<i>Review of AITIGA</i>	Comprehensive review of ASEAN–India FTA underway.

Significance of ASEAN for India

1. Economic Importance

- Bilateral trade between India and ASEAN reached ~\$150 billion in 2024-25.
- Over 45% of India's maritime trade passes through the Strait of Malacca, located in ASEAN's geographical zone.
- ASEAN is vital for India's energy security, investments, blue economy, and service sector.

India-ASEAN relations



2. Geopolitical Importance

- The South China Sea disputes and China's **Nine-Dash Line** claims make ASEAN a critical strategic buffer for India.
- ASEAN's "centrality principle" ensures India a key role in the **Indo-Pacific Strategy**.



3. Cultural and Civilizational Ties

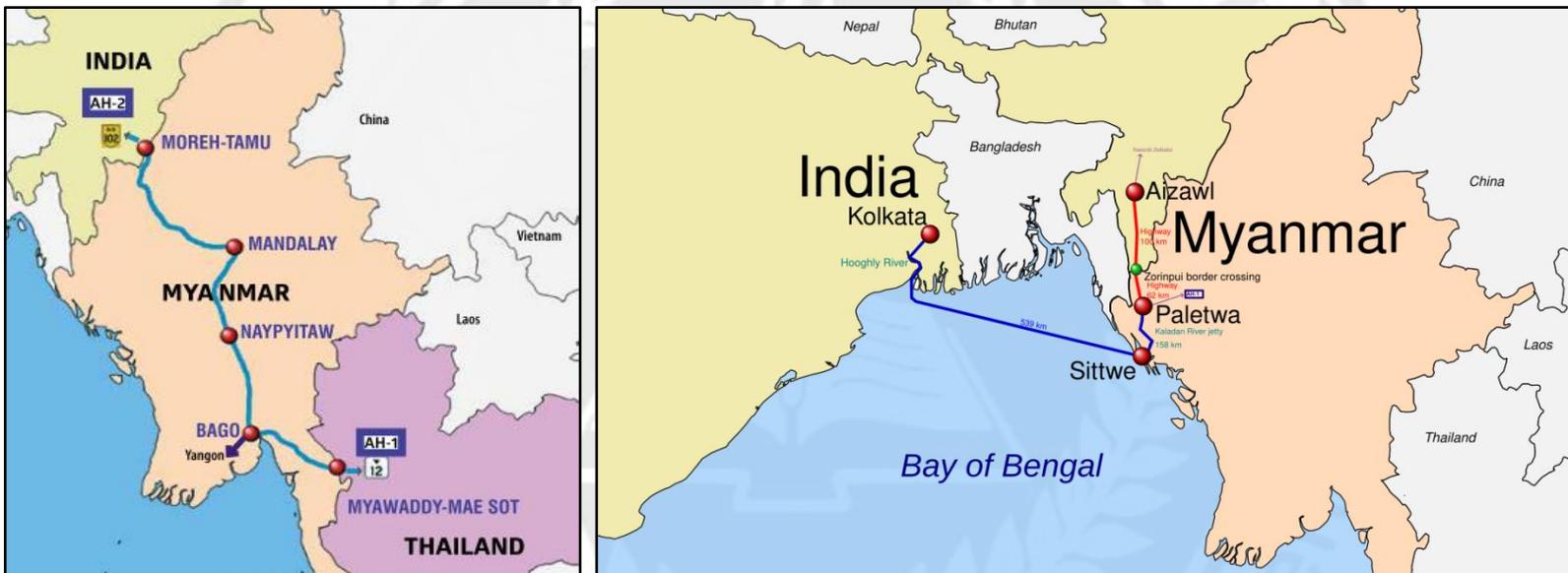
- India and Southeast Asia share over **2,000 years** of cultural and religious exchanges.
- Temples like **Angkor Wat (Cambodia)** and **Borobudur (Indonesia)** reflect deep Indian influence through **Hinduism and Buddhism**.

4. Connectivity and Infrastructure

Major projects enhancing India–ASEAN linkage:

1. **India–Myanmar–Thailand Trilateral Highway (Moreh–Mae Sot Route)**
2. **Kaladan Multi-Modal Transit Project (Mizoram–Sittwe Port Link)**

These initiatives aim to link **India’s Northeast** with Southeast Asia.



