

# Winning the path to net zero: how India can sustainably achieve its growth objectives

July 2023



# Foreword

The entire globe is going through a transition, a series of challenges, propelled by the unprecedented crisis, one after another, the continuous disaster risks, Russia-Ukraine war, global financial crisis, climate risks, incomplete trust everywhere; for quite some time now. Moreover, global average temperature of our planet has gone up above 1.2° celsius of the pre-industrial times, which is beyond human tolerance.

India from the time immemorial has exhibited outstanding resilience, demonstrated its dynamic global leadership in centre-staging sustainability and decarbonization; not only in public policy; but also through climate friendly, low carbon lifestyles that Indians normally adopt and follow, which are principles of reducing, reusing and recycling, thereby conserving nature and natural resources.

To tide over the crisis, we need to come together and engage ourselves in solution based approaches. Global Sustainability Summit (GSS) 2023 is a platform by International Institute for Sustainable Development (IISD) - Carbon Minus India (CMI) to find solutions to all these existing challenges where Indian leadership can debate, discuss and deliver with global players is presented by IISD-CMI.

In this program, IISD-CMI will bring global thought leaders, business, and industry leaders, political as well as policy and governance leadership together, along with Indian culture, arts and glamour world, creating an occasion to showcase India's pragmatic sustainability leadership of the last 75 years and how India aspires to contribute towards the planet, at India @100 in 2047.

From 17th to 20th July 2023, at Vigyan Bhawan, New Delhi; a detailed program has been organized by IISD-CMI; where Global Sustainability Summit 2023 will take place. Further, National Sustainability Awards will be awarded by the chief guest to distinguished nominees, for their outstanding contribution to nation, from different fields, in promoting social, environmental and economic sustainability, and enabling stronger climate actions.

The Global Summit covers the thematic sessions such as LiFE - Sustainable Lifestyle, sustainable finance, green hydrogen, renewable energy and decarbonization, sustainable fashion, sustainable agriculture and nutrition, technology enabled sustainability, chief sustainability officers round table, preventive health, sustainable aviation, sustainability and decarbonization leadership's in India's G 20 leadership, and India of my dream in 2047 - thought leader's session among other things.

It's our pleasure to have EY as our esteemed knowledge partner. Together we have prepared this knowledge paper titled "Winning the path to net zero: How India can sustainably achieve its growth objective" which is a reflection of the way the summit has been organized.



**Dr. Srikanta K. Panigrahi**

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Reversing climate change requires our unwavering attention and commitment. Climate change is everybody's business and it requires synchronized action from all stakeholders - Government, regulators, Businesses, Investors, Consumers and the society at large. Businesses hold the key to implementing necessary measures to build a sustainable future by providing sustainable products and services, setting ambitious goals, embracing innovation and focusing on adaptation.

We echo Prime Minister Narendra Modi's call at COP26 in Glasgow, to drive LiFE (Lifestyle for Environment) as a global movement towards, "mindful and deliberate utilization", to protect and preserve the environment.

By 2047 (India@100), it is estimated that the economy will reach by a size of US\$26 trillion and the per capita GDP would be over US\$15,000, ie., six times its current level. Many sectors are expected to witness dramatic changes in the coming decades: energy, automobiles, healthcare, education, agriculture. India requires a budget of over US\$10 trillion to accomplish its net zero emissions target by 2070. With SEBI's new guidelines, the sustainable investing market in India is expected to grow significantly in the coming years. There are several measures being taken both in the public and the private sector, to increase investment and financing for green growth opportunities. Private sector companies are allocating their investments towards green projects due to their potential for long-term returns and significant positive environmental impact. The government has authorized 100% annual FDI (Foreign Direct Investment) for renewable power generation and distribution projects. According to the government's investment agency - Invest India, renewable energy projects worth US\$196b are in progress.

Green Hydrogen is an emerging energy carrier with the potential to drive global decarbonization in hard-to-abate sectors. India already consumes about 6 million tons of hydrogen, primarily for refining and fertilizers, which is currently produced from coal gasification or natural gas reforming and results in huge CO2 emissions. The Government of India GoI recognizes the importance of developing this area and has taken a series of measures to reinforce its development, with a goal to meet 10% of global hydrogen demand by 2030.

There is an immense potential for digitalization to play a significant role in increasing the sustainability and delivery across these sectors. Companies need to be agile in their way of doing business and keeping sustainability at the centre of growth plans.

In this era of Amrit Kaal, the companies would also need an integrated governance and change management playbook, embedding three key enablers:

- ▶ Technology at speed
- ▶ Innovation at scale
- ▶ Human behavior and adaptability across the ecosystem

The demand for climate-related skills exceeds the available supply, posing challenges for our country and companies in terms of meeting climate requirements and implementing net-zero strategies.

Companies need to embrace environmental, social and governance data as a strategic business imperative and harvest its strategic value. As reporting norms such as the Business Responsibility and Sustainability Report (BRSR), International Sustainability Standards Board (ISSB) take shape, we will see the ESG landscape evolve significantly which will in turn influence the sustainable investing and financing arena.

There is also a need to mobilize collective action and financing for sustainability in sectors like Agriculture, Logistics, Textiles, which are central to sustainable developments. The Indian economy is ripe for innovative financing and the market for Green, Social, Sustainability and Sustainability-linked (GSSS) bonds, which includes green, yellow (solar) and blue (marine) bonds, is gradually expanding. The IFSCA (International Financial Services Centres Authority) at GIFT city has also taken several proactive measures to focus on ESG and is poised to play an important role in raising sustainable finance for India's transition towards net-zero.

This knowledge document from EY provides insights into the key sectors that present opportunities for sustainable growth and economic resilience amid global economic challenges. It highlights the significance of embracing renewable energy and decarbonization and provides sector-specific insights, including the Indian logistics sector, agriculture, and sustainable mobility sector. The document emphasizes the value of these solutions in terms of long-term growth, sustainability, cost-efficiency, and meeting consumer demands.



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# Executive Summary



In the realm of global economy, there is not only a singular battle being waged against climate change and its repercussions. There are a multitude of challenges, including rising inflation, supply chain disruptions, and geopolitical conflicts that the economy is contending with. These challenges may have a lasting impact on economic growth, making it crucial for governments and businesses to mitigate risks and adapt to changing circumstances.

As India approaches its centenary of independence, it is crucial for India to accelerate its own climate transition and deploy sustainable models as the economy's growth engine. India has made significant efforts towards sustainable growth and outlined its commitment towards net-zero, with the "Panchamrit" goals. The transition to a low-carbon economy is gaining momentum, driven by the need to reduce greenhouse gas emissions, cost-competitiveness of renewable energy, and growing public demand for clean energy. The renewable energy sector is expected to experience significant growth, presenting new opportunities for businesses and driving the broader clean energy economy. Companies that adapt to this transition will position themselves for long-term growth. As the cost of renewable energy continues to decline, and governments set ambitious targets for emission reduction. Key technologies driving this growth include solar photovoltaics (PV), wind energy, hydropower, geothermal energy, green hydrogen, and biomass.

The Indian logistics sector constitutes 14% of the country's GDP. Factors such as e-commerce expansion, the rise of the middle class, and government focus on infrastructure development have driven the growth of this sector. In the coming future, businesses that increasingly adapt to the evolving needs of the logistics sector will position themselves for long-term success. Government initiatives, such as promoting logistics parks, infrastructure development, and technology adoption, are expected to further enhance sector's efficiency and productivity.

The sustainable agriculture sector, constituting 16.5% of the country's GDP and 18% of the Country's emissions, is experiencing rapid growth due to increased consumer awareness of environmental and social impacts of food

production. Factors driving this growth include rising demand for sustainable food, the escalating cost of conventional food production, and the availability of sustainable agriculture technologies. Businesses have opportunities to develop new sustainable food products, provide services, and invest in technologies within this sector.

India has committed to achieving net-zero emissions by 2070, which will require significant investment. In 2019-20, green finance amounted to INR 309 thousand crores (~US\$ 44 billion) per year, only a quarter of what India requires. India needs approximately INR 11 lakh crores to meet its climate goals. To finance this transition, a variety of sources including the public sector, private sector, and international climate finance will be needed. The existing knowledge and public literature emphasize the need for the public sector to play a leading role in mobilizing investment through fiscal incentives, market-based mechanisms, and public-private partnerships. The private sector also has a significant role to play through direct investment and financing of low-carbon projects. Additionally, international climate finance will be essential in filling the financing gap, necessitating increased commitments from developed countries.

India has also focused on creating a regulatory environment that promotes sustainability, led by regulators like the Securities and Exchange Board of India (SEBI) and the Reserve Bank of India (RBI). In 2022, India approved the country's first Sovereign Green Bonds (SGrB) Framework, the proceeds from which will be used to finance green projects under themes like renewable energy, and climate change adaptation. Alongside this, the RBI also issued a host of enabling guidelines, to mobilize financing for tackling the challenges associated with climate change. Recent and evolving guidelines from the RBI on the acceptance of green deposits can present the opportunity to mobilize financing for promoting sustainable growth. In addition, the government has ensured financing of the "Panchamrit" outcomes through budgetary allocations across sectors, as part of the Union Budget (2023-24). This includes funding under the 'Green Growth' priority, including investments to accelerate India's net zero transition, and focus on energy security.



