MAINS MATRIX

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Tapping the Shine: India's Solar Power Success and Challenges

Introduction

India's solar energy journey represents one of the most significant global transformations in renewable energy. From being a marginal player a decade ago, India has emerged as the **world's third-largest producer of solar power**, positioning itself as a pivotal actor in the global clean energy transition. However, bridging the gap between **ambitious climate goals and ground realities** remains a pressing challenge.

1. India's Solar Power Success Story

- **Cost Competitiveness:** The **per-unit cost of solar power** fell below that of coal around **2017**, making solar energy commercially viable and attracting large-scale private investment.
- **Global Leadership:** As of **2024-25**, India ranks **third globally** in solar power generation, behind **China and the United States**, surpassing **Japan**.
- **Manufacturing Growth:** Solar module manufacturing capacity has surged from **2 GW (2014)** to a projected **100 GW (2025)**, with about **85 GW operational capacity** already installed.
- **Installed Capacity:** India's **domestic solar capacity** reached around **117 GW as of September 2025**, reflecting rapid progress under national missions such as the **National Solar Mission** and **Renewable Energy Development Scheme**.

2. The Ambition–Reality Gap

- **2030 Climate Target:** India aims to achieve **500 GW of non-fossil fuel capacity by 2030**, of which **250–280 GW** is expected from solar energy.
- **Required vs. Actual Growth:** To meet this goal, India must add **~30 GW annually**, but current additions hover between **17–23 GW per year**, creating a **capacity shortfall trajectory**.

3. Key Constraints and Market Realities

- **High Domestic Costs:** Indian-made modules are **1.5–2 times costlier** than Chinese ones due to smaller economies of scale, limited access to **critical raw materials (like polysilicon)**, and lower automation in production.
- **Limited Export Penetration:** Despite capacity growth, India's **solar exports remain marginal** — only **4 GW exported to the US in 2024**, compared to **China's 236 GW annual exports**.
- **Risk of Overcapacity:** The upcoming **manufacturing expansion** may face **underutilization** unless new international markets are secured, threatening financial viability.

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4. Strategic Opportunity: Africa as a Growth Frontier

- **New Market Focus:** Through the **International Solar Alliance (ISA)**, India seeks to position itself as a **reliable solar partner for Africa**, countering China's dominance.
- **Leveraging Domestic Experience:** Successful domestic schemes such as **PM-KUSUM (solar irrigation pumps)** and **PM Surya Ghar (rooftop solar)** offer scalable models adaptable to African conditions.
- **Addressing African Energy Deficits:** With only **4% of Africa's arable land irrigated** and widespread **rural power shortages**, solar-powered irrigation and micro-grid solutions from India can **catalyze agricultural productivity** and **energy access**.
- **Strategic Goal:** India's broader ambition is to emerge as a **credible second supplier** in the African solar market—ensuring **sustainability for its domestic manufacturing sector** and enhancing **South-South energy cooperation**.

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5. Policy and Strategic Way Forward

- **Enhance R&D and Cost Efficiency:** Invest in **indigenous solar technology**, **storage solutions**, and **raw material processing** to reduce dependence on Chinese imports.
- **Promote Domestic Demand:** Strengthen rooftop and decentralized solar programs to **absorb domestic manufacturing capacity**.
- **Diversify Export Markets:** Use the **ISA platform** to expand into Africa, Southeast Asia, and Latin America.
- **Policy Stability:** Maintain predictable tariff and subsidy structures to **encourage private investment** and **long-term industry confidence**.

Conclusion

India's solar revolution symbolizes its **commitment to sustainable growth and climate leadership**. Yet, sustaining this progress requires **bridging the ambition–implementation gap** through innovation, market diversification, and regional cooperation. By tapping the African opportunity, India can convert its solar surge into both a **domestic economic multiplier** and a **pillar of global green diplomacy**.

How to use it

India's solar energy journey is a case study of **successful policy-driven industrial transformation**, but it now faces the challenge of moving from **domestic capacity building to global strategic competitiveness**. The sector's future hinges on overcoming cost disadvantages, securing supply chains, and leveraging diplomatic tools like the International Solar Alliance (ISA) to create a sustainable ecosystem.

Primary Relevance: GS Paper III (Economy, Environment, Security)

1. Infrastructure: Energy, Ports, Roads, Airports, Railways etc.:

- **How to use:** This is the most direct application. Solar power is a critical component of India's energy infrastructure.
- **Key Points:**
  - **Remarkable Growth:** Cite the data to show the scale of transformation: from a marginal player to the **world's 3rd largest solar power generator**, with installed capacity soaring to **~117 GW (as of Sept 2025)** and manufacturing capacity projected to reach **100 GW**.
  - **Cost Revolution:** Emphasize the pivotal moment around **2017 when solar became cheaper than coal**, which was a game-changer for its commercial viability and attractiveness to private investment.