Key Outcomes of the 47th ASEAN Summit (2025)

Agenda	Key Decisions
Membership Expansion	Timor-Leste admitted as ASEAN’s 11th member.
India’s Role	2026 declared as “Year of ASEAN–India Maritime Cooperation.”
Economic Agenda	Agreement to expedite review of AITIGA.
Security Cooperation	Support for <i>Freedom of Navigation</i> in the South China Sea.
Digital Economy	ASEAN Digital Master Plan aligned with Indian digital initiatives.
Sustainable Development	Strengthened collaboration on green energy and clean technologies.
Cultural Cooperation	Proposal to celebrate “ <i>ASEAN–India Heritage Year 2027.</i> ”

Backdrop: US–China Competition

- The ongoing **US–China trade and technology war** has reshaped ASEAN’s external engagement.
- ASEAN nations seek **balance** — relying on **China economically** but enhancing **security cooperation** with **India and the US**.
- India is increasingly viewed as a “**Trusted Partner**” offering strategic autonomy and reliability.

India–ASEAN Maritime Cooperation

Under the **Indo-Pacific Maritime Security Framework**, India and ASEAN have initiated several programs:

1. **Information Fusion Centre (IFC-IOR), Gurugram** – for maritime data sharing.
2. **Coast Guard Cooperation** and **joint maritime patrols**.
3. **Disaster Management & Search and Rescue (SAR)** collaboration.
4. **Support for Maritime Law & Freedom of Navigation**.
5. **ASEAN–India Maritime Exercise (AIME-2025)** – joint naval drills.

Economic Ties: Challenges & Reforms Needed

ASEAN–India FTA (AIFTA) Review

- The **ASEAN–India Trade in Goods Agreement (AITIGA)** signed in 2009 is under review.
- India has gained **limited benefits** due to already low ASEAN tariffs and **indirect Chinese imports** via ASEAN.
- India is pushing for stricter **Rules of Origin** to curb third-country rerouting of goods.

India’s Withdrawal from RCEP (2020)

- India opted out of the **Regional Comprehensive Economic Partnership (RCEP)** to protect domestic industries.
- India now seeks a **balanced and transparent** trade framework with ASEAN.

Strategic Importance for India

Domain	Role / Impact
Indo-Pacific Vision	ASEAN is the <i>central pivot</i> ; India supports a <i>Free, Open, and Inclusive Indo-Pacific</i> .
Quad–ASEAN Linkage	India aligns with Quad (US, Japan, Australia, India) and ASEAN for regional stability.
Maritime Security	Joint naval exercises enhance sea-lane security.
North-East Integration	ASEAN connectivity projects promote development in India’s North-East.

Lessons for India from ASEAN

1. **Economic Integration:** Like ASEAN, South Asia (SAARC/BIMSTEC) should reduce trade barriers to foster regional growth.
2. **Unity in Diversity:** ASEAN nations maintain cooperation despite political and cultural differences.
3. **Gradual & Consistent Diplomacy:** ASEAN's steady evolution shows the power of continuity.
4. **Policy Takeaways for India:**
 - Strengthen **BIMSTEC** and **BBIN** on the ASEAN model.
 - Focus on **sustained engagement** and **shared interests**.

Persistent Challenges

- **Myanmar's political crisis** and military rule divide ASEAN.
- **South China Sea tensions** threaten regional security.
- **Economic disparity** and **domestic instability** within member states.
- **Trade imbalance** between India and ASEAN persists.

Conclusion

The **47th ASEAN Summit** provides India an opportunity to reinforce its role as a **stabilizing force** in the **Indo-Pacific** region.

India-ASEAN relations are rooted not merely in geography but in **shared civilizational ties, economic interdependence, and strategic convergence**.

India's *Act East Policy* is now evolving into an "**Engage East Strategy**", with ASEAN as its **most natural and trusted partner** in shaping a free, secure, and prosperous Indo-Pacific.

Question:

Analyze the role of Power Balance in the Indo-Pacific region in the context of India-ASEAN relations.