In transition to a net-zero economy, India requires a substantial increase in investment from multiple sources and a few examples are outlined in the report of how sustainable finance is being deployed across key high-growth sectors.

This knowledge document acknowledges the progress India has made but emphasizes the need for further efforts from the government and the private sector. By seizing this opportunity, India can not only address the climate crisis but also create jobs, boost economic growth, and improve the overall environment. . The importance of taking immediate action to mobilize investment and accelerate the transition to a low-carbon economy cannot be overstated, as it not only drives economic growth but also shapes a more sustainable and resilient future for businesses and society. Winning the path to net-zero remains challenging, however, the opportunities for sustainable growth are immense. With collective actions from all stakeholder groups, India can achieve its path to net-zero.







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## Overview and macro-economic context

India is actively pursuing sustainable growth models, aiming to transition towards a net-zero economy. With a strong commitment to reducing carbon intensity and increasing non-fossil fuel sources in power generation, India is on track to become a global leader in sustainable development. At COP26, India presented five essential commitments, known as "Panchamrit," outlining a step-plan for a greener India.

These commitments include achieving net-zero emissions by 2070 and reducing carbon intensity by 45% by 2030. Through policy changes, administrative actions, and private sector investments, India is driving sustainable growth and making significant progress towards its ambitious targets.

India's Union Budget for FY 2023-24 prioritizes "green growth" as a key focus area. With an outlay of INR 350 billion for priority capital investments, the government is emphasizing the transition to a net-zero carbon economy. The budget allocates INR 19,744 crores to the National Green Hydrogen Mission, supporting sectors like green hydrogen.

The budget also includes significant capital investment of INR 10 trillion for asset creation, including infrastructure, with an additional INR 350 billion specifically earmarked for energy transition and net-zero objectives.

### Panchamrit - Overview



Non fossil electricity capacity of 500GW by 2030



50% electricity capacity from renewable energy by 2030



1 billion tonnes carbon emission reduction by 2030



45% reduction carbon emission intensity of GDP by 2030



Net zero emission by 2070



## Enabling a regulatory environment to promote sustainability

Led by regulators including the Securities and Exchange Board of India (SEBI) and the Reserve Bank of India (RBI), India is paving the way for improved ESG-related disclosures and sustainable finance.

*A summary of key developments, initiatives on sustainability by the RBI is shown below:*

### Initiatives on greening the Indian financial system

#### Need for greening the financial system

- ▶ As of 2021, \$ 2.5 trillion Cumulative assets of Indian banks were not fully aligned with India's SDGs
- ▶ In case emission pathway continued to be consistent with 30C, \$ 35 trillion economic potential will be lost by 2070

#### Role of RBI

- ▶ Network for Greening the Financial System (NGFS): Member of the NGFS since 2021 for climate risk awareness and monitoring financial stability
- ▶ Task Force on Climate-related Financial Risk (TCFR): Member of the TCFR since 2020 of the Basel Committee on Banking Supervision

#### Action taken by the RBI

- ▶ External Commercial Borrowings (ECB): Liberalization of ECB authorizing Indian companies to raise green bonds finance
- ▶ Sustainable Finance Group (SFG): Created in 2021 to provide a framework on climate change for Banks and Regulated Entities

### Initiatives on climate risk and sustainable finance for all regulated entities - announced in February 2023

#### Climate scenario analysis and stress testing

- ▶ As per its announcement in February 2023, RBI shall issue guidelines for Regulated Entities on Disclosure framework on Climate-related Financial risks and Guidance on Climate Scenario analysis and Stress Testing in a phased manner

#### Framework on green deposit

- ▶ RBI issued detailed guidelines for acceptance of 'green deposits' by banks and NBFCs wherein the funds could be used for financing activities like renewable energy, green transport and green buildings.
- ▶ The framework will come into effect from June 1, 2023.

#### Framework for Sovereign Green Bond (SGB)

- ▶ In 2022, SGB framework was implemented to deploy proceeds in public sector projects which help in reducing the emissions intensity of the economy
- ▶ Green project categories are funded, like Renewable Energy, Clean transportation, Climate change Adaptation, Green buildings, etc

Coordinated efforts by Indian regulators and agencies including the Ministry of Finance have helped create a regulatory environment that is conducive for India's achievement of its climate action goals.

To mobilize financing for climate action, in 2022, India's first Sovereign Green Bonds (SGrB) Framework was approved by the Union Finance Minister Nirmala Sitharaman. India's SGrB framework<sup>1</sup> was developed by the Department of Economic Affairs, Ministry of Finance, and applies to all SGrB issued by the Government of India (GoI). The GoI will use the proceeds raised from SGrBs to finance and/or refinance expenditure for green projects in categories including renewable energy, energy efficiency, clean transportation, and climate change adaptation.

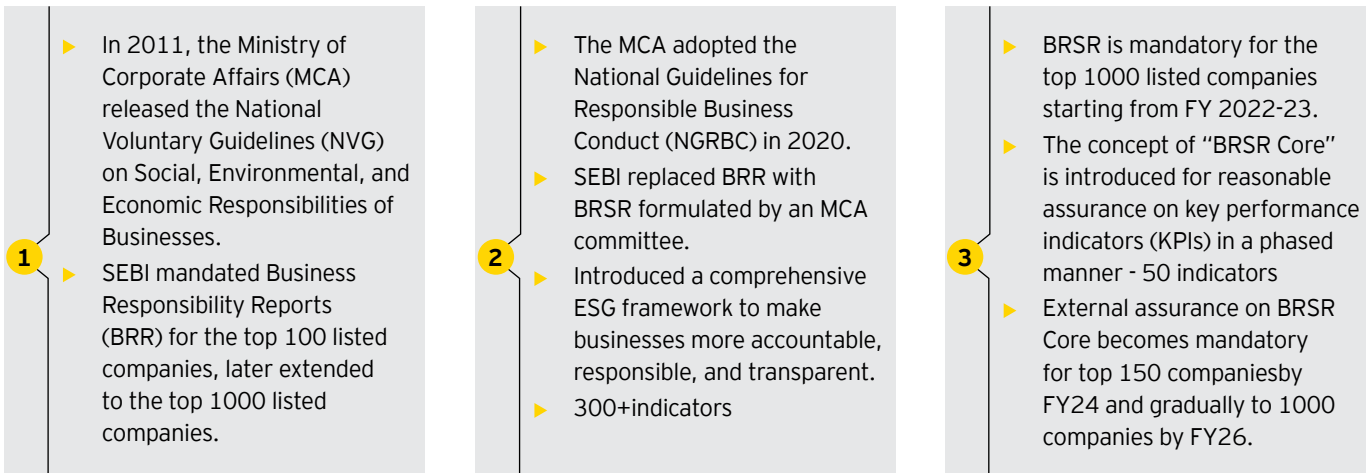
Through these initiatives, the Government of India is actively engaging with key stakeholders like Regulated Entities (REs) to drive the sustainability agenda in India.

1. Framework for Sovereign Green Bonds (dea.gov.in), Department of Economic Affairs, 2022 | SGB Press Announcement, PIB, Government of India, 2022  
2. ESG: How Is India Placed To Adopt The ESG Framework, Mondaq, 2023

## Key initiatives on sustainability by the SEBI<sup>2</sup>

The SEBI has taken some progressive measures to promote corporate sustainability. The Board introduced a framework called Business Responsibility and Sustainability Report (BRSR) which combines key elements from leading global frameworks like GRI, SASB, TCFD, IR and leading public companies have been mandated to report on key ESG topics through this framework. In addition, the SEBI recently introduced the "BRSR Core", a pool of 50 select indicators on which the companies are mandated to get external assurance during the annual reporting cycle.

An overview of key developments in legal frameworks on ESG reporting is depicted below:

