CII-ITC Centre of Excellence
for Sustainable Development

Confederation of Indian Industry

Sectoral Report

FINANCING INDUSTRY TRANSITIONS

Roadmap for Achieving Net Zero Transition in India by 2070

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This report draws insights and data from McKinsey's "Decarbonising India: Charting a pathway for sustainable growth." The recommendations contained in this report are of the CII Mission Net Zero.

Context Setting: The CII Mission Net Zero's sectoral report on Financing Industry Transitions provides an in-depth analysis of the financial strategies and frameworks required for India to achieve net-zero emissions by 2070. It contrasts two scenarios: the Line of Sight (LoS) and Accelerated scenarios, outlining the investment needs, challenges, and potential financial mechanisms to support India's green transition. The document projects the financial outlays necessary for decarbonisation and recommends policy initiatives, banking reforms, and market solutions to mobilize the required investments effectively. It underscores the urgency of establishing robust financing structures, including green banks and carbon markets, to drive the transition towards a sustainable, low-carbon economy by 2070, detailing the economic, environmental, and social co-benefits of such a transition.

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Foreword

Mr. T V Narendran
Past President CII
Chairman CII Mission Net Zero &
Global CEO and Managing Director
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In an era where the clarion call for climate action resonates stronger than ever, India's journey towards net-zero emissions is both a monumental challenge and a historic opportunity. Standing at the cusp of transformative change, the CII Mission Net Zero is committed to leading from the front to achieve this ambitious goal.

The growth anticipated in various sectors, including power, steel, cement, automotive, and agriculture, could drive energy demand across the board. Setting up policies that generate the right demand signals within this decade can channel these capacities toward low-carbon alternatives.

The sectoral report on "Financing Industry Transitions" reveals the substantial financial commitment required to catalyze a net zero transition, estimating an investment need of $7.2 trillion for a business-as-usual scenario and an additional $4.9 trillion under an accelerated scenario by 2050. These investments span various sectors and encompass capex investments in green power generation, hydrogen-based steel production, Electric Vehicles (EVs) and supporting infrastructure in the mobility sector, and investments in agriculture.

The sectoral report on "Financing Industry Transitions" reveals the substantial financial commitment required to catalyze a net zero transition, estimating an investment need of $7.2 trillion for a business-as-usual scenario and an additional $4.9 trillion under an accelerated scenario by 2050.

In our pursuit of financing India's transition to a net-zero emissions future, the report indicates that substantial funding is essential, amounting to 3.5–6 percent of cumulative GDP until 2050. Initiating this transition within the current decade is crucial, considering that over three-quarters of India's 2050 landscape (and over 80 percent of the India envisioned for 2070) is yet to be developed.

Additional investments will target green hydrogen production, material circularity, natural climate solutions, and Carbon Capture, Utilization, and Storage (CCUS). This significant financial undertaking highlights the critical role of innovative financing solutions and robust policy frameworks in unlocking the necessary capital for green technologies and infrastructural developments.

The report also highlights that India has the potential to accelerate its journey towards decarbonisation by implementing interventions such as Carbon Markets and Green Banks. Apart from these interventions, actions like lowering uncertainty, reducing the cost of capital for clean energy projects, and ensuring cost-effective hedging are essential to achieving India's sustainability goals. As global financial institutions increasingly prioritize climate risk management and align with sustainability agendas, India must adapt to the evolving landscape and harness financial mechanisms to drive its decarbonisation efforts.

There is also a strong need to establish supportive policy frameworks. Such frameworks are essential to mitigate risks, enhance the attractiveness of green investments, and ensure a just transition for all stakeholders involved. Our findings suggest that strategic interventions in policy and regulation can significantly accelerate the pace of industrial decarbonisation, thereby contributing to India's commitments under the Paris Agreement and its broader sustainability goals.

As the Chair of the CII Mission Net Zero, I am privileged to witness and contribute to this collective endeavour. Our actions today will determine the legacy we leave for future generations. Let this report serve not just as a testament to our commitment but as a blueprint for the transformative actions we must undertake. Together, we have the power to achieve India's net-zero ambitions and lead the global charge in climate action.

It calls for a strategic and collaborative approach, uniting policymakers, industry stakeholders, and the financial community to address the multifaceted challenges of this transition. By fostering reforms, enhancing local manufacturing, and developing skills, and by leveraging global partnerships for technology transfer and joint R&D initiatives, we can drive India—and indeed the world—towards a sustainable, clean energy future.

1. BACKGROUND

The report discusses emission reduction levers across two scenarios, both of which assume an orderly transition, (a) the Line of Sight (LoS)/Business as usual (BAU) scenario with current (and announced) policies and foreseeable technology adoption and (b) the Accelerated scenario with further reaching polices like carbon prices and accelerated technology adoption, including those of technologies like CCUS.

In LoS scenario India could get to net-zero emissions by 2070, while in accelerated scenario, India could get to net zero by 2050.

Getting to the LoS scenario would create 207 $GtCO_2e$ of carbon space till 2070, while the Accelerated scenario would add a further 80 $GtCO_2e$. Exhibit 1 is equivalent to 36 percent and 14 percent, respectively, of the remaining carbon budget for an even chance at limiting warming to 1.5 degrees Celsius. This is despite India not reaching net zero in either of the scenarios, due to the residual emissions from agriculture and select industrial sectors (remaining emissions in 2070 of 1.8 and 0.4 $GtCO_2e$ in the LoS and Accelerated scenarios, respectively).

In LoS scenario India could get to net-zero emissions by 2070, while in accelerated scenario, India could get to net zero by 2050.

