




Sustainable and Green Industrialization: Challenges and Opportunities

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This policy brief summarizes key issues raised at the ISID Policy Roundtable on “Sustainable and Green Industrialization: Challenges and Opportunities for India”, held on October 4, 2023 at the National Conference “Towards Industrial Transformation of India: Building an Inclusive, Sustainable, and Competitive Manufacturing Sector to Realize the 2047 Vision,” held at ISID Campus, October 4-6, 2023. This roundtable was chaired by **Dr Nitin Desai**, Chairman, TERI, and former UN Under-Secretary-General, United Nations. The speakers included **Dr Arunabha Ghosh**, CEO, CEEW; **Mr Shikhar Jain**, Executive Director (Sustainability), CII; **Dr Laveesh Bhandari**, President, CSEP (formerly Brookings India); **Mr Pranav Kumar**, Vice President (International Trade Policy), Reliance Industries Ltd; and **Prof Thomas Pogge**, Leitner Professor of Philosophy and International Affairs, Yale University, New Haven, CT, USA (online). The panel discussion was followed by a round of open-floor questions and answers. The YouTube link of the policy roundtable is available here. 

The Challenge of Sustainable Industrialization

Achieving a greater degree of industrialization at a faster pace requires multiple considerations today than those in the past. The discussion often receives attention on various aspects of industrialization such as the impact in terms of job creation and income inequality, and the sources of industrial growth such as R&D and innovation, productivity, and investment. The overarching concern is the potential impact of the increase of greenhouse gas (GHG) emissions due to their detrimental effect on life and the environment. Many countries and regions have communicated their commitments in the form of emission pledges and/or green targets as part of the climate strategy. To deliver on the decarbonization promise, countries must act in a manner consistent with the national and global requirements.

The challenge for the industry in India is to expand rapidly and yet be compliant with the sustainability commitments while also meeting

other development criteria for overall well-being. The growth patterns followed in the past century overlooked the emission implications of industrial expansion. This pathway to growth cannot continue if the issues of global warming are to be addressed. The industrial strategy in today's context has to be green industrialization strategy making it more challenging.

For India, increasing the share of manufacturing sector in the gross domestic product (GDP) is required to foster job creation while being cognizant of the Government's nationally determined contribution (NDC) for the year 2030 and the net zero emission (NZE) target for the year 2070. Indian enterprises are also defining their individual NZE targets consistent with the national targets. A critical issue in the transition is the race to move towards sustainability quickly, thereby necessitating interventions to reach the desired outcomes by changing the economic environment for industry or any other activity. Interventions that deliver suitable transition outcomes require

attuning the carbon price to that of the fossil fuels whether through changes in tax structure or the cap-and-trade mechanism, changes in regulations and institutions for better monitoring and implementation at the firm level, and greater investment in innovations.

Turning Challenges into Opportunity

Compared to the approach of yesteryears, the present and future approaches require consciously designing growth models which are more sustainable. This presents a range of options to choose from strategies of the past that delivered successfully on the sustainable industrialization agenda. The decarbonization lineup has the benefit of preparing the domestic industry, within the organized segment of manufacturing, through a national carbon pricing mechanism, or the emissions trading system, like in other countries. Importantly, this creates space for countries to participate in future negotiations for a fair representation in the sustainable transition process for better outcomes.

Also, the sustainability agenda brings along with it the need for extending the global- and national-level infrastructure development programs to the local level. Localized infrastructure provides deeper gains. The environmental efficiencies of a local economy are acceptably higher than in the broader geography, and can therefore be a source for increased integration of the former in the global value chains (GVCs). Further, green industrialization also presents an opportunity to enhance trade in green goods in the neighbourhood and beyond. Bilateral and regional arrangements have gathered momentum across the world with a wider scope of cooperation to include measures

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related to sustainability. In the same vein, the presently abysmal level of India's trade in the South Asian region is suggestive of the prospects to strengthen trade relations despite disagreements on other fronts especially for trade in environmental goods that would also help to accelerate their clean transition.

Technology is Crucial

A question that follows is what matters the most for a sustainable industrial transformation. Technology is central to walking the transition path. Environmental technologies can be classified into three baskets: transition technologies, foundational technologies, and breakthrough technologies.

The transition technologies are fairly advanced in terms of evolution but are not yet commercial at a large scale. These move the technology needle in a non-trivial manner. Relevant examples are the developments in renewables such as solar, wind, and electric vehicles (EVs). These technologies are crucial in the transition process but will take time to reach a certain level of maturity over a decade, after which the bankers begin to consider such technologies as investible propositions. Over time, more countries indulge in the transition technologies. The number of countries investing in renewable energies has increased from 39 to as many as 70, and the number of countries manufacturing EV batteries has more than doubled from 19 to 40. However, these technologies continue to be characterized by high concentration at the global level suggesting that a swing from import dependency to

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indigenous manufacturing would not be practicable. Instead, positioning India as an indispensable node within the supply chain of clean technology and products would ensure the stake in negotiating the trade rules to create a market for finished goods with a crucial role in it.

The foundational technologies are those requiring more basic work and can impact a range of industries. Examples include advanced chemistry cells and lithium batteries. The difference in this case is that alternatives are available notwithstanding the concentrations in global supply. Here, greater investment will encourage efficiency improvements based on parameters such as efficiency, storage content, and range anxiety, as compared with efficiency improvements only on a mechanical basis, thereby giving appropriate signal to the market to expand and achieve a higher scale in the alternative materials. Similarly, investing in research on foundational technologies for biofuels can go a long way in the sustainability endeavour. This will unlock the different components of the bio-fuel value chain, which can then serve different markets. A market for second-generation bio-fuels can then be developed based on their use as an alternative transportation fuel in automobiles or aviation, as liquid fuel in heavy industry, or for crop management.