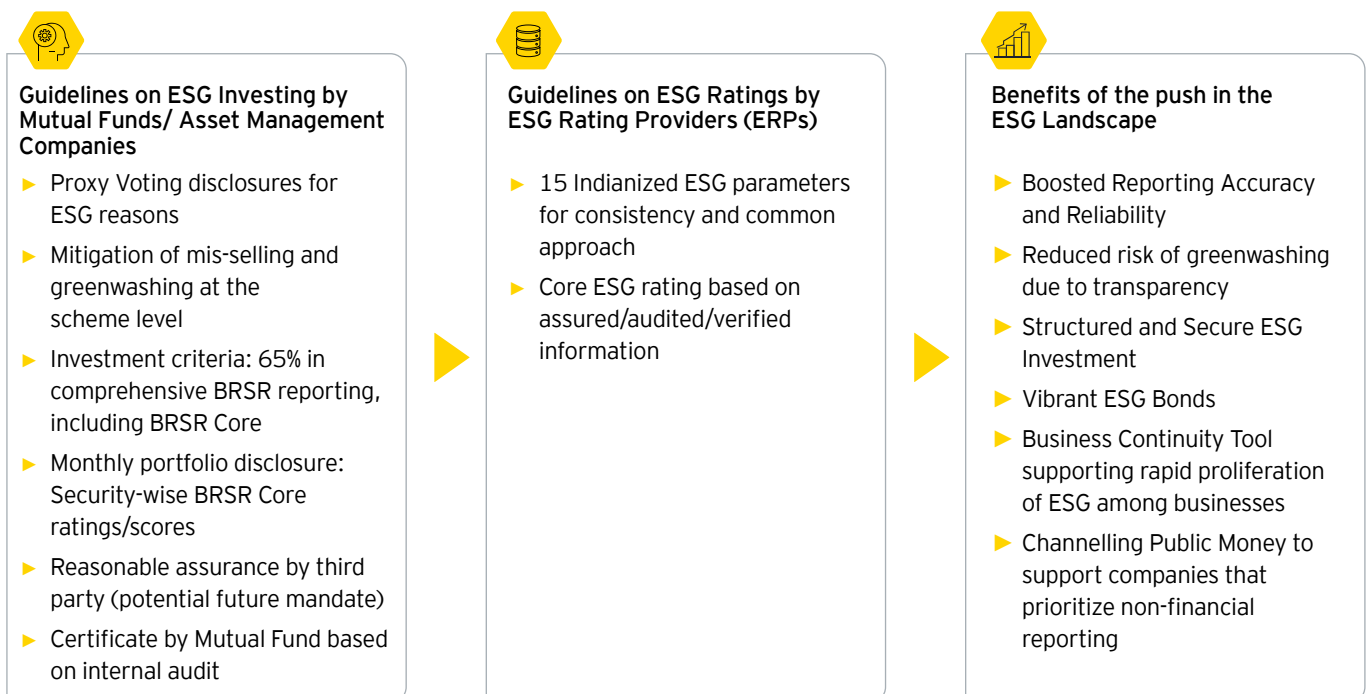


Legal Framework Driving ESG Reporting and Assurance in India

### Strengthening the ESG Investing Landscape in India - ESG Funds, Ratings, and Related Outcomes

The ESG fund landscape in India has seen significant activity and momentum in the past half decade. In particular, integration of ESG factors in funds in India is a process that has roadblocks. These challenges are due to varying ESG ratings and approaches followed by market practitioners and resulting challenges in comparing performance. A recent development in this space is the introduction of guidelines for the regulation of ESG rating providers (ERPs), notified by SEBI in July 2023. With this, India has become the first country to introduce regulations and guidelines for ERPs on key aspects such as the registration of ERPs. This also includes guidelines on requirements for ERPs to disclose their rating methodology – a key step towards promoting greater transparency.

*To address the aforementioned challenges and promote more consistent and effective ESG integration, several regulatory frameworks, guidelines, and initiatives have been proposed in India over the past decade. A summary of this is shown below:*



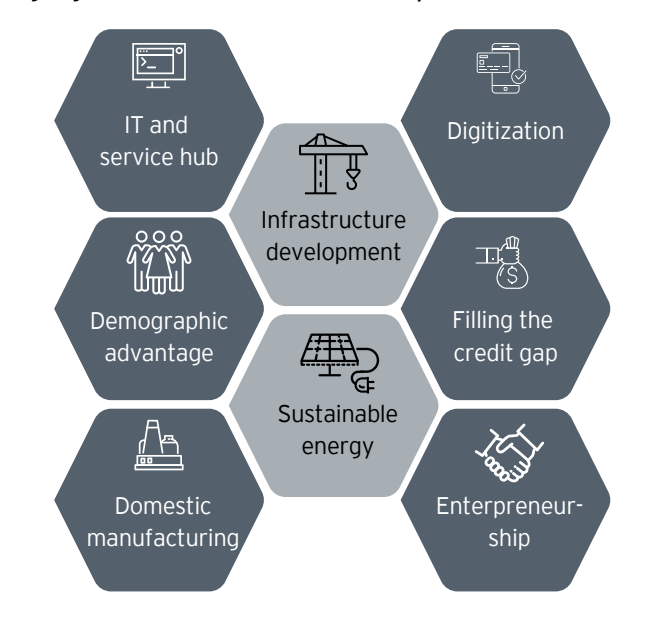
India's proactive approach to adopting forward-looking measures is crucial to keep pace with ongoing changes. The introduction of the ESG framework by regulators highlights the need for responsible business practices and transparent disclosures. It aims to promote sustainability, inclusivity, diversity, and transparency in business operations.

## India@100: growth drivers of Indian economy<sup>3</sup>

India's vision to become a "developed" economy by 2047, termed as the 'Amrit Kaal' has gained significant momentum. Despite global challenges such as the pandemic and economic crises, India has risen from the 13th position to become the fifth largest economy in the world, growing at an average rate of 6% over slightly more than two decades. This growth has been fuelled by economic liberalization, market orientation, and increased private capital, positioning India for sustained and robust growth in the coming years.

A recent EY report 'The study 'India@100: realizing the potential of a US\$ 26 trillion economy' details eight growth drivers of India's economy:

### Eight growth drivers of India's economy



Of these, five enablers will prove key to driving the country's growth in a responsible and sustained manner. A summary of these enablers and their contributions to sustainable development is presented below:

#### 1 Thriving entrepreneurship

Entrepreneurship in India is driving sustainable development, with climate-tech businesses securing US\$7 billion in equity funding in 2021, a four times increase from the previous year<sup>5</sup>. Total climate-tech investment in 2022 was around US\$ 22.5 billion, as debt financing<sup>6</sup>.

Across India, start-ups are providing solutions for emission reduction, resilience, and sustainability across sectors such

as agriculture, energy, and transportation. Agri-tech start-ups are using digitalization and modern techniques to transform farming practices, while others focus on waste management and circular economy solutions. In the energy sector, start-ups offer green electricity options, reducing carbon footprints and energy costs. Additionally, many emerging start-ups are promoting clean mobility solutions.

Venture Capital (VC) funding in climate technology surpassed US\$1 billion over the past five years. With a focus on energy and electric vehicles, funding in the sector is expected to grow at least five times in the next five years, with agri-tech, food tech, and the circular economy gaining significant traction. However, traditional investors face hesitancy due to the lack of benchmark financial returns and limited demand for sustainable products. To create an enabling environment, the government is promoting digitalization through multiple initiatives, such as the Digital Agriculture Mission.

India's focus on domestic manufacturing presents a significant opportunity for economic growth and job creation. With initiatives like 'Atmanirbhar Bharat' and the Production Linked Incentives (PLI) scheme, India has attracted substantial investments in key sectors such as textiles, food processing, electric vehicles, and renewable energy products, amounting to US\$31.3 billion. These initiatives aim to strengthen the manufacturing ecosystem, reduce dependence on imports, and promote self-sufficiency.

India is also placing a strong emphasis on sustainability through the adoption of 12 key technologies to facilitate carbon trading and market mechanisms. The National Designated Authority for the Implementation of the Paris Agreement (NDAIAPA) will play a crucial role in determining the types of projects eligible for participation in international carbon markets under Article 6 mechanisms<sup>7</sup>.

#### 2 Filling and bridging the credit gap

Access to green credit is essential for MSMEs to adopt sustainable practices and mitigate their impact on the climate. Based on the business and other key considerations, MSMEs have a significant carbon footprint, and are vulnerable to climate risks. However, there are significant barriers that hinder the flow of climate or green finance for MSMEs. These include a lack of awareness or literacy around the concept, formal financing structures, and extensive procedural requirements. Green credit can serve as a medium to plug in existing gaps and offers several benefits for MSMEs. It enables MSMEs to invest in technologies that reduce their carbon emissions, improve energy efficiency, and promote cleaner production and enhance their competitiveness.

3. India @100 - Realizing the potential of a \$26 trillion economy (ey.com), EY, 2023  
4. Government-led sustainability initiatives gather pace in India, ADSK News India, 2021  
5. The State of Climate Finance in India -Ideas and Trends for 2022, Unitus Capital, 2022  
6. The State of Climate Finance in India 2023, Unitus Capital, 2023  
7. Developments in India under Article 6 Mechanisms, CCarbon, 2023

Private sector players and the government both play a vital role in enhancing financial inclusion and sustainability by promoting credit and green credit growth, developing the corporate bond market, and ensuring capital availability for manufacturing and infrastructure investments. Financial institutions should be empowered to guide MSMEs through the application and delivery process. By unlocking more capital through risk mitigation measures, these institutions can facilitate the flow of green credit to the MSME sector.

A key positive development in the context of enabling credit access has been the government's redefinition of MSMEs in 2020. This has facilitated increased credit flow to MSMEs, enabling banks and NBFCs to provide cash flow-based loans instead of relying solely on collateral-based loans.

### 3 Digitalization

The government's emphasis on digital platforms and active private sector participation in the digital ecosystem has brought about a formalization of the economy. It has increased financial inclusion, reduced costs, reduced emissions and created new business opportunities. Initiatives like the Indian Stack and platforms such as OCEN and ONDC are democratizing credit and transforming e-commerce, driving sustainability and inclusivity.

India is driving sustainability by prioritizing green investments and adopting digital solutions through initiatives like the National Mission on Enhanced Energy Efficiency and the Forest Management Information System, demonstrating a commitment to reducing energy consumption and conserving natural resources. For instance, initiatives like building information modelling (BIM) at Bangalore International Airport have enabled data-driven decision-making resulting in increased construction efficiency and reduced environmental impact locally<sup>4</sup>.

However, there is still untapped potential for digitalization to drive environmental progress in India. To achieve technology leadership, increased investment in next-gen technologies and research and development is required. Collaboration with nations with successful innovation ecosystems can also be beneficial. India's digitalization efforts have laid a foundation for sustainability, but further integration of environmental considerations in its progress is crucial.