India's GHG emissions, Gt CO_2e per annum[1]

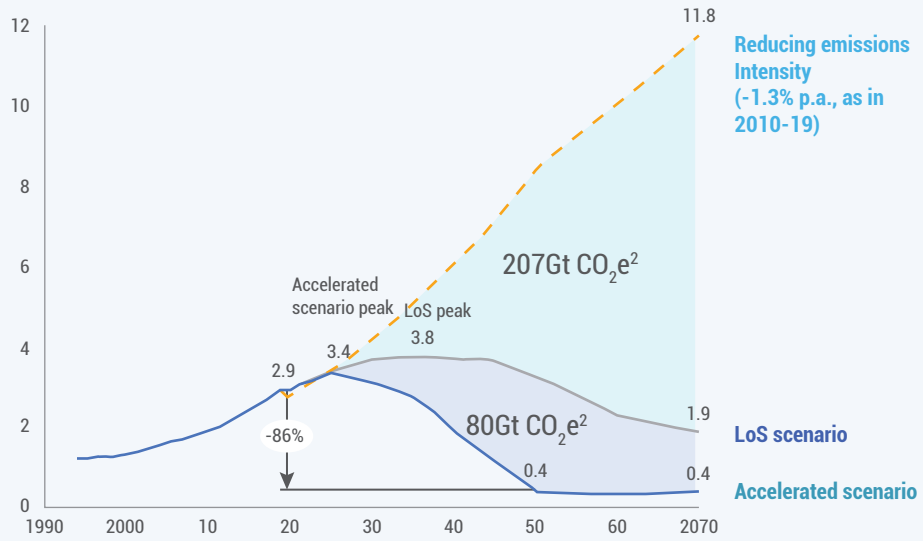

Exhibit 1

1.1 Aspirations

In 2021, at COP26, India announced its ambition to become a net-zero emitter by 2070. Despite low per-capita emissions (1.8 tons CO_2 per capita), India is the third-largest emitting country globally. Therefore, to win the global war on climate change, India will need to play a significant role.

There is no better time than now for India to push for an accelerated decarbonisation trajectory. Much of the India of 2050 is yet to be built, with India's GDP estimated to grow four times over this period. If India builds it right, it has the unique opportunity to decarbonise without slowing the economy down. This can also serve as an inspiration to other high growth economies.

1.2 Trends and Trajectories

India would need large funding (3.5–6 percent of cumulative GDP till 2050) to power this transition. To have an orderly and accelerated decarbonisation, the transition has to be set up within this decade. Over three fourths of the India of 2050 (and 80+ percent of the India of 2070) is yet to be built. The growth could multiply demand across sectors: power (eightfold), steel (eightfold), cement (triple), automotive (triple) and food (double). If policies are set in place to create the right demand signals within this decade, then the capacities India adds in the two decades thereafter will be low carbon ones.

India will likely require $7.2 trillion to be invested in green technologies till 2050 for the LoS scenario and an additional $4.9 trillion for the Accelerated scenario (3.5 percent and 2.4 percent, respectively, of cumulative GDP for the period). The investments required are frontloaded and India would have a runway till 2040 to orchestrate half of the total $12.1 trillion required by 2050 (Accelerated scenario). The balance half of the investments would be required in the decade of the 2040s. Decarbonisation could decrease operating costs by $2.1 trillion by 2050, mostly in the decade of the 2040s, thus easing cash needs.

However, current annual financing for decarbonisation meets only 10–12 percent ($44 billion in FY2019–20) of the investment demand in the Accelerated scenario. Financing is constrained due to real and perceived risks. India needs an aligned plan for its decarbonisation, cascaded into the right industrial policies like accelerating the nationwide compliance carbon market to fast-track green investment and increasing the flow of capital toward hard to abate use cases. Banks could define glide paths for their financed emissions and set ambitious targets for financing new green businesses. Institutional measures like shaping banking regulations towards transition financing and setting up a green transition bank to orchestrate capital are greatly required to fast-track decarbonisation.

2. ROADMAP TOWARDS NET ZERO EMISSIONS

2.1 Decarbonisation Financing Challenges

Despite the positive return profile for most cases, financing is constrained due to real and perceived risks (e.g., technology risks, payment risks, project execution, policy stability) and structural constraints (e.g., investor expectation mismatch, limited participation from the Indian banking sector). These challenges are detailed below:

- **Limited participation from the Indian banking sector:** There are very few banking regulations and incentives to drive sustainable finance in a scalable manner. As per the RBI ESG Survey 2022, 45 percent of the boards of Indian banks have not discussed the need to increase green finance in the last two years.
- **High cost of debt:** Clean technologies inherently have higher upfront costs, but significantly lower operating costs as compared to conventional technologies. It means the key recurring cost is mainly cost of the capital, which has a direct bearing on the price of clean energy or energy services.
- **Long payback period, even for NPV positive levers:** About 50 percent of the abatement levers (e.g., EV, RE), even between the LoS and Accelerated scenarios, are NPV positive. Yet, even for these positive levers, opex savings kick in substantively only in the 2040s, while the investment is made in the prior decade, creating a cash flow mismatch for the economy.
- **Uneconomic business cases responsible for a quarter of the abatement,** such as CCUS, hydrogen-based green steel (till 2045) and green hydrogen as a grey hydrogen replacement (till 2030).
- **Capital flows constrained by investors' expectation mismatch:** Most investor groups have a short-term investment horizon, while green projects have long-term funding requirements (e.g., most solar/wind projects need financing for over 20 years while most bank borrowings are five years in tenure).
- **Capital formation challenges for positive investment cases,** due to both financial and structural constraints. These include payment-related risks (e.g., power purchase agreement (PPA) renegotiations as technology costs decline, payment delays by power distribution companies), project risks (e.g., land acquisition challenges, delays in grid connection) and currency risks for import dependent projects.
- **Concerns regarding health of clean tech. project executors** (e.g., DISCOMs, state transport authorities). It raises the cost of capital, thereby reducing project viability. Many innovative business models/ scalable solutions have come up to solve this – for example, mobility-as-a-service General Conditions of Contract (GCC) contracts in which customer receivables are directly channeled via a direct debit mechanism as per credit hierarchy.
- **Hedging market in India is shallow:** Nearly 90% of cross-border debt from developed countries to projects in developing countries like India is in hard currency while the revenues generated from these projects are in local currencies.

As per the RBI ESG Survey 2022, 45 percent of the boards of Indian banks have not discussed the need to increase green finance in the last two years.

The market for currency hedging swaps in developing countries is not deep enough especially for average maturity of over three years. For a tenure greater than the average maturity of 10 years, the hedging solution itself is non-existent, leaving projects exposed to currency risk depreciation in the medium to long term. The unhedged Forex risk adds to the fragility of projects. Ultimately, it translates to high overall cost of capital because of expensive hedging, even if the cost of the foreign currency loan is low, thereby neutralizing all savings.

2.2 Financing Trajectory

The current annual green financing market in India is estimated to be around $44 billion across both debt and equity investments. It could increase to an annual spend of $160 billion per annum (4.1 percent of GDP) in the current decade, $440 billion in the 2030s (6.8 percent of GDP) and $610 billion in the 2040s (six percent of GDP) in our Accelerated scenario (Exhibit 2).

Two-thirds of this spending will likely be needed even in the LoS scenario. The funding could be mobilized largely from the retained earnings of corporations, banks, public markets and the government. Private equity and sovereign wealth funds could have a smaller, but important, role to play.

Annual investment required in Accelerated scenario, $ Bn

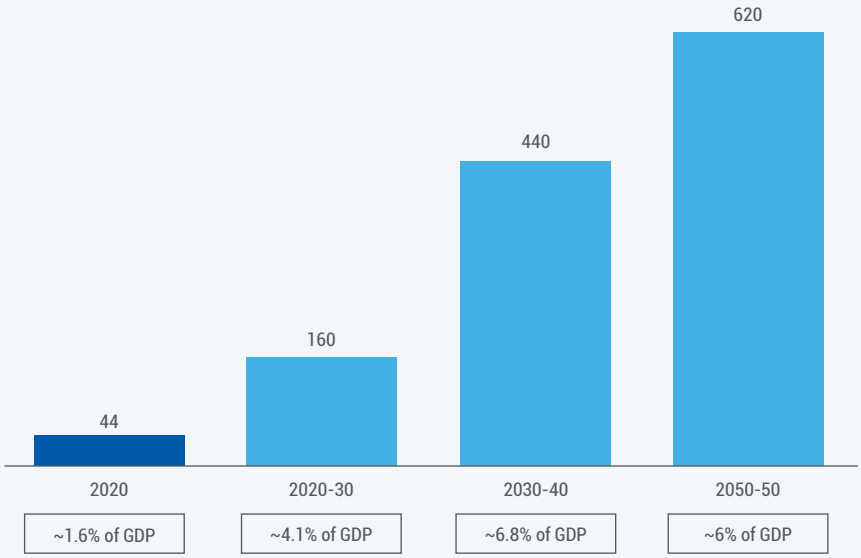

Exhibit 2

3. COST OF TRANSITION TO NET-ZERO

The transition will likely require $7.2 trillion to be invested in green technologies till 2050 for the LoS scenario and an additional $4.9 trillion for the Accelerated scenario (3.5 percent and 2.4 percent, respectively, of cumulative GDP for the period)

3.1 Estimated costs to achieve net-zero emissions

In both scenarios, about 70 percent of the capital investment would be required for decarbonising the power and automotive sectors, with agriculture and industry making up a quarter of the overall estimated investments.

Investment for the power sector includes green capex on low carbon emission power generation such as solar and its supporting infrastructure. Similarly, investment for industry considers additional green capacity via technologies such as hydrogen-based steel production. Mobility investment includes capex for EVs (including incremental capex for the vehicle), sustainable aviation fuel (SAF) production units and supporting infrastructure. Agriculture investment includes capex in electric tractors and installation of equipment for the green transition in agriculture. Other investments include capex in green hydrogen (electrolyser manufacturing, pipeline and storage infrastructure), CCUS (setting up capture, transportation and storage infrastructure for CO_2) and material circularity (infrastructure for waste management and segregation). These sector-wise investments are detailed below:

- **Power Sector**
  The transition will likely need an investment of $2.5 trillion until 2050 in the LoS scenario and an additional $1.3 trillion in the Accelerated scenario. Importantly, most of the investment is Net Present Value (NPV) positive and could get India's power- generation cost from its current INR 4/kWh to INR 3/kWh by 2050. The total average system cost of supply which was 6.15 INR/kWh in 2020 can also come down by 0.7–0.9 INR/kWh as increases in per unit transmission and distribution cost could be offset by decreases in generation cost and aggregate, technical and commercial (AT&C) loss reduction. However, India would have to be mindful not to compromise on energy security through import localization and power-mix diversification.
- **Automotive**
  The Accelerated scenario needs an incremental investment of $1.3 trillion till 2050, in addition to the $1.9 trillion needed for the LoS scenario. the additional Accelerated scenario investment is necessary to accommodate for higher upfront EV costs for the customer, while automotive, battery makers, and charging providers will need to invest less than they would for the equivalent ICE manufacturing capacity. Additionally, the government would need to re-balance its finances as fuel taxes, which currently amount to 14 percent of central government receipts at $50 billion (two percent of GDP) and will decline with faster EV penetration.
- **Aviation**
  In the Accelerated scenario, production of SAF to maximum potential would require a total investment of $347 billion by 2050, which is almost one-and-a-half- times the expected investment in the LoS scenario.

The Accelerated scenario needs an incremental investment of $1.3 trillion till 2050, in addition to the $1.9 trillion needed for the LoS scenario.

- **Cement**
  The Accelerated scenario will likely require $351 billion more in capex investment than the LoS scenario by 2070. Acceleration could also see cumulative opex savings of $118 billion more than the LoS scenario by 2070, due to lean design, higher clinker efficiency and use of green fuels and refuse derived fuel (RDF) from waste at lower costs than fossil fuels.
- **Steel**
  While the capex intensity of the steel-making step would decline in hydrogen-based steel making, incremental spending on green power and hydrogen would likely require an additional capex of about $135 billion, which is about 40 percent on top of the capex on the steel value chain across technologies. Also, cumulative forex savings of approximately $500 billion would accrue through to 2050 from reduced spending on coking coal in the Accelerated scenario. India would also avoid locking into about 200 million tons of BF-BOF technology in the Accelerated scenario.
- **Agriculture**
  In an LoS scenario, implementing green interventions in agriculture may require total capex spending of nearly $240 billion by 2070. Accelerating the transition by 2050 would likely require an additional spend of $240 billion over LoS. Significantly, nearly half the proposed green interventions could be carried out at net-negative lifecycle costs. Sustainable agriculture could also open up avenues for premium pricing, creating further economic gains.

Investment on cross-cutting enablers:

- **Green Hydrogen**
  The investment needed (till 2050) is estimated to be in the region of $430 billion across green hydrogen production (i.e., electrolysers and renewable energy – accounting for $316 billion), midstream (i.e., storage and pipeline infrastructure – accounting for $114 billion) in the Accelerated scenario. The comparable investment by 2050 in the LoS scenario is $242 billion
- **Material Circularity**
  Significant capital and operational expenditure will likely be needed for collection, sorting and processing of waste to accelerate material circularity. Capex investment of $660 billion would likely be required by 2070 in the Accelerated scenario ($220 billion more than in the LoS scenario), with the majority going towards recovery and recycling infrastructure for construction (one percent recycled) and plastic waste (25 percent recycled).
- **Natural Climate Solutions**
  Accelerating adoption in a fast-growing economy will be challenging. It could require a total investment of around $160 billion by 2070—$110 billion more than in the LoS scenario. Incentivizing investments in NCS would require structural interventions, such as setting up domestic carbon markets and creating natural capital solutions to convert natural resources into investible assets. Regional road maps could also drive implementation to deliver high-impact NCS projects.

- **Carbon Capture, Utilization and Storage** A preliminary analysis suggests that 3 $GtCO_2e$ cumulative CCUS would require capex of $1.3 trillion by 2070, of which about $0.5 trillion would be for carbon capture and the balance for transportation and storage in the hub model.

Accelerated decarbonisation will likely create operational cost savings, such as lower costs of power generation due to increased solar penetration. As a result, some portion of the additional investment could be recuperated through operating cost savings. From now until 2050, operating costs could lead to overall savings of $2.1 trillion, offsetting about 45 percent of the capital investments over this period.

However, the cost savings are not balanced across sectors. Power invests an incremental $1.3 trillion over the time frame for the Accelerated over the LoS scenario, while saving $0.5 trillion in operating costs; transportation invests an incremental $2.3 trillion, while saving $1.9 trillion; agriculture invests an incremental $0.05 trillion, while saving $0.3 trillion. On the other hand, industries like steel and cement invest $0.9 trillion, with a simultaneous increase in costs ($0.2 trillion); other levers such as NCS and material circularity would require investments of $0.1 trillion while saving $0.3 trillion.

3.2 Potential financing solutions

The following two important interventions, Carbon Markets and Green Banks, could accelerate the availability of domestic and international funding.

Carbon Markets

To accelerate the process of decarbonisation, India could explore three types of carbon pricing mechanisms that have been implemented globally—carbon tax, emissions trading systems (ETS) and voluntary carbon markets (VCMs). The first two are mandatory and enforced using regulatory measures, whereas VCMs are based on internal targets and buyers can buy carbon credits based on voluntary commitments. Carbon tax is comparatively easy to implement but it has limitations—for example, it has a higher impact on low-income households and no market- based adjustments—and many developing countries are now shifting to an exchange- based carbon-pricing mechanism.

In the ETS, the regulator sets a cap of CO_2 to be emitted (overall or for a sector). Firms emitting lower emissions can sell their surplus quota in a regulated market to firms that need more allowances than originally received, leading to the formation of a price. This has proven to be the most effective way to reduce GHG emissions as can be seen in the example of European ETS. By restricting the supply of allowances, higher carbon prices can prevail, providing critical economic signals for decarbonisation. India has already introduced the Carbon Credit Trading Scheme (CCTS), a transition of its successful Perform, Achieve, Trade (PAT) scheme, although it is yet to be implemented. Carbon markets will likely need to be accelerated in India to build India right. For example, in the case of steel, without visibility into carbon pricing in the next two or three years, India will likely build and lock itself into long-lasting high carbon steel-making assets in the decade of the 2030s.

Voluntary Carbon Markets (VCMs)

In the short term, India could consider launching a VCM to build awareness, signal future policy intent and build the necessary capabilities and administrative muscle needed for launching and operating ETS. Carbon trading by tapping global VCM markets has already started gaining momentum in India – $300 million or about 60 $MtCO_2e$ worth of carbon credits were exported from India across different VCMs in 2021. Multiple local initiatives are already running to generate value by selling carbon credits (e.g., the Indian Agricultural Research Institute is building a carbon credit market for Indian farmers in Punjab and Haryana). For setting up the VCM, India could consider:

- **Creating demand for VCMs in India:** Increasing global carbon credit demand opens an attractive opportunity. India's own large medium-term demand for carbon credits would need support to materialize through advocacy and awareness.
- **Building a robust supply pipeline:** India has robust supply, but project types need to shift from avoidance to removal. Most credits generated in India are from renewable energy projects, which are no longer accepted by many global standards. Robust demand signals would likely be needed to stimulate nature based and emerging technology projects.
- **Designing a VCM** open to international participation, which may better support India's NDCs since it could provide stronger returns to developers of carbon projects. The Paris Agreement's Corresponding Adjustments (CAs) provision helps avoid double counting and allows voluntary cooperation in the implementation of countries' NDCs to allow for higher ambition and promote sustainable development and environmental integrity. Companies buying international carbon credits on VCMs are unlikely to require CAs as the purchases are made to meet voluntary commitments and not their respective host countries' NDCs. Allowing international trade of carbon credits could enable proponents of climate mitigation projects to receive robust prices and improve the financial prospects of such projects.

Demand for voluntary carbon credits[2] has surged 37% per annum over 2016-2021

voluntary carbon credits retired[3], $MtCO_2e$

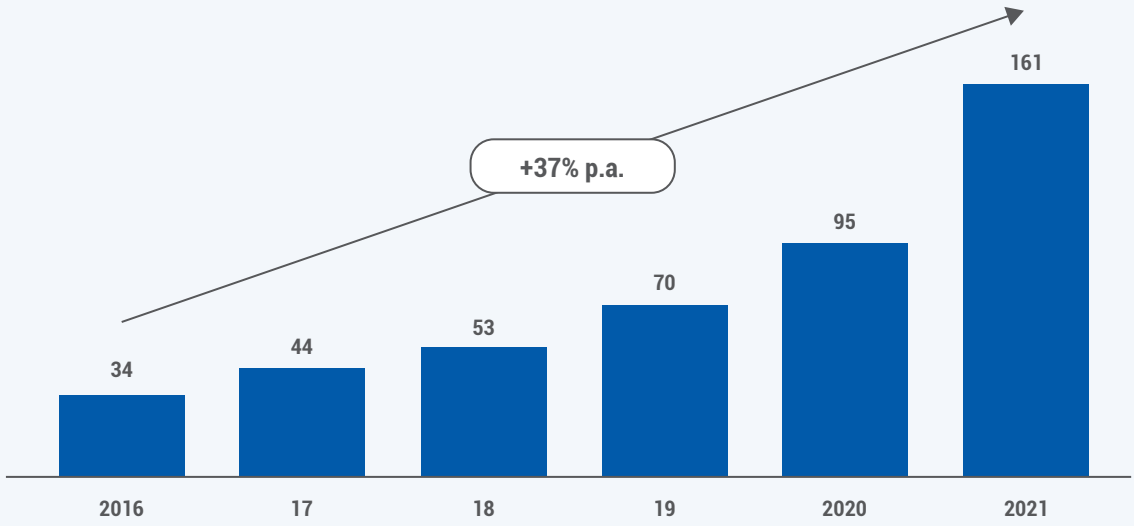

Exhibit 3

Compliance carbon markets (CCMs)

For the longer-term, to build itself right, India needs to learn from the world and accelerate its compliance carbon markets through the proposed five steps:

- **Define an ambitious purpose:** A blueprint which incentivizes a systematic switch of investments into green assets such as hydrogen based green steelmaking, rather than only incremental activities such as energy efficiency, would likely ensure that India builds the right industrial configuration. India could consider an ambitious plan which:
  - Covers at least 50 percent of emissions from high-emitting sectors by 2030.
  - Ramps up to a carbon price of $50 per ton by 2030 to enable investments into green technologies and prevent locking in further into long-lasting, carbon-intensive technologies.
  - Comes into effect quickly – India could target implementing ETS in 36 months. The EU's ETS was the first large-scale compliance market, and it took time to rollout and achieve the desired results. However, based on its learnings, other markets have been able to ramp up faster. ETS in China was announced in the December of 2017 and the trading was initiated in July 2021. Similarly, Mexico started ETS design work in 2017 and began the ETS pilot which involved about 300 companies in 2020.
- **Outline clear guidelines, roles and responsibilities in the government to set up the market:** Given that multiple stakeholders will be working in concert for the success of a CCM, the blueprint could clearly lay down the roles, responsibilities and expectations from ministries, nodal agencies such as Bureau of Energy Efficiency (BEE), from emitters and industry players such as exchanges, registries and verification bodies.

Appointing a ministry or coordinating body that could design the ETS and ensure compliance (e.g., Directorate General for Climate Action in the EU or The Secretariat of Environment and Natural Resources in Mexico) could constitute the first step. The body could then make clear what the timelines for implementation are, what methodologies would need to be followed for obtaining and distributing allowances, benchmarking and reporting, and what private sector capabilities would be needed (e.g., measurement, reporting and verification). It might also tender certain roles to the private sector (e.g., auctioning platform and exchange for trading allowances like the European Energy Exchange in the EU). It could ensure that the private sector and financiers would have the long-term visibility needed and begin to rise to the occasion.

- **Draw up a competitiveness impact assessment and mitigation plan:** India could conduct a comprehensive sector level assessment of the impact such instruments may have on the competitiveness of Indian manufacturers and the potential for carbon leakage. Surfacing these issues in a fact-based manner and addressing them head on with mechanisms like carbon border adjustments could help obtain the buy-in of all stakeholders. Risk mitigation plans including levers such as free allowances for some sectors could also be put in place.
- **Build a private ecosystem including the measurement, reporting and verification (MRV) of carbon credits:** Strong systems for reporting, verification and accounting of emissions are key to the success of a CCM. The private sector could efficiently provide MRV and other services such as advisory for a successful transition to a CCM.
- **Use CCM proceeds to ensure a just transition and for capacity building:** There could be reskilling required for new green jobs which can be funded through the carbon revenues. It may also ensure that the policy is 'self-funding' and won't require to be reallocated from elsewhere. For instance, in the EU – the Social Climate Fund has been proposed as part of the new Transport & Buildings ETS. The revenue from auctioning of allowances would go to this fund, which would be used to finance temporary direct support to vulnerable households and make infrastructure investments that reduce emissions in these sectors. In California, ETS revenues go to the Greenhouse Gas Reduction Fund to design and implement programs that facilitate greenhouse gas emission reductions and benefit disadvantaged communities and low-income households. Overall, India's national carbon plan could be balanced to include capability-building for industries, service providers, bankers and stakeholders to build an understanding about carbon markets. Learning how to decarbonise and trade will likely boost participation.

  Once India establishes its own market, it might also have an opportunity to take the expertise to other analogous countries (e.g., other high growth, emerging markets).

Key challenges of setting up a carbon market in India

- Although India's PAT scheme success has prompted BEE to transitioning this into a new compliance market, it is important to note it is only an emissions intensity trading scheme. Additionally, market does not have enough depth to facilitate adequate exchange of compliance certificates.

- Cognizance needs to be taken of the fact that India has no experience in setting up compliance markets and external expertise is needed
- In many cases, industry emissions baselines (emissions per unit product) are self – defined and not translatable across sectors
- Very often, firms lobby for free allowances which might be a problem
- Setting up a carbon market cannot be demand driven exclusively – policy/ supply-side push needs to be present

Green Banks

Green banks could accelerate and enable financing of 'hard-to-abate' use cases. A green transition bank is typically a public financial institution that uses innovative financing methods and market development tools with the private sector to accelerate decarbonisation. Significant barriers exist to obtaining green project funds such as insufficient capacity in debt capital markets and perceived risks in policy frameworks or new technologies. Small projects also struggle to attract funding as the short-term expectations of investors often don't meet long term financing requirements. This is where a green transition bank could come into play:

- As an innovative transition structure to mobilize low-carbon investment and support local community development.
- To orchestrate government funds and support financing for early-stage projects before they become viable for other investors.
- As a market maker to channel global green capital into local projects and as a catalyst for securitizing green loans (rated and classified into tranches), which could create additional avenues for green-focused investors with different risk profiles.

A green transition bank could help India unlock finance in its goal toward net-zero, as in other parts of the world—Australia, Japan and the United Kingdom have all created nationalized banks to leverage private investments in sustainable technologies. The UK Green Investment Bank, for example, was established in 2012 and, to date, has mobilized over £25 billion for 36 GW of renewable energy projects.

The Indian Government may consider setting up a green bank (such as IREDA), however, for money to flow in, projects need to be viable.

Apart from Carbon Markets and Green Banks, the following actions can be taken to lower uncertainty & reduce cost of capital for clean energy projects:

- Affirmative action/new financial instruments needed to mobilize finance from global north to south
- Reducing the risk premium for clean energy projects (cost of debt is the sum of risk-free rate and risk premium, with the former being controlled by the govt.) and can be achieved by contract enforcement.

Some of the 'here-and-now' actions that may be taken in relation to this are as follows:

- Ensure cost-effective hedging
- Developing a global agency (similar to insurance) to pool foreign capital from various sources
- Availability of First loss facility in cases of weaker financials of parties
- Deepening domestic bond markets via multilateral institutions, which can facilitate fixed rate loans, thereby averting a loss of project viability via asset liability mismatch (when interest rates go up).

Appendix 1 describes a climate financing agency that may address some of the above.

4. INTERDEPENDENCIES, CO-BENEFITS, AND TRADE-OFFS

4.1 Global Banking imperatives for managing climate risk

Globally, financial institutions are under rising regulatory and commercial pressure to protect themselves from the impact of climate change and to align with the global sustainability agenda. Banking regulators around the world, now formalizing new rules for climate-risk management, intend to roll out demanding stress tests in the months ahead. Many investors, responding to their clients' shifting attitudes, already consider environmental, sustainability, and governance (ESG) factors in their investment decisions and are channeling funds to "green" companies.

The commercial imperatives for better climate-risk management are also increasing. In a competitive environment in which banks are often judged on the green credentials, it makes sense to develop sustainable- finance offerings and to incorporate climate factors into capital allocations, loan approvals, portfolio monitoring, and reporting. Some global banks have already made significant strategic decisions, ramping up sustainable finance, offering discounts for green lending, and mobilizing new capital for environmental initiatives.

The increased engagement reflects the fact that climate-risk timelines closely align with bank risk profiles. There are material risks on a ten-year horizon (not far beyond the average maturity of loan books), and transition risks are already becoming real, forcing banks, for example, to write off stranded assets. Ratings agencies, meanwhile, are incorporating climate factors into their assessments. Standard & Poor's saw the ratings impact of environmental and climate factors increase by 140 percent over two years amid a high volume of activity in the energy sector.

4.2 Dependence of India's Financing Trajectory on Other Sectors

Current annual investments toward decarbonisation and other green projects are about $44 billion (heavily skewed toward the power sector), accounting for 10–12 percent of the future investment required. The Accelerated scenario optimizes net system-level costs at country level. However, most businesses and consumers are unlikely to take decisions based on total cost of ownership. Without intervention, these stakeholders may well make decisions different from those laid out here, basing their spending decisions on factors like upfront capital costs. Thus, financing the transition will require targeted demand- and supply-side interventions.

The cost of decarbonisation is expected to decline as technologies mature – even in a high growth economy, as innovation and economies of scale lower technology costs over time. Between the Accelerated and LoS scenarios, two-thirds of the emissions could be abated at negative or low cost and 50 percent of the emissions could be abated through in-the-money levers. Solar energy, wind power and EVs, that comprise the first quintile of the abatement potential, present a very positive investment case.

The levers in the last quantile are the high-costs ones, comprising some advanced agricultural practices, offshore wined, CCUS (which could cost more than $60/$tCO_2e$ and would likely need demand signals to be setup), hydrogen-based steel (could cost $47/$tCO_2e$ till 2040 and $9.6/$tCO_2e$ from 2040-2070). An estimated carbon price of $40–50/ tCO_2e could potentially drive domestic carbon credits generation by making all sequestration levers cost competitive (100 percent sequestration levers are cost competitive at $35 per tCO_2e).

The availability of viable clean tech projects in India needs to increase substantially in order to bring in financing. The industry is looking up to green H_2 based clean tech with eagerness. It is because grey hydrogen has become less viable due to natural gas prices going up. Replacement of existing grey hydrogen use cases by green H_2 might be a compelling proposition. Apart from green H_2, biomass based fuels might also be 'in the money' already. Although outlook on green H_2 is promising, these key challenges remain to be addressed.

- Domestic use cases for green H_2 need to be developed. Although green H_2 tech is relatively well-established, credible counterparties are needed for its offtake. A possible solution might be a SECI-like central structure that can provide long-term PPAs.
- Perennial asset-liability mismatch (typical for large gestation period projects) is a challenge. The takeout risk needs to be mitigated.
- In terms of exports, green H_2 may be like 'exporting water'. It might be more beneficial for India to consider export of technology/ infrastructure or manufacturing units.

4.3 Potential decarbonisation co-benefits

While the primary benefit of decarbonisation is the ability to arrest climate change and reduce global warming, this transition offers a series of other benefits to the country that it is important to recognize. In our analysis, we have identified the following additional benefits:

- **Energy import reduction and energy security:** Decarbonisation would result in the localization of India's energy requirements with the shift from coal, oil and gas to renewable energy, green hydrogen and biomass. It would likely imply a huge reduction in coal (184 Mt) and oil imports (145 tons) by 2050 with a corresponding increase in lithium-ion batteries and modules, cells, turbines for renewable energy. India's transition from thermal power to renewables is expected to decrease the average cost of power supply from INR 6.15/ kWh in FY20 to INR 5.25/kWh and INR 5.4/kWh by 2050 in the LoS and Accelerated scenarios, respectively.
- **Substantial forex savings:** The import reduction could bring substantial Forex savings for the government, i.e., $1.5–1.8 trillion from reduction in oil imports, $0.4–0.6 trillion from reduction in natural gas imports and $0.8– 1.0 trillion from reduction in coking coal imports. However, there could also be an increase of $0.3 trillion in battery imports and $0.3 trillion in solar panels. It could be reduced by intensively focusing on indigenous manufacturing with the help of initiatives such as PLIs, etc.
- **Leadership opportunities:** There would be the opportunity to use India's huge demand to catalyze the development of globally competitive cleantech industries and give India the opportunity to lead the world. India could establish a global manufacturing hub for green H_2, solar panels, etc. and become a global leader and exporter of green technologies such as green H2, green steel, green pig-iron, SAF (5.5 Mt of annual SAF export, worth $5.5 billion) and storage technologies not based on lithium or carbon.

  Sustainable farming practices could help generate additional farmer income of INR 3400/hectares (ha)/annum in the LoS scenario which could increase to INR 4800/ha/annum in the Accelerated scenario.

As physical and transition risks materialize, corporates will become increasingly vulnerable to value erosion that could undermine their credit status. Risks may be manifested in such effects as coastal real-estate losses, land redundancy, and forced adaptation of sites or closure. These, in turn, may have direct and indirect negative impact on banks, including an increase in stranded assets, uncertain residual values, and the potential loss of reputation if banks, for example, are not seen to support their customers effectively.

5. POLICY RECOMMENDATIONS

India needs an aligned, cross sectoral, top-down plan for its decarbonisation, cascaded into the right industrial policies.

- **An overarching India-wide plan** could be considered with an appropriate governance system to ensure coordination across ministries and external stakeholders in delivering net zero. Such a plan, with multiple horizons (five-, 15-, 25-year), could form the basis for developing industrial policies which would enable the large industrial investments needed for India's decarbonisation. In the absence of such a plan, the capacities could get built on legacy technologies (e.g., fossil fuel-based steel), or possibly capacities would not come, leading to shortages and higher prices.
- **Defining Green projects:** definition of what constitutes as green projects needs more clarity to avoid green-washing. Learnings might be incorporated from Europe in this regard.
- **Carbon markets:** Accelerate the nationwide compliance carbon market to fast-track green investment and increase the flow of capital toward hard-to-abate use cases. It could also help the move to greener technology at a time when India will likely add a lot of capacity, thus preventing a lock into fossil fuel-based technologies.
- **Dimension of climate risk:** Project evaluation in India needs to include the dimension of climate risk (as is already being done in Europe). The concept has already been laid out by IPCC and a nudge from RBI may be needed in this regard.
- **Renewable energy** lending may be given PSL status
- **Proposed regulatory actions that could be considered to enable banks:** A well-coordinated set of interventions could be implemented by different regulatory bodies and government agencies across sectors to increase the availability of finance.
  - **Resilience-building:** Strengthening the sector's resilience to sustainability related risks; this could be done through institutionalizing scenario analysis and climate stress-testing within risk management; defining the governance frameworks for climate finance (e.g., risk appetite framework, board oversight, etc.).
  - **Market solutions and development:** Incentivizing and facilitating the growth of sustainable investments, such as grants and direct investment, into sustainable projects.
  - **Infrastructure enablers:** Enabling efficiency and ensuring the integrity of the financial ecosystem—for instance, setting industry-wide green taxonomy and product development frameworks.
  - **Capability-building:** Developing a knowledge and talent base in sustainable finance and risk assessment through educational programs.
  - **Disclosure guidelines:** Standardizing and strengthening disclosure guidelines to build transparency and a network of verification agencies to enable investors to evaluate opportunities. By mandating disclosure requirements, particularly in high-emitting sectors, companies could be awarded 'ESG' ratings, which in turn could inform investors about where to channel funds and would act as a guardrail for financing.

6. PROPOSED ACTION

6.1 Actions by businesses

- Aiming to play on the front foot, companies could evaluate investment opportunities that this green trend would unlock, aligned with India's national plans or the opportunities opened by decarbonisation of other countries (e.g., green hydrogen derivative exports).
- Companies could focus on creating strategic alignment, reallocating capital and people and engage with the government. As leaders prepare to discuss green transformation with their boards, it may help to quantify the potential.
- For companies that are not aligned with science-based carbon budgets and slow to reallocate capital for the green transition, the gap between management expectations and market valuation could grow. They would need to shift focus from prolonging the lead in traditional technologies to building competitive positions in zero emission technologies.

  Government policies could create the demand signals for decarbonized products and services.

  The global financial sector and international customers (e.g., European customers impacted by ETS and carbon border adjustment mechanisms) could also demand decarbonisation roadmaps and committed action. Companies would need to respond.
- The government and corporate India may need to provide policy support and capability building for MSMEs to decarbonise faster (e.g., scoping three targets taken up by large firms could incentivize supplier ecosystems to decarbonise).

  These actions could be supported by consumers wholeheartedly such that we see a shift in consumer behavior.

  The government has announced the Lifestyle for Environment (LiFE) mission at CoP26. This would be a crucial component of India's transition.

6.2 Actions by CII

The CII can play a key role in shaping and charting the path of the transition.

- It can create awareness and sensitization across the ecosystem while stimulating green investments. There is a need for more information dispersal in the market to increase sensitization about cost of not transitioning. Example - IPCC has listed out cost of climate related events to spread awareness.
- It can create a forum for key industry players across the value chain to participate in dialogue and align on a plan of action. Cross-sector partnerships could be promoted to take advantage of synergies, and thus maximize the impact of financed emissions reduction.
- CII should facilitate deliberations among industry players for ensuring a just transition like labor force reskilling requirements, shift in jobs from the eastern coal belt to the west etc.
- It can help mobilize industry to contribute to the capacity building of the next generation of green MSMEs, helping supercharge national development and providing fulfilling livelihoods to millions of Indians.

Appendix 1

A global agency for catalyzing global climate financing flows

One way to resolve the multidimensional aspects of financing clean energy is through the creation of a Global Climate Finance Agency (GCFA) which can provide hedging capacity and support the creation of currency risk market. The GCFA can be managed by a reputed existing multilateral agency and capitalized by some part of promised capital support from developed countries. Apart from this sovereign support, additional funds can be sourced from grants provided by foundations. These foundations in turn will receive Certified Emission Reductions (CER) credits, which they can use either as green credentials or for trading.

The agency will be responsible for the following key functions:

- **The main purpose of the platform will be to provide a cost-effective hedging mechanism** for private sector projects that are green. Similar to an insurance cover, the GCFA will create a gross currency book by pooling together capital from multilateral banks, climate investors and philanthropies from developed countries for green projects. Developers of green projects can avail of foreign capital from this pool at a rate marginally above the annual currency depreciation. Any volatility in the hedging cost can be absorbed by GCFA with its transparent and long-term pricing of risk related to currency depreciations. This will result in green project developers getting better off-sets for their exposure. The GCFA will also act as a market maker by creating new risk markets at a global scale and crowd in commercial actors such as investors, borrowers, donors, corporates and remitters to bring additional hedging capacity and diversity in it to further lower the hedging costs.
- **Second is the creation of a First Loss Facility.** Government utilities with weaker financial positioning are major buyers for clean technology projects in developing countries. In the absence of a payment security mechanism, the risk perception of a project increases, resulting in higher energy and energy services costs. A First Loss Facility for clean technology projects will reduce such related risks and accelerate adoption and funds flow in these segments.
- **Finally, venture capital for emerging technologies/ business models** is needed. Today, there is a large dependence on some countries for imported capital equipment for the solar and battery sector. This restricts the creation of a local ecosystem for new technologies. For adoption of hydrogen, battery storage and electric mobility, emerging countries needs to reduce import dependence before scaling up these technologies. It is also necessary for business models to evolve to reflect the nature of emerging technologies. Venture capital for emerging technologies/ business models will ensure that energy transition is more democratic.

  The GCFA will not only increase mobilization of capital but also bring in risk transparency and market discipline especially in developing countries. The larger size and transparent pricing of currency risks by GCFA is will likely to attract more institutional investors as this futuristic energy source expands.

Confederation of Indian Industry

The Confederation of Indian Industry (CII) works to create and sustain an environment conducive to the development of India, partnering Industry, Government and civil society, through advisory and consultative processes.

For more than 125 years, CII has been engaged in shaping India's development journey and works proactively on transforming Indian Industry's engagement in national development. With its extensive network across the country and the world, CII serves as a reference point for Indian industry and the international business community.

As India strategizes for the next 25 years to India@100, Indian industry must scale the competitiveness ladder to drive growth. CII, with the Theme for 2023-24 as 'Towards a Competitive and Sustainable India@100: Growth, Livelihood, Globalisation, Building Trust' has prioritized 6 action themes that will catalyze the journey of the country towards the vision of India@100.

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CII-ITC Centre of Excellence for Sustainable Development

CII-ITC Centre of Excellence for Sustainable Development (CESD) is one of CII's 11 Centres of Excellence. The Centre is a not-for-profit, industry-led institution that helps businesses become sustainable organisations. It is on a mission to catalyse innovative ideas and solutions, in India, and globally, to enable business, and its stakeholders, in sustainable value creation. Its knowledge, action and recognition activities enable companies to be future ready, improve footprints profiles, and advocate policymakers and legislators to improve standards of sustainable business through domestic and global policy interventions.

The Centre leverages its role of all-inclusive ecosystem player, partnering industry, government, and civil society. It has been a pioneer of Climate Change, environment management systems, biodiversity mapping, sustainability reporting, integrated reporting, and social & natural capital valuation in India, thus upgrading business in India to sustainable competitiveness. The Centre operates across the country and has also been active in parts of South and South-East Asia, the Middle East, and Africa. It has held institutional partnerships and memberships of the United Nations Global Compact, Global Reporting Initiative, International Integrated Reporting Council, Carbon Disclosure Project, development agencies of Canada, the USA, the UK, and Germany.

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