2. Conservation, Environmental Pollution and Degradation, Environmental Impact Assessment:

- **How to use:** Solar energy is central to India's climate commitments.
- **Key Points:**
  - **Climate Goals:** Link the solar push to India's **Panchamrit** commitments, specifically the target of **500 GW non-fossil fuel capacity by 2030**, which requires **250-280 GW from solar**.
  - **The Ambition-Reality Gap:** Use the data to show the challenge: a requirement of **~30 GW per year** versus current additions of **17-23 GW per year**. This

demonstrates the scale of the effort still needed.

3. Indian Economy and issues relating to Planning, Mobilization of Resources, Growth, Development and Employment:

- **How to use:** The solar sector is a strategic industry with economic and geopolitical dimensions.
- **Key Points:**
  - **Strategic Industrial Policy:** The **Production Linked Incentive (PLI) scheme** for solar module manufacturing is a key government intervention to build a domestic manufacturing base and reduce import dependence, especially on China.
  - **The China Challenge:** Highlight the core constraint: **Indian modules are 1.5-2 times costlier than Chinese ones** due to China's control over the entire supply chain (like polysilicon) and economies of scale.
  - **Export-Led Growth Strategy:** Discuss the risk of **overcapacity** and the solution: finding new markets. Position the **International Solar Alliance (ISA)** as a tool of economic statecraft to tap into the **African market**, offering models like **PM-KUSUM** and **PM Surya Ghar**.

Secondary Relevance: GS Paper II (Governance, International Relations)

1. Government Policies and Interventions for Development in various sectors:

- **How to use:** The entire solar success story is a result of targeted government policies.
- **Key Points:**
  - Mention key schemes like the **National Solar Mission (NSM)**, **PM-KUSUM** (for solar agriculture), and **PM Surya Ghar: Muft Bijli Yojana** (for rooftop solar).

2. Bilateral, Regional and Global Groupings and Agreements involving India and/or affecting India's interests:

- **How to use:** The International Solar Alliance (ISA) is a key diplomatic initiative.
- **Key Points:**
  - Frame the ISA as India's soft power tool to lead the global solar agenda, foster **South-South cooperation**, and create a market for its solar industry, countering China's Belt and Road Initiative (BRI) with a greener alternative.

The Tailwinds from Lower Global Oil Prices and Their Impact on India

Global oil prices are undergoing a structural shift driven by changing supply–demand dynamics and technological disruptions. As the world's **third-largest oil importer**, India stands to gain substantially from the current **oil market battle** between producers and the emerging price softness. However, these tailwinds also come with strategic and economic caveats.

1. The Current Oil Market Battle

A new phase of competition has emerged between **OPEC-Plus** (led by Saudi Arabia and Russia) and **non-OPEC exporters** such as the **US, Canada, Brazil, Guyana, and Argentina**.

Consumers — particularly large importers like India and China — have now become decisive players in determining the market's direction.

The outcome of this battle could translate into **tangible economic gains** for energy-importing nations like India.

2. Key Market Trends: Supply vs. Demand

(a) Supply-Side Factors

- Technological breakthroughs such as **shale extraction**, **horizontal drilling**, and **ultra-deepwater exploration** have expanded output.
- Global crude production rose by **5.6 million barrels per day (mbpd)** year-on-year, with **OPEC contributing 3.1 mbpd** as it rolled back pandemic-era cuts.
- Major contributors to the surge include the **US, Canada, Brazil, Guyana, and Argentina**.

(b) Demand-Side Factors

- **Global demand growth is plateauing** due to sluggish post-COVID recovery, **EV adoption**, and climate transition goals.
- In **OECD economies**, demand is stagnant, while in **China**, consumption is subdued due to economic slowdown and EVs accounting for **half of all new vehicle sales**.
- The **global demand growth rate** for 2025 is expected to be a modest **1.2% (1.3 mbpd)** — with only **10%** of this growth coming from developed economies.

3. Price Impact and Market Dynamics

- The growing **supply overhang** has triggered a **16% fall in Brent crude prices** since the start of 2025, bringing prices down to **$61 per barrel**.
- The fall has been cushioned by:
  - **Strategic stockpiling** by major consumers.
  - **Producer hoarding** of over **100 million barrels** on tankers awaiting price recovery.

