



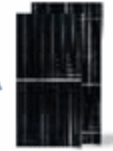
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Global Shifts: India's potential to benefit from the China Plus One model

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The global solar photovoltaic manufacturing industry today stands at a crossroads, witnessing rapid growth but being heavily reliant on a single dominant player, China. Over the past two decades, China has strengthened its position as the nucleus of the global solar supply chain, with a majority share in virtually every segment of the PV supply chain. Its dominance extends well beyond module production. As per the International Energy Agency (IEA), by 2025, the country is projected to control nearly 95 per cent of the global manufacturing capacity for polysilicon, ingots and wafers, which are the building blocks of solar panels. Notably, around 40 per cent of global polysilicon production is currently concentrated in Xinjiang province itself. While this concentration represents an economic strength for China, it poses a vulnerability for the rest of the world.

The Covid-19 pandemic further highlighted the fragility of global supply chains owing to disruptions to manufacturing and logistics. Accidents at key Chinese polysilicon plants were further examples of disruptions in global production from 2020 to 2022. In 2020, such incidents reduced annual polysilicon output by an estimated 4 per cent, causing prices to nearly triple between 2020 and 2021. These disruptions underscored the risks of relying heavily on a single country for key supplies.

This realisation spurred the adoption of the "China Plus One" strategy by nations and companies to diversify their supply chains and reduce their dependence on China. While the pandemic accelerated this shift, the initial efforts to reduce reliance on China began during the US-China trade war in 2018. Additionally, the US launched the Inflation Reduction Act in 2022 to provide an impetus to domestic clean energy manufacturing, including solar PV.

Since then, the US and other countries including India, Vietnam, Malaysia and Mexico have emerged as strong alternatives to China, creating opportunities to reorganise the solar PV supply chain.

This raises a key question: How can India leverage the “China Plus One” model?

Can India become an alternative to China?

State of the Indian economy

Although the International Monetary Fund has cautioned India about the possibility of a lean growth period in 2025, India’s economy, when assessed through aggregate macroeconomic indicators, remains robust. The World Economic Situation and Prospects Report 2025 projects that India’s GDP will grow by 6.6 per cent in 2025, driven by strong private consumption and investment.

As per the Reserve Bank of India’s (RBI) September 2024 report, India’s GDP rebounded in 2022-23, post the pandemic glut, achieving a growth rate of 6.99 per cent at constant prices. The momentum was carried forward into 2023-24 with a projected GDP growth of 8.15 per cent. This was driven by a strong gross value added growth of 7.22 per cent across sectors. Investment activity has also been rising, as reflected in gross capital formation, which accounted for 34.41 per cent of GDP in 2022-23, signalling a sustained recovery. Meanwhile, China’s growth rate is expected to slow down to 4.5 per cent in 2025.

However, the prospects for India’s manufacturing sector have not been entirely favourable. While it has shown growth in certain years, it has struggled to achieve consistency and scale. The sector’s contribution to GDP has gradually declined, from 17 per cent in 2010 to about 13 per cent in 2023, according to RBI, significantly lagging behind global leaders such as China and Vietnam.

India’s potential to benefit from the China Plus One model for solar PV manufacturing depends on several key factors. India offers a significant labour cost advantage, making production more affordable compared to many global competitors. While China’s minimum wage surged by nearly 170 per cent between 2009 and 2024, reaching approximately \$353 per month as per TradingEconomics, India’s real wage growth has remained below 1 per cent

over the past decade. This significant difference in labour costs positions India as an attractive destination for cost-sensitive manufacturing industries. However, technological capabilities, in India still fall short of leading nations like China.

On the brighter side, India's ambitious renewable energy targets, including 500 GW of non-fossil-fuel capacity by 2030, provide a large domestic market for solar PV products, ensuring consistent demand for manufacturers. Since 2014, India's installed solar PV module manufacturing capacity has grown by around 35 times, from 2.3 GW to about 80 GW. According to a report by the Institute for Energy Economics and Financial Analysis, India imported a record-breaking \$6.2 billion worth of PV cells and modules from Chinese manufacturers in 2024. The report also states that in financial year 2024, India exported over 5.8 GW of PV modules, a more than threefold growth compared to financial year 2023. Notably, over 29 per cent of India's PV module production was exported, with the majority of these exports driven by the three largest domestic manufacturers – Waaree Energies, Adani Solar and Vikram Solar. Each of these companies exported more than half of their total production during the year. Meanwhile, other key players, such as ReNew and Tata Power, allocated a significant share of their production for captive consumption.