Breakthrough technologies such as green hydrogen are the ones receiving much policy support and subsidies. India is also in the race with the US and the EU as the leaders. The key here is to invest in specific segments based on the value addition potential rather than the entire value chain. This will strengthen our position to set the rules and standards for interoperability in the green hydrogen industry. Three nodes in the supply chain are suggested. First, investing in renewables is beneficial for

India's green hydrogen mission as India has abundant natural sunshine. Second, investing in developing completely purified water required to run through the electrolyzer/membrane can address our water constraints for developing green hydrogen. Third, alternative membrane design and mineral materials consumed in the manufacturing of membranes can reduce the dependence on a lot of critical materials. It will be important where we choose to position ourselves in the global technology chain.

Green Transformation should be an Integral Part of the Business Model

From a business perspective, the clean industry transition is often mandated or regulated under environmental laws requiring that the transformation of the industrial process be compliant with the regulations. Most of the transformation and transition activities are bound by compliance and require financial support, particularly for SMEs. A trigger factor in advancing a company's focus on further greening its supply chain has been the digitalization initiatives that have brought compliance-related information into the public domain. This has particularly increased awareness of the ecological footprints in sensitive areas, for example, mining and societal issues. Further, the technology intervention through greater digitalization is also coming into the overall compliance monitoring within the country through geo-tagging of the inputs. This segregates the industries into two

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categories – those which are compliant or even exceeding, and those industries which are on the periphery and trying to improve their compliance.

The digitalization initiatives have added further transparency on the firms' commitments to go green as information on the sustainability measures is reported in the annual reports and helps to increase investor confidence in the company. Furthermore, the incipient extended producer responsibility (EPR) requires a company to look into the complete value chain for various types of waste recycling. This contributes to greater transparency on compliance even though the ease of doing business is compromised. In addition, market-based legislations such as the environmental, social and governance (ESG) practices which are required to be reported in the accounts of the 1000 top listed companies add a second layer of transparency for the environment-conscious investors. Furthermore, companies also report green capex and green operating expenses (OpEx) in the books of accounts to build investor confidence. The green investment, therefore, is becoming a part of the business model. This necessitates the need for a governance mechanism in place for an effective green transformation of the industry.

While much of the efforts in the business focus on mitigation, for example, through efficiency improvements and energy mix, the industrial infrastructure needs to be climate resistant. This brings to the fore the need for climate adaptation efforts in the industry which can also be reported as disclosures for industries and companies operating in vulnerable districts where supply disruptions eventually lead to financial loss for the investors. Building adaptation measures into the business model of the climate-fragile industries will also boost investor confidence.

Response of the Industry to a Sustainable Revival

The industry has to respond to the evolving global environment legislations such as the corporate sustainability due diligence directive (CSDDD), regulations on deforestation-free products, and the carbon border adjustment mechanism (CBAM) as already applicable in parts of the world. For India to achieve developed economy status by 2047, and to export manufactured goods and services of \$1 trillion each, trends in the global trading regimes need to be responded. Companies have begun to prepare themselves by proactively announcing NZE timelines. For instance, Reliance Industries Limited has pledged carbon neutrality by 2035.

The two important components of a NZE strategy are the transition to renewable energy sources and the adoption of a circular economy approach. The latter emphasizes recycling and reuse, thereby reflecting that resource efficiency is becoming increasingly important for a sustainable future. This is important for all industries across the manufacturing spectrum from electronics and batteries to plastics. For instance, the importance of circularity in the largely informal plastics economy is demonstrated by the United Nations giving a heads-up on a legally binding treaty to cover plastic pollution. Simultaneously there continues the effort to cut the production of plastics by increasing the amount of plastic reused and recycled as an intermediate product for key

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industries such as electronics, automobiles, and medical equipment, among others. This impacts the entire process of manufacturing revival. This includes recycling initiatives such as converting pet bottles into staple fibres for the manufacture of fabrics and garments.

Facilitating Affordable Access to Technologies for Green Transition

To make the new energy transition affordable and secure for its 1.4 billion people, India must help create international frameworks to facilitate affordable access to harness the environmental technologies that are already available. Indeed, the Indo-Pacific Economic Framework has a focus on green hydrogen and circular plastic economy, among others. Furthermore, sustainable transition can not be achieved entirely through market mechanisms. Multiple stakeholders in the global community and at the country- and

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state level make it politically difficult to cater to all interests. In this context, impact investing could be an option to incentivize green innovations and their rapid deployment in developing countries. One of the proposals in this respect is the proposed ecological impact fund (EIF) that could enable originators of innovative green technologies to exchange some of their monopoly privileges in return for impact rewards. The EIF model, as proposed by the Yale University, will help to proliferate green and cleaner technologies in the global South by giving the originators of technology a financial interest in the wide and effective use of their technologies. The large-scale deployment of their technologies will serve the capital interests in lieu of which they will agree to waive propriety benefits such as the royalty, license fee, and markups, all of which tend to inflate the price of green technologies. The ultimate gain would be achieving a green transition in the global South at no additional costs to the technology developers.

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