Conflicting Forecasts

- **OPEC:** Predicts a supply shortfall.
- **IEA and others:** Forecast an unprecedented **surplus of ~4**

mbpd, potentially driving prices to the **low $50s per barrel**.

4. Geopolitical and Economic Imponderables

- **Geopolitical Disruptors:** Oil prices remain sensitive to possible **lifting of sanctions on Russia, Iran, or Venezuela**, renewed **West Asian conflicts**, and changes in the **US–China trade equation**.
- **Economic Outlook:** The **IMF's 2025-26 World Economic Outlook** projects a **mild global slowdown and sluggish trade**, adding further downward pressure on prices.

5. The Outlook and Risks for India

(a) Net Positive Impact

- The **concurrent decline in oil prices and the US dollar** presents a dual windfall for India's macroeconomy.

Key Benefits

1. **Improved Current Account:** Every **$1 decline in oil prices** improves India's **CAD by ~$1.6 billion**.
2. **Reduced Subsidy Burden & Inflation:** Lower oil import bills cut **fuel subsidies**, stabilizing **inflationary trends**.
3. **Fiscal Space and Growth:** Savings on oil imports allow higher **capital expenditure** and **public investment**.
4. **Strategic Autonomy:** A global oil surplus reduces India's **dependence on discounted Russian crude**, easing **geopolitical friction** with Western partners.

(b) Emerging Risks

- **Remittance & Export Risks:** If West Asian economies slow due to lower oil revenues, **remittances, trade, and FDI inflows** to India may stagnate.
- **Cyclical Uncertainty:** Oil markets are **highly cyclical**; the current price relief may prove temporary.

6. Policy Recommendation

India must avoid policy complacency and continue to:

- **Diversify energy sources** and boost **renewable capacity** under the **National Green Hydrogen Mission**.
- Expand **strategic petroleum reserves (SPR)** during this low-price phase.
- Promote **domestic EV adoption and energy efficiency** to mitigate future oil shocks.
- Deepen **energy diplomacy** with both OPEC and non-OPEC suppliers for long-term supply security.

Conclusion

The ongoing realignment in the global oil market presents India with a rare **macroeconomic tailwind** — lower import bills, stable inflation, and fiscal breathing space. Yet, the inherent volatility of the oil market demands prudence. Sustained gains will depend

on how effectively India uses this moment to **accelerate its energy transition**, **strengthen external balances**, and **build long-term resilience** against future oil shocks.

How to use it

The decline in global oil prices presents a **significant macroeconomic opportunity for India**, but it is a **cyclical windfall, not a permanent solution**. The strategic imperative for India is to leverage this temporary relief to strengthen its fiscal health and accelerate its long-term energy transition, rather than falling into policy complacency.

Primary Relevance: GS Paper III (Indian Economy)
1. Indian Economy and issues relating to Planning, Mobilization of Resources, Growth, Development and Employment:

- **How to use:** This is the core application. The impact of oil prices cuts across multiple macroeconomic indicators.
- **Key Points:**
    - **Fiscal Management:**
        - **Reduced Subsidy Burden:** Lower oil prices directly reduce the government's expenditure on fuel subsidies (for LPG, kerosene), freeing up fiscal resources.
        - **Increased Fiscal Space:** The savings can be redirected towards **capital expenditure (capex)**in infrastructure (like PM Gati Shakti) and social sectors, boosting long-term growth.
    - **External Sector:**
        - **Current Account Deficit (CAD):** Use the specific data: **Every $1 fall in oil prices improves India's CAD by ~$1.6 billion**. A lower CAD reduces vulnerability to global financial shocks and strengthens the rupee.
        - **Inflation Management:** Lower crude prices translate to lower fuel and transportation costs, helping to control **headline inflation**. This gives the Reserve Bank of India (RBI) more room to maintain growth-supportive monetary policies.

2. Effects of Liberalization on the Economy, Changes in Industrial Policy and their effects on Industrial Growth:

- **How to use:** The oil price shift affects input costs for all industries.
- **Key Points:**
  - Lower oil prices reduce the cost of production and transportation for a wide range of industries, from manufacturing to agriculture, thereby boosting corporate profitability and potentially stimulating investment.

3. Infrastructure: Energy:

- **How to use:** This is a critical moment for energy security planning.
- **Key Points:**
  - **Strategic Petroleum Reserves (SPR):** The article's key recommendation is to **fill India's SPRs**while prices are low. This is a crucial strategic buffer against future supply disruptions or price spikes.
  - **Energy Transition:** The price relief should be used to double down on investments in **renewable energy (solar, wind)** and the **National Green Hydrogen Mission** to reduce long-term dependence on fossil fuels.

Secondary Relevance: GS Paper II (Governance, International Relations)

1. Government Policies and Interventions for Development in various sectors:

- **How to use:** The government's policy response is key to maximizing the benefits.
- **Key Points:**
  - Discuss the need for policies that encourage **Electric Vehicle (EV) adoption** and **energy efficiency**, as mentioned in the article, to lock in the gains and reduce future oil demand.

2. Bilateral, Regional and Global Groupings and Agreements involving India and/or affecting India's interests:

- **How to use:** The changing oil dynamics alter India's diplomatic leverage.
- **Key Points:**
  - **Enhanced Strategic Autonomy:** A global oil surplus reduces India's dependence on any single supplier (like Russia), allowing it to diversify imports and negotiate better terms without geopolitical pressure.
  - **Energy Diplomacy:** India can use this period to **deepen ties with both OPEC and non-OPEC suppliers** (like the US,

Canada), securing long-term supply contracts.

Shock, Horror; Terror: How Dalit Stories Are Stirring the Literary World

Central Theme:
The rise of Dalit autobiographies as a powerful literary and sociological tool exposing the deep-rooted caste oppression, social exclusion, and lived realities of the Dalit (especially Mahar) community in India.

Key Authors and Works

Author	Work (Year, Language)	Focus / Contribution
Daya Pawar	*Baluta* (1978, Marathi)	Pioneer of Dalit autobiography; raw portrayal of Mahar life, breaking silence on caste humiliation and poverty.
Baby Kamble	*The Prisons We Broke* (1986, Marathi)	First Mahar woman's autobiography; intersection of caste and gender; critique of patriarchal customs and women's bondage.
Dadu Mandrekar	*Untouchable God* (1997, Marathi)	Brings attention to Dalits in Goa and Konkan; documents inhuman rituals, caste markers, and social neglect.

Major Themes and Sociological Insights

1. Caste-Based Poverty and Oppression

- All three narratives reveal the absence of dignity and opportunities for Dalits.
- The caste system confines them to degrading jobs and segregated living spaces.
- Reflects Louis Dumont's *homo hierarchicus*—a structural hierarchy justified by ritual purity and pollution.

2. Inhuman Rituals and Customs

- Mandrekar exposes macabre practices such as *Cade* (exhumation and public display of remains).
- Reflects how ritual pollution extends even beyond death.
- Illustrates *ritual degradation* (M.N. Srinivas) as a structural mechanism of control.

3. Exploitative Superstitions

- Myths and legends are weaponized to ensure Dalits' subservience.
- Rituals like compulsory drumming (*dhol*) or self-harm during festivals expose how religion legitimizes labor exploitation.
- Parallels B.R. Ambedkar's critique of Hindu scriptures as tools of social subjugation.

4. Gender and Caste Intersectionality

- Kamble shows how Dalit women suffer "double marginalization" (caste + patriarchy).
- Domestic spaces become microcosms of caste oppression.
- Resonates with Sharmila Rege's concept of *Dalit Feminist Standpoint*.

5. Segregation and Caste Markers

- Dalit settlements are spatially segregated from main villages.
- Distinct objects, smells, and customs act as caste identifiers.
- Reflects Ghurye's analysis of *segmented social order* and *endogamy*.

6. Critique of Educated Dalits

- Kamble and others question whether education has truly emancipated Dalits.
- Educated Dalits often become part of bureaucratic systems without uplifting their communities.
- Mirrors Ambedkar's concern about *elite co-optation* within modern India.

Sociological Significance

- These autobiographies are not merely literary texts but **testimonies of resistance and identity assertion**.
- They **deconstruct dominant narratives** of Indian modernity and development that often overlook Dalit realities (especially Mandrekar's Goa).
- They serve as **counter-discourses** challenging Brahmanical historiography and caste invisibility in mainstream literature.

Broader Implications

Dimension	Implication
Cultural	Reclaims Dalit voice from upper-caste literary domination.
Sociological	Demonstrates how caste is lived, embodied, and reproduced through ritual, space, and everyday interactions.
Political	Aligns with Ambedkarite ideology—assertion of dignity, human rights, and critique of tokenism.
Gendered	Lays the foundation for Dalit feminist consciousness in literature.

Conclusion

Dalit autobiographies by Daya Pawar, Baby Kamble, and Dadu Mandrekar

have revolutionized Indian literature by transforming *personal pain into political narrative*. They blend myth, memory, and resistance—forcing society to confront the contradictions between India's aesthetic beauty and its moral failures toward the marginalized.