India's solar industry has also benefited from key government policies and continued support. The production-linked incentive scheme is a major initiative, with Rs 45 billion allocated in the first phase to develop domestic manufacturing and Rs 195 billion in the second phase to develop 65 GW of solar PV production capacity. Tariff barriers in the form of safeguard duties and basic customs duties, incentives such as concessional customs duties on inputs required for domestic manufacturing, and waivers on import duties for specific capital goods required for solar PV cell and module production have further supported the sector's growth over the years.

Further, the Ministry of New and Renewable Energy has expressed interest in expanding the Approved List of Models and Manufacturers (ALMM) to include solar PV cells (List-II). As per a recent notice, starting June 1, 2026, developers will only be allowed to use modules from List-I, manufactured using cells from ALMM List-II. With these efforts, in 2024, India's installed solar PV module and cell manufacturing capacity has reached 80 GW and 15 GW respectively.

Comparing India's and China's industrial policies

China's leadership in solar PV manufacturing is largely due to its aggressive industrial policies. The Chinese government provides large subsidies to manufacturers, helping them scale up production, reduce costs and invest in research and development (R&D). For instance, China alone spends 2.5 times more on R&D for clean technologies than the global world average spending, according to the World Economic Forum. India, on the other hand, is still catching up. Additionally, India invests less in R&D, while Chinese companies lead in patent filings and innovation.

Supply chain assessment: India's strengths and weaknesses

To capitalise on the China Plus One strategy, India must focus on certain strategic economic interventions, market-driven incentives and tax breaks. India must prioritise capturing specific areas of the solar PV value chain based on its advantages and disadvantages. India has demonstrated the ability to manufacture high quality PV modules for export markets such as the US and should continue to expand capacity in this segment. With relatively lower entry barriers, India holds a logistical advantage, particularly for countries adopting the China Plus one model.

Furthermore, India can focus on vertical integration into high-value, export-oriented segments, such as solar cell manufacturing, rather than wafer production. According to the IEA, China dominates the global wafer market, accounting for 95 per cent of wafer manufacturing compared to 86 per cent of cell production and 81 per cent of module manufacturing. Given this disparity, it may be more practical for India to import wafers to support domestic and small-to-medium enterprises (SMEs) in downstream processes while spending its resources on cell and module manufacturing. The government could provide tax breaks and concessions to large companies capable of scaling up cell manufacturing, enabling them to achieve economies of scale and compete globally. India can also expand its global footprint by focusing on project development and engineering, procurement and construction services. Regions such as Africa, South Asia and West Asia are witnessing growing demand for solar energy, creating an opportunity for Indian firms to leverage their cost advantages and engineering expertise.

India can also position itself as a leader in the solar PV recycling and circular economy space. As the first generation of solar panels approaches the end of their life cycle, recycling offers a significant, high-value

opportunity. Early investments in recycling technologies can reduce reliance on raw materials and address long-term resource challenges.

To ensure inclusive growth in the solar PV sector, it is crucial to support SMEs by providing access to capital and subsidies to scale production. In the short term, this can drive GDP growth and job creation. Over the medium term, it will help substitute imports and stabilise the current account by reducing reliance on imports.

Further, providing tax incentives to companies that allocate a certain share of their revenue to R&D is another pivotal strategy, fostering an alliance with academia, human resource development and innovation. As per Climate Scorecard, approximately 10 per cent of funding for China's national R&D programmes was allocated to energy research, encouraging solar companies to launch their own R&D programmes. In the long term, this will pave the way for India to establish itself as a global hub for solar manufacturing, driving innovation and economic resilience.

Lastly, a more proactive foreign policy is required. This would mean introducing and advocating for stringent anti-dumping policies (not just domestically but also abroad), fostering international joint ventures and partnerships with other producers across the global supply chain. For instance, partnerships such as the International Solar Alliance (ISA) can strengthen energy interconnections across regions like South Asia, West Asia and Africa. By aligning with the ISA's "One Sun, One World, One Grid" initiative, India can promote energy security and position itself as a key player in the global solar market, capitalising on the opportunities presented by the China Plus one model.

Conclusion

To conclude, India should adopt strategic initiatives to drive growth in the solar PV supply chain. As outlined above, this would involve shifting focus towards high-value segments in the supply chain rather than relying solely on broad subsidies or manufacturing incentives. While these incentives are essential, fully capitalising on the China Plus One strategy requires prioritising key areas that offer the most significant and practical ways to capture and strengthen the supply chain.