### 4

### Domestic Manufacturing

India's focus on domestic manufacturing presents a significant opportunity for economic growth and job creation. With initiatives like 'Atmanirbhar Bharat' and the Production Linked Incentives (PLI) scheme, India has attracted substantial investments in key sectors such as textiles, food processing, electric vehicles, and renewable energy products, amounting to US\$31.3 billion. These initiatives aim to strengthen the manufacturing ecosystem, reduce dependence on imports, and promote self-sufficiency.

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### 5

### Sustainable Energy as a key focus area for domestic manufacturing:

India's commitment to achieving net-zero emissions and increasing the share of non-fossil fuel sources in power generation is attracting significant private sector involvement. The GoI allocated US\$2.2 billion for the development of 5 million metric tonnes of green hydrogen capacity and 125 GW of renewable energy. Additionally, the private sector has pledged over US\$200 billion to support India's energy roadmap.

India has plans to implement a 4000 MWh battery energy storage system and has set a target of a 5% compressed biogas mandate through the GOBARdhan initiative<sup>8</sup>.

As the 3rd largest producer of renewable energy, and with 40% of its installed capacity coming from non-fossil sources, India provides an immense potential for private players in equipment manufacturing, project development, and infrastructure creation<sup>9</sup>.

Also, India has identified a range of activities for trading carbon credits, including renewable energy with storage, solar thermal power, off-shore wind, green hydrogen, compressed bio-gas, emerging mobility solutions like fuel cells, energy-efficient technologies, sustainable aviation fuel, best available technologies for process improvement, tidal energy, ocean thermal energy, ocean salt gradient energy, ocean wave energy, ocean current energy, high-voltage direct current transmission, green ammonia, and carbon capture utilization and storage (CCUS). The assessment of CO<sub>2</sub> storage capacity in India shows significant potential, with an estimated range of 395-614 gigatons. However, further actions are required to make geological storage of CO<sub>2</sub> a reality in the country. The government is actively funding and promoting key steps, such as source-sink mapping, pore space mapping, and geological characterization and exploration for CO<sub>2</sub> storage<sup>10</sup>.

By focusing on these technologies, India aims to accelerate the adoption of sustainable practices, reduce carbon emissions, and promote the development of a green and resilient economy.

5. The State of Climate Finance in India -Ideas and Trends for 2022, Unitus Capital, 2022

6. The State of Climate Finance in India 2023, Unitus Capital, 2023

7. Developments in India under Article 6 Mechanisms, CCarbon, 2023

8. Press Announcement, PIB, Government of India, 2023

9. Press Announcement, PIB, Government of India, 2022

10. CCUS Policy Framework and its Deployment Mechanism in India, NITI Aayog, 2022

# Way forward



Environmental risks including extreme weather-related events, and climate action failure by leading actors (governments, corporations) are currently among the greatest threats to the world.

While India continues to experience strong economic growth, a continued focus on the environment and its conservation needs to be maintained – in line with these goals. There is a need to continue the integration of sustainability and social inclusion in India's pursuit for economic expansion.

India's real GDP growth for the year ending March 2023 was 7.2%. Over the next 30 years, India's GDP is expected to triple, and the population is expected to increase by 200 million people<sup>11</sup>. In line with this, a corresponding strengthening of core systems and its financing, including manufacturing, infrastructure, connectivity, and sustainable resource management is required.

Newly-introduced initiatives in the Union Budget for greening the system, under the 'Green Growth' priority, and recent announcements, including the INR 350 billion of priority capital investments directed to the net zero transition and energy security, can help India pursue both – its climate action priorities as well as responsible and sustained economic growth and expansion. Additionally, the government's advocacy efforts through, for example the Lifestyle for Environment (LiFE) campaign is prompting collective action to combat the impact of climate change.

11. World Economic Forum, 2022



## Transition to sustainable energy

### India @100 - New energies

India's goal to achieve net-zero emissions by 2070 is set to be supported by its Nationally Determined Contributions (NDC) to combat climate change under the Paris Agreement.

Achieving the "Panchamrit" targets will boost the transition to new energies, and the Government of India (GoI) has come up with various Performance Linked Initiatives (PLI) and policies to expedite the energy transition:

- ▶ INR 19,500 crore (US\$ 2.5 billion<sup>11</sup>) allocated for photovoltaic (PV) modules to push India's energy transition toward renewable sources.
- ▶ INR 18,100 crore (US\$ 2.3 billion<sup>12</sup>) for Advanced Chemistry cell (ACC) and Faster Adoption of Electric Vehicle (FAME) - INR 10,000 crore (US\$ 1.3 billion<sup>1</sup>) will enable India to leapfrog from traditional fossil fuel-based transportation system to alternative, and more efficient Electric Vehicle (EV) based system.
- ▶ GoI has recently announced "Strategic Interventions for Green Hydrogen Transition Programme (SIGHT) of Rs 17,490 crore (US\$ 2.1 billion<sup>1</sup>) for electrolyser and green hydrogen manufacturing to cater to the aspiration of producing 5 MT of green hydrogen by 2030"

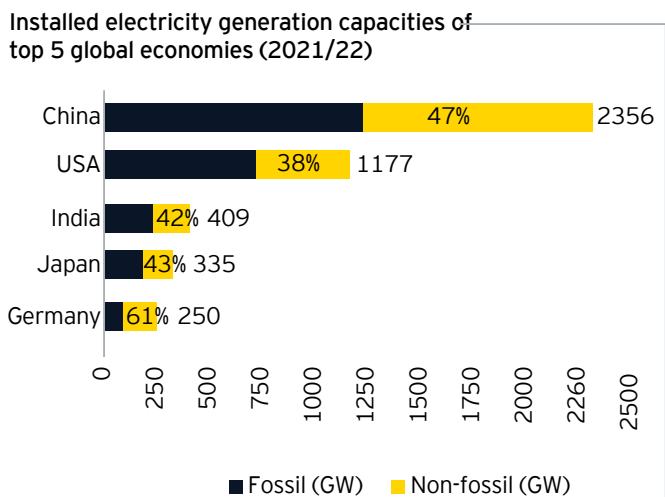
These visionary policy initiatives will bolster India's emergence as a production hub for clean energies, catering to increasing domestic consumption as well as serving growth markets for clean energy, through technology and commercial innovation, and cost competitiveness.

### Renewable energy

India is the third-largest producer of renewable energy in the world, with 42% installed capacity coming from non-fossil fuel sources<sup>13</sup>. With more than 150 GW<sup>2</sup> of renewable energy already installed, about 80% of India's power capacity additions are expected to come from renewables as it chases a 500 GW RE goal to be achieved by 2030. Over three quarters of this growth is expected from solar and wind, and rest from nuclear, hydro and biomass. Such large-scale renewable power capacity addition will help India achieve its NDC target of 50% of Non-Fossil Energy by 2030, and go on to meaningfully increase RE share further through 2047.

11. Conversion into US\$ billion is done using the average exchange rate at INR79.4 per US\$ during April 2022 to November 2022

12. Press Announcement, PIB, Government of India, 2021



Non-fossil includes renewable, nuclear and storage  
 Source: US EIA, India CEA

Over the last decade, the renewable energy market has matured, with accelerated scale-up on the horizon across utility-scale as well as distributed generation for commercial, industrial, agricultural and residential consumers. With this growth in renewable energy and an intent on indigenization, there is a huge opportunity for private players to create businesses across distinct value pools. These include equipment manufacturing (e.g., solar PV modules, wind turbines, ancillary electricals etc.), renewable energy project development and building infrastructure to serve customers along their decarbonization journeys.

Long-term growth across each of these value pools is supported by government and private-sector initiatives such as PLI schemes and import duties or restrictions favouring local manufacturing. Aggregated project tenders by large, government-backed organizations such as Solar Energy Corporation of India (SECI) de-risk projects and enable capacity additions at scale. Corporate commitments to RE100<sup>13</sup> are driving further growth by increasing renewable energy demand and introducing innovative business models for renewable energy procurement.

### Energy storage

Energy storage is the missing link in the faster and wider adoption of renewable energy in the country. Owing the increasing share of variable renewable energy that will require storage, India will emerge as the third largest country in terms of energy storage installation by 2040. Energy storage is expected to be a 230-300 GWh opportunity, an investment of nearly US\$ 45-55 billion across Battery Energy Storage Systems (BESS) and Pumped Hydro Storage Projects (PSP).

Government policy, incentives, interventions, and regulations are driving demand for energy storage, which include:

- ▶ PLI Scheme on 'National Program on ACC battery storage' Two standalone ESS tenders that SECI and NTPC recently issued with a combined storage capacity of 1GW/4GWh
- ▶ Energy storage obligation (ESO) on discoms and other obligated entities notified for 1-4% of total energy consumption to come through storage by 2030

Battery manufacturing in India has been restricted to assembling packs from imported cells so far, in a fragmented market with many small players. With PLI for ACC batteries, end to end manufacturing of batteries at giga scale (>5GWh) is picking up, as large players have now started setting up facilities, with announced plans to scale to nearly 140-150 GWh of manufacturing capacity (including battery demand for stationary applications and electric mobility). While large players have clear advantages in manufacturing BESS, value chain opportunities across project development, operations and maintenance will emerge for Real Estate project developers, public or private oil and gas/energy companies along with technology players to participate in the growing energy storage market.

### Green hydrogen

Green hydrogen, produced by splitting water molecules in an electrolyser by using renewable energy or produced from biomass, is an emerging energy carrier with the potential to drive global decarbonization in hard-to-abate sectors. India already consumes about 6 million tons of hydrogen primarily for refining and fertilizers, which is currently produced from coal gasification or natural gas reforming and results in huge CO2 emissions.

As a feedstock, green hydrogen may be used to refine petroleum products, manufacture ammonia-based fertilizers, reduce iron-ore for steel production or produce synthetic fuels for shipping or aviation. As a fuel, its applications vary across industrial heating, blending with natural gas for cooking or power generation, co-generation in coal-fired power plants, hydrogen combustion engines, fuel-cell-based electric vehicles or power backup, among others. Currently, green hydrogen production cost in India is around US\$ 4-7/kg. For it to be competitive against alternatives across the applications mentioned above, green hydrogen production cost needs to go down to US\$ 1-2/kg. India has a distinct advantage in driving this cost reduction through low-cost renewable energy, technology innovation, economies of scale, value chain integration, and policy and regulatory support.

13. RE100 is a global initiative bringing together the world's most influential businesses committed to 100% renewable electricity; <https://www.there100.org/>

The recently approved National Green Hydrogen Mission is a shot in the arm for green hydrogen development in India - aimed at making it a global hub for production, utilization and export of Green Hydrogen and its derivatives (e.g. green ammonia, green methanol). It is comprehensive in its coverage with financial outlay and incentives of over US\$2 billion targeting two key areas under the SIGHT program (Strategic Interventions for Green Hydrogen Transition Programme) - domestic manufacturing of electrolyzers and production of green hydrogen. This in turn is expected to spur close to US\$100 billion in total investments in development of green hydrogen capacity (5 MMT) and associated renewable energy capacity addition (125 GW). Overall, this is expected to be game-changer to aggressively support the development of the hydrogen market in India - in line with similar policies announced by the US and the EU. As we scale to million-ton green hydrogen production and consumption, opportunities across giga-scale equipment manufacturing, project development, operations and maintenance, hydrogen storage and transportation services, and building and securing offtake distribution networks for end-uses are emerging for Indian private enterprises to capture quickly and decisively.

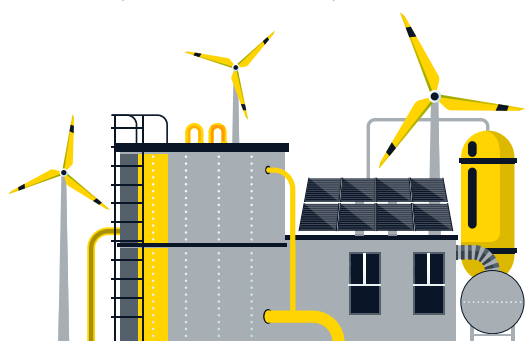
**Union cabinet approves**  
National green hydrogen mission

**Expected deliverables by 2030**

At least  
**5 MMT**  
GH<sub>2</sub> annual  
production

**60-100 GW**  
electrolyser  
capacity

**125 GW**  
RE capacity for  
GH<sub>2</sub> generation  
and associated  
transmission network



Total outlay approved: ₹ 19,744 crore

<b>Rs 1 lakh crore</b> import savings	<b>50 MMT</b> CO <sub>2</sub> annual emissions averted
<b>6 lakh</b> Jobs	<b>Rs 8 lakh crore</b> investment

In conclusion, India's energy transition is going to create a lot of value for all the stakeholders involved. The transition will reduce the dependence on imported fuel, which will improve

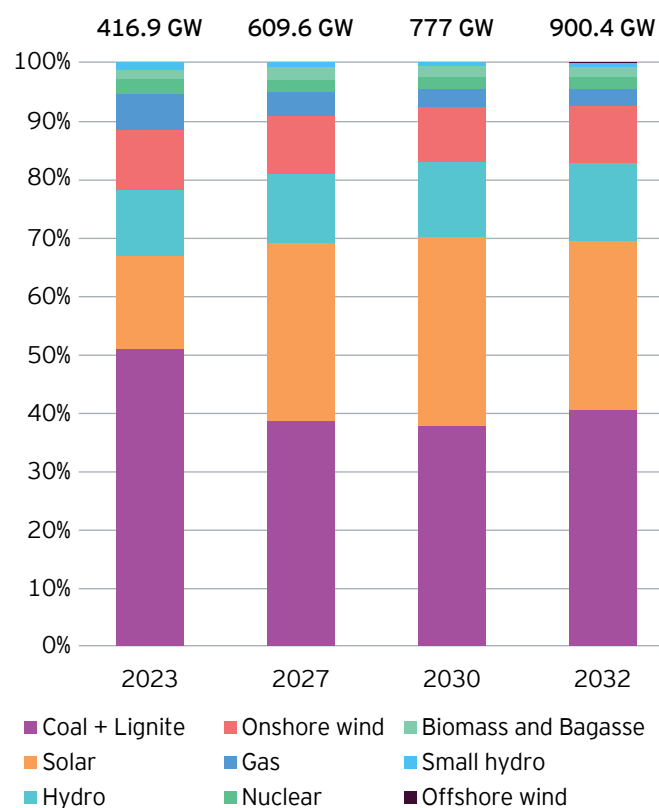
trade balance and cut GHG emissions. India's policies also have provisions for pilot projects, research and development, to support its overall development as a Technology hub for clean energies across Solar PV and Wind for renewable energy generation, energy storage and electrolyzers for green hydrogen. There is a pivotal opportunity for large conglomerates as well as new entrants from supply and demand for multi-decadal value creation and driving India's climate ambitions.

**Vision for 2047**

To achieve Government of India's targets under "Panchamrit" to deal with global warming and climate change, India needs to take a holistic approach combining various measures such as high penetration of renewable energy, energy efficiency measure in industrial, commercial, and residential sector, introduction of mandatory carbon tax etc.

As India has already drafted a roadmap to achieve 500 GW of non-fossil fuel-based energy capacity by 2030. Over three quarters of this growth is expected from solar and wind, and rest from nuclear, hydro and biomass. Such large-scale renewable power capacity addition will help India achieve its NDC target of 50% of Non-Fossil Energy by 2030 and go on to meaningfully increase RE share further through 2047.

**Installed capacity (in GW)<sup>14</sup>**



14. CEA, National Electricity Plan and Optimal Generation Mix Report, 2030



Despite being a developing country, India is the third largest carbon-dioxide emitter in the world after China and USA. India can adopt a two-pronged approach to reduce its CO2 and overall GHG emissions by promoting clean and low-emission fuels and penalizing heavy emitters such as energy-intensive industries and heavy-duty transports. To promote low-emission fuels, India has already taken steps to tap potentials of green hydrogen and its derivatives by formulating "National Green Hydrogen Policy", setting 5 MTPA green hydrogen production targets and incentivizing green hydrogen production. Hydrogen can be a vital element to help realize decarbonization in hard-to-abate sectors such as steel manufacturing, refineries, heavy-duty vehicles etc.

Further, India has targets to achieve 30% penetration of electric vehicles in the overall vehicle sales by 2030. This will not only reduce harmful GHG emissions from Internal Combustion Engine (ICE) vehicles but also helps in minimizing the cost of oil imports.

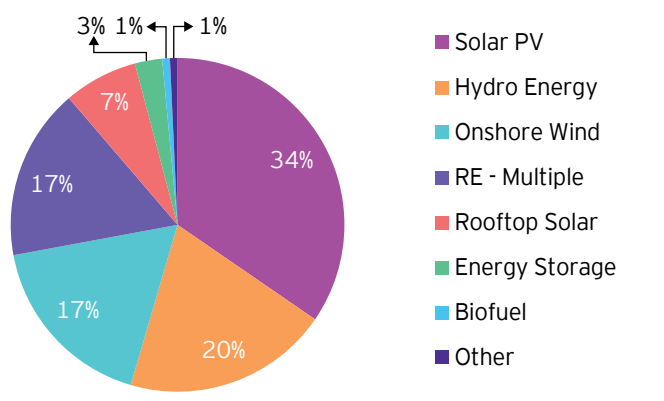
Currently, India does not have an explicit carbon price to penalize heavy emitters but there are certain implicit tools and mechanisms such as Energy Saving Certificates (ESCs), Renewable Energy Certificates (RECs) and GST compensation cess. Bureau of Energy Efficiency (BEE) is planning to rollout domestic carbon market in a phased manner by mid 2023. Such stringent measures can further motivate large emitters of GHG to shift towards cleaner options.

### Current landscape of sustainable finance for decarbonization

Financial institutions are actively embracing decarbonization as a crucial priority and strategic opportunity.

Over the past decade, renewable energy financing in India has undergone a significant transformation, witnessing the involvement of a diverse range of players competing for a share in the rapidly expanding sector. Renewable energy financing initially relied on multinational development banks, but commercial financing options, particularly from Indian banks and non-banking financial institutions (NBFCs), have gained traction.

#### Investment inflow for Clean Energy (FY2019-20)



Investment in renewable energy in India reached a record US\$14.5 billion in FY 2021-22, an increase of 125 % YoY

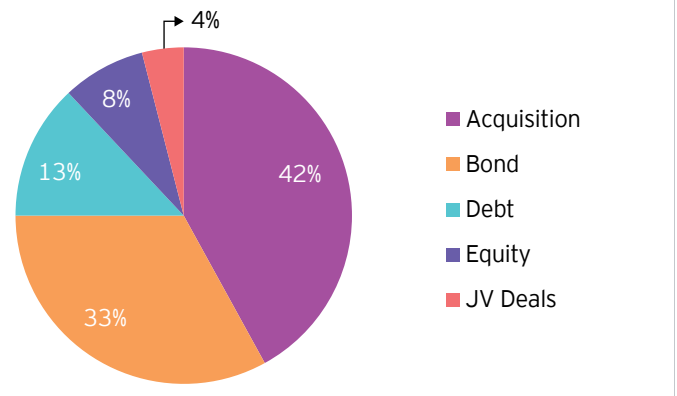
A leader in renewable energy deals with US\$ 30.7 bn of deal activity in Q3, 2022

Financing for renewables such as wind and solar has been in the form of equity (from global investment funds, Indian conglomerates) and debt financing (from global banks, Indian private banks, NBFCs and DFIs). Green Bonds have been a major source

of financing for renewables so far, with both international and domestic banks issuing them. Today, there are various instruments like green debt securities, impact bonds, and sustainability-linked loans that are emerging.

Recent investments in the clean energy sector have witnessed a dominant presence of mergers and acquisitions (M&A). However, green bonds have emerged as a significant avenue for Indian Independent Power Producers (IPPs) to raise funds for both new and existing projects. Green bonds have gained popularity, particularly for refinancing purposes, due to the low operating costs associated with renewable energy projects and the stable revenue streams generated through long-term Power Purchase Agreements (PPAs). In the fiscal year 2021-22, a substantial amount of USD 4 billion was raised through green bonds by various Indian IPPs

#### Investment by Deal Type in FY2021

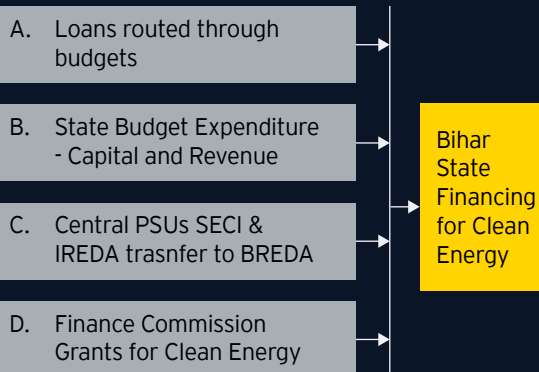


## Private Sector

A leading power company secured a **US\$ 320 million sustainability-linked loan** from international lenders, from a leading international bank that offers a lower cost of financing compared to traditional loans. The funds will be used by the company to refinance and expand its power production units, while its subsidiaries will use it to refinance their existing loans. One notable benefit for the company is the potential drop in financing rates by up to eight basis points if it avoids investing in or expanding capacity in industries like thermal power generation over the next few years. To earn additional financial incentives, the company must also increase its renewable energy generation by 1.5 to 2 gigatonnes per year.

## Public Sector

The state of Bihar allocated a portion of its budget to the power sector in FY 2021-22 towards addressing climate change. In the Bihar Green Budget 2020-21, 7.05% of the total scheme budget was allocated for implementing various “green” objectives such as climate change adaptation, waste management, sustainable land use, pollution abatement, circular economy measures, biodiversity conservation and promotion of clean energy. Channels for Energy financing<sup>16</sup>



## Green Hydrogen

Majority of the financing for green hydrogen is expected to come from government incentives (~INR13,050 crore). While the market is led by the large players, start-ups in the ecosystem have been gaining momentum with h2e power. A leading Fund anchored by a major public sector bank aims to deploy USD 300 million in the next 3 years in Green Hydrogen.

16. Bihar's Public Policy and Budgetary Priorities for a transition towards a Green Economic Recovery - CBGA - June 2022





## Building the momentum on sustainable mobility and transportation

India's Transportation and Logistics sector acts as the backbone to bolster the fast-paced growth which it is certain to achieve in the next 25 years. The performance of logistics sector in the economic development of India has never been more promising. A sound and robust logistics sector can go a long way in boosting India's quest for being a manufacturing giant given that several initiatives like 'Make in India' have been launched by the Government. The industry has witnessed rapid growth in the last few years due to increased planned outlay of the government, improved infrastructure facilities and greater access to global markets. However, the country's logistics and transportation services have not fully capitalized on the opportunity in the global market .

Concentrated efforts are being made in the years ahead to build a robust logistics network in the country. With better infrastructure planning, increased coordination among stakeholders and improved operational efficiencies, India aims to fully unlock the potential of the sector needed to fuel economic growth. In 2023, India was ranked 38th in The World Bank LPI Index that ranks countries based on their logistics

performance – moving up from 54th in 2014<sup>17</sup>. While this is indicative of improvement in the sector, multiple challenges of infrastructural deficiency, lack of integration amongst stakeholders, lack of skilled manpower and slow adoption of technology continue to pull it down.

### India's transportation and logistics landscape

Logistics costs in India are among the highest at 14% of GDP, due to the inefficient modal mix, which is tilted towards the Road segment, which is about 66%. This is followed by rail (31%), shipping (3%) and air (1%)<sup>18</sup>. India has an extensive network of cargo support infrastructure comprising 129+ In-land container depots, 168+ container freight station, and ~300 m sq. ft. of warehousing space<sup>19</sup>. India's rank in "container throughput" improved from 16 to 11 in 2016 and has since remained constant. India's share of global "container port throughput" increased from 1.7% in 2016 to 2% in 2020. In contrast, China's share exceeded 30% in 2020. Also, India's share of global "container.

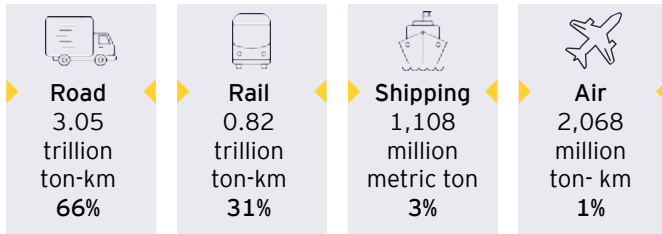
17. <https://lpi.worldbank.org/international/global>

18. Transforming Trucking in India, Niti Aayog

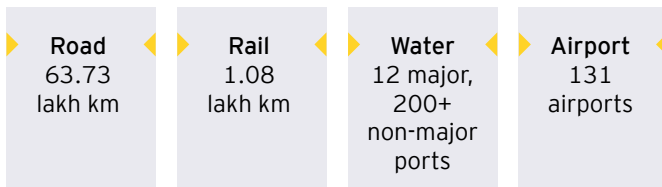
19. Source- PBI, Ministry of shipping, Ministry of civil aviation, Niti Aayog

India ranks 20th in maximum cargo carrying capacity for ship<sup>20</sup> and 40th in maximum container carrying capacity for ships.<sup>20</sup> For ports to handle container vessels above 16,000 TEU, a draft of 18 m to 20 m is essential. Not many Indian ports have sufficient draft to accommodate them. The lack of deep draft ports results in shipping lines bypassing India, thereby reducing transshipment opportunities.

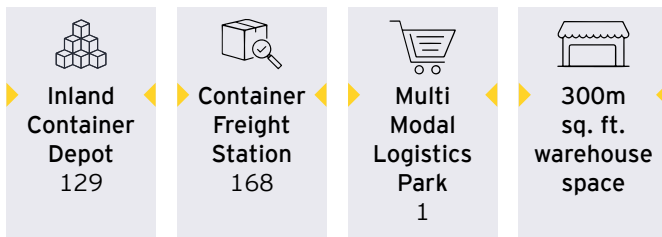
### Modal split-freight movement in India in 2022



### Infrastructure present



### Support infrastructure present



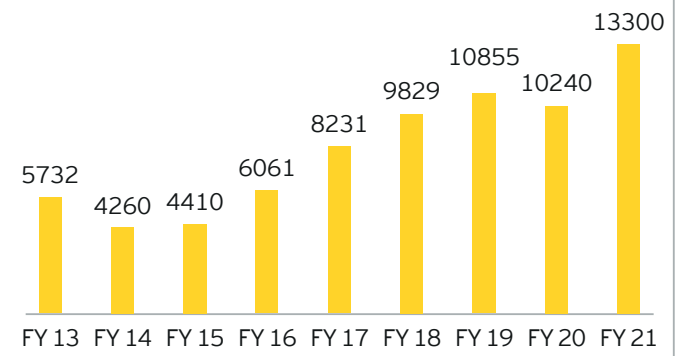
Source: PBI, Ministry of Shipping, Ministry of Civil Aviation, Niti Aayog

The uneven distribution of modes of transportation has led to low operational efficiency, prompting the GoI to undertake multiple logistics specific initiatives, such as GatiShakti, National Logistics Policy, Dedicated freight corridors. These programs aim to streamline India's logistics sector by making it more green, agile, transparent and integrated. India aims to reduce logistics cost from 13% to 14% of GDP, to 8% to 10% of GDP, by 2030<sup>21</sup>.

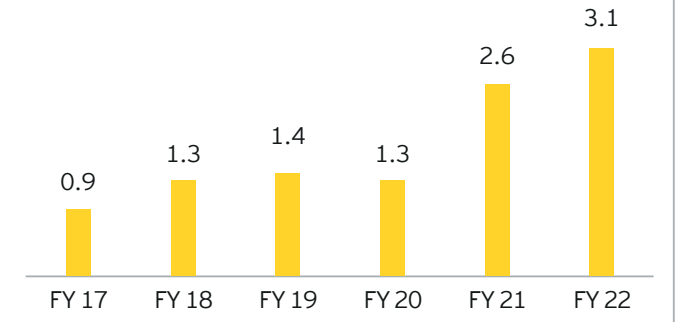
To address some of these challenges, there has been a recent spurt in development of associated infrastructure, which is in line with the changing business environment. The sector is witnessing a rapid development of infrastructure, greater thrust in digitalization, and enhanced focus on sustainable logistics.

The infra sector investments as represented has significantly aided sectors like logistics in improving reach, network & the pace of service execution.

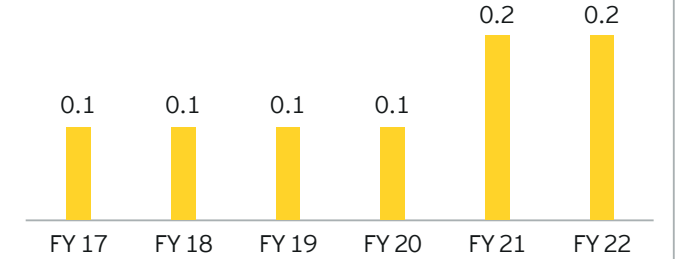
### Road construction (Kms)



### Railway sector investments (INR t)



### Port investments (INR t)



Source: National Infrastructure Pipeline, MOFSL Report

Although the above-mentioned initiatives are likely to transform and improve efficiency in the logistics sector, some challenges continue to persist, which may limit its growth. A collaborative effort of industry and GoI may be required to resolve them.

Thus, we recommend following strategies to accelerate India's competitiveness in global ports, shipping and logistics sector.

*The sector is witnessing a rapid development of infrastructure, greater thrust in digitalization, and enhanced focus on sustainable logistics.*

20. UNCTAD, review of Maritime Transport, 2022

21. Press information Bureau, Government of India, National Logistics Policy

## Focusing on sustainable logistics

Freight transportation relies heavily on fossil fuels compared to any other sector and accounted for 21% of CO2 emissions in 2020. With the maritime industry responsible for transporting no less than 90% of world commerce, there is increasing pressure on the sector to reduce its carbon footprint swiftly. In order to achieve net zero target by 2050, it is estimated that emissions related to freight movement have to be reduced from 6.6 MtCO2 in 2020 to 5.1 MtCO2 by 2030.

EY has developed an ESG performance analysis (including third-party data) for global companies. Using EY ESG Compass, Indian logistics companies were compared with the global counterparts in multiple ESG-related parameters. A sub sector level analysis highlighted that cargo ground transportation is an area where Indian companies can improve on ESG parameters and communications.

From an ESG perspective, technology companies have an opportunity to develop solutions/ platforms to monitor and analyze emissions across the supply chain. Stakeholders in the transportation and logistics sector should work to identify and prioritize focus areas for decarbonization and meet net zero emission target.

## Adopt advanced technologies and explore new business models

Recent supply chain disruptions and amplified focus on sustainability have led to increased adoption of technology-enabled solutions. As a result, blockchain, big data, cloud computing, digital twins and others are seeing widespread adoption, globally. New business models like digital freight forward, on-demand warehousing and crowdsourcing models have paved the way for multiple start-ups offering innovative solutions by either working independently or partnering with traditional players.

## Fast-track infrastructure development

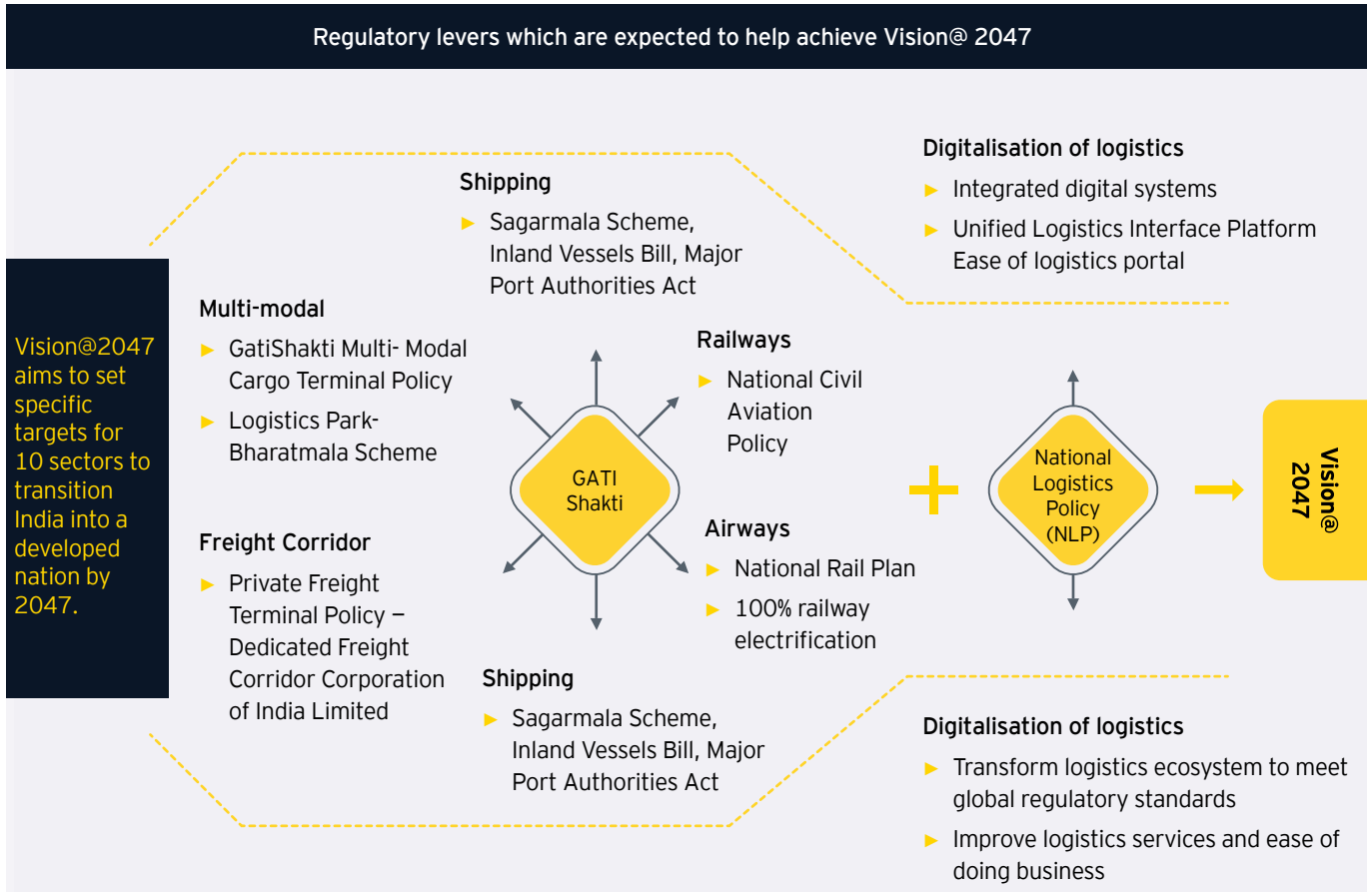
Several Multi Modal Logistics Parks (MMLPs) are being developed to connect multiple modes of transport. MMLPs also help to improve utilization and performance of inland container depots and container freight stations. However, delayed land acquisition and clearances are key challenges which need to be addressed. It has a significant impact on project timelines and profitability. A complete roll out of nationwide single window clearance system by the government will go a long way to resolve this.

## Attract investment and investor interest

Traditionally, the GoI has been the main proponent and financier for the development of infrastructure. However, it is increasingly adopting new policies to attract private and foreign investments as levers to fast-track infrastructure development. This includes 100% Income Tax exemption in any consecutive 10-year period out of 20 years of operations for road construction projects. This also includes volume-based rebate scheme of up to 100% on rail tariff for movement of empty containers from ports to hinterlands for its utilization in exports as offered by CONCOR, among others. In total, investors have an opportunity to invest in ~6,000 projects worth INR52 lakh crore (~US\$650 billion), which can aid the transportation and logistics sector.



EY projects that India will continue its strong economic performance and become a US\$ 26 trillion economy by FY48<sup>22</sup>. This will create a significant opportunity for India's transportation and logistics sector, which is poised to grow at ~4.5% CAGR (from 2022 to 2050) to 15.6 trillion-ton km by 2050<sup>23</sup>. Vision@ 2047 is a guiding principle which is being supported by multiple regulatory and government initiatives to revamp India's logistics sector



The GoI has prioritized capital investment over revenue expenditure to drive longer-term growth. Capex outlay has increased from 1.6% (pre-COVID) to 2.9% of the GDP for 2022-23. Two key government initiatives aimed towards better planning and execution have been the National Infrastructure Pipeline (NIP) and Gati Shakti. NIP provides comprehensive list of projects that would need to be implemented for India to upgrade its infrastructure in all areas i.e., transportation, energy, communications and social infrastructure.

Gati Shakti envisages building a digital platform that will bring 16 ministries together for integrated planning and coordinated implementation of infrastructure connectivity projects. It will incorporate infrastructure schemes such as Bharatmala (highway project with the objective of providing connectivity to 550 district headquarters and remote areas), Sagarmala (coastal shipping and inland waterways), dry/land ports and UDAN (air transport) etc. under various ministries and state governments.

Initiatives taken under NLP include- automating EXIM processes for paperless clearances (eSanchit- e-Storage and Computerized Handling of Indirect Tax documents), building complimentary infrastructure related projects under Gati Shakti and reforming the rail sector. NLP also focuses on improving seaport quality, engaging with private and MSME sectors to boost exports (for toys, textiles, chemicals) and facilitating modal shift in first and last mile logistics.

22. EY report, India@100

23. EY report, Envisioning the Future of Indian Logistics@2047

## Current state of sustainable finance in the sector

The journey of sustainable transportation financing in India has seen remarkable developments, with the government, financial institutions, international collaborations, and private sector investments all contributing to the growth of this sector. Banks, non-banking financial companies (NBFCs), and other financial institutions have recognized the potential of sustainable mobility and started offering specialized financing products for EVs and related infrastructure. Collaborations between government entities, financial institutions, and private companies have facilitated the deployment of electric buses, shared mobility solutions, and renewable energy-powered transportation systems.

Source of Funding	Funding instrument	Types of projects	Example
Government	Various subsidies, incentives, and grants	<ul style="list-style-type: none"> <li>▶ Electric vehicle adoption, development of charging infrastructure</li> <li>▶ Clean transportation solutions</li> <li>▶ Green shipping</li> </ul>	30% financial assistance for the advancement of green shipping
Multilateral development banks, international funding and collaboration	Grants, green bonds, project financing,	<ul style="list-style-type: none"> <li>▶ Public transportation</li> <li>▶ Non-fossil fuel based energy</li> <li>▶ Road safety</li> </ul>	Shriram Finance Limited secured USD 250 million funding from the International Development Finance Corporation for vehicle financing aimed at commercial purposes, alternative fuel vehicles
Public-private partnerships	Equity, debt financing, grants, subsidies,	<ul style="list-style-type: none"> <li>▶ Metro rail systems, bus rapid transit (BRT) networks</li> <li>▶ Electric vehicle charging infrastructure</li> </ul>	Navi Mumbai International Airport project developed between Govt. of Maharashtra and a private consortium to provide mobility solutions such as electric vehicle charging infrastructure, public transportation connectivity
Venture capital and private equity		<ul style="list-style-type: none"> <li>▶ Innovative start-ups, technologies</li> <li>▶ Electric vehicle,</li> <li>▶ Shared mobility</li> <li>▶ Clean transportation sectors</li> </ul>	Climate Angels - an angel investment fund that focuses on expanding the scope of sustainable mobility in India
Venture capital and private equity	Green loans, green bonds, guarantees, e-vehicle insurance, vehicle loans	<ul style="list-style-type: none"> <li>▶ Electric vehicle,</li> <li>▶ Clean transportation sectors</li> </ul>	Tube Investments, along with SBI, Multiples Private Equity Fund III, and other co-investors, secured up to INR 1,950 crore through equity and CCPS to expand TI's presence in e-mobility

Several cities in India are now dedicating a portion of their budget to support sustainable transportation initiatives. For instance, the Pune Municipal Corporation has allocated 20%<sup>24</sup> of its budget specifically for sustainable transport projects. This includes funding for procurement of buses, implementation of Bus Rapid Transit System (BRTS), conversion of autorickshaws to compressed natural gas (CNG), and development of non-motorized transport (NMT) infrastructure.

To fulfil India's EV aspirations, the country's EV market is expected to expand to US\$206 billion by 2030<sup>25</sup>. Meeting this target will necessitate investments exceeding US\$180 billion for both vehicle manufacturing and the development of charging infrastructure.<sup>26</sup> The shipping and logistics sector in India is prepared to adopt sustainable practices in order to align with both domestic and global regulatory policies. India has been selected as the first country under the IMO's Green Voyage 2050 project to conduct a pilot related to green shipping.<sup>27</sup> Additionally, they plan to develop a single-window portal to streamline and oversee river and sea cruises, making the process more convenient and accessible.

24. Sustainable Bus Transport Financing: India - Shakti Sustainable Energy Foundation - 2020

25. Financing India's Transition to Electric Vehicles - CEEW Centre For Energy and Finance

26. Preparing Indian Cities for a Shift to E-Mobility - Observer Research Foundation - 2021

27. EY: Envisioning the future of Indian logistics







## Sustainable agriculture - An enabler for inclusive growth

### Transitioning to sustainable agriculture

Agriculture is a crucial component of India's economy, contributing 16.5% to its GDP and employing around 42.3% of the workforce in the 2019-20 period. India is a major producer of a wide range of agricultural products, including milk, pulses, spices, rice, wheat, cotton, sugarcane, farmed fish, sheep and goat meat, fruit, vegetables, and tea. The Indian food processing industry accounts for 32% of the country's total food market, and is ranked fifth in terms of production, consumption, export, and expected growth. The Indian agriculture sector is poised for growth in the coming years driven by a number of factors, including rising consumer spending, urbanization, and the increasing demand for processed foods.

However, the sector is mired with a number of structural challenges. Despite the rapid growth to mark its presence at global level, on marketing front, Indian agriculture is still facing the problems such as low degree of market integration and connectivity, accessibility of reliable and timely information required by farmers on various issues in agriculture. Also, the agricultural marketing sector is characterized by fragmented supply chain. Huge post-harvest losses, multiple market intermediaries, higher transaction cost, lack of awareness, and several other socio-economic factors are some of the acute problems being faced by the Indian agriculture. The country's cultivated land is highly rainfed, with only 40% (approx.) being irrigated, indicating inefficiencies in food production. It will be a challenge to meet the demands of a growing Indian population with rising incomes if these existing gaps are not addressed well.



### Fragmented landholdings

The Indian agriculture sector is dominated by small landholders - 85% of farmers in India having less than 2 hectares of land<sup>28</sup>. Small landholdings make it difficult for farmers to adopt modern agricultural practices, access credit and benefit from economies of scale. The average land size has decreased, making it unviable for farmers and resulting in abandoned or underutilized land due to insufficient capital.



### Lack of technology adoption

The low adoption of modern agricultural technologies, such as improved seeds, mechanization, and precision farming techniques, in India is primarily attributed to a lack of knowledge about advanced farming methods and inadequate extension services. As a consequence, the agricultural sector experiences lower productivity, higher production costs, and inefficiencies throughout the value chain.



### Input dependency and rising costs

The high cost of chemicals fertilizers, pesticides and hybrid seeds, coupled with inadequate access to affordable credit, increase the financial burden on farmers. Increased dependency on such inputs, and their fluctuation or increasing costs can pose significant challenges with long-term impacts.



### Inadequate market infrastructure

The agriculture sector is hindered by insufficient infrastructure, such as storage facilities, cold chains, and transportation networks, resulting in significant post-harvest losses. Furthermore, the absence of a reliable price discovery mechanism and direct market linkages contributes to price volatility and exploitation of farmers by intermediaries.



### Dependence on monsoons

Agriculture in India heavily relies on monsoon rains, with a significant portion of the country lacking irrigation facilities. As per the report titled Dryland agriculture in India - problems and solutions about 68% of the cultivated area in India is categorized as dryland, which plays a critical role in India's food security. Erratic rainfall patterns and droughts can lead to crop failures, affecting farmer incomes and food production.



### Environmental impacts

The sector is also facing challenges from climate change, including erratic weather patterns, rising temperatures, and water scarcity, which are expected to exacerbate the existing issues. The Indian Council of Agricultural Research (ICAR) has projected a 5-10% decrease in the irrigated wheat and maize yields by 2050 due to climate change.

On the demand side, India's population is on an upward trajectory, with estimates suggesting a growth from 1.412 billion in 2022 to 1.668 billion in the year 2050<sup>29</sup>. As urbanization continues and incomes rise, consumer preferences are shifting towards convenient, healthy, and sustainable food options. As the nation prepares for this demographic shift, one of the key challenges will be to meet the expected 50% increase in food demand by 2050 through sustainable agriculture.

On the supply side, urbanization and climate change pose additional pressures in terms of the degradation of vital natural resources like air, water, and land.

As cities expand and climate patterns shift, the availability of arable land, water, soil, and nutrients for agriculture may come under further strain. About 30% of land in India is already facing degradation which calls for concerted efforts towards soil health restoration. The land restoration of around 30% of this degraded land in India has been proposed to achieve land degradation neutrality by 2030<sup>30,31</sup>.

According to the OECD environmental outlook for 2050, India will encounter severe water scarcity. With agriculture accounting for 90% of water usage<sup>32</sup>, the country ranks first in terms of area under groundwater irrigation<sup>30</sup>. A significant share of electricity is being used primarily for irrigation in agricultural activities. India is already grappling with rapid groundwater depletion and insufficient irrigation infrastructure, exacerbating the impending water scarcity challenge.

**Table 1: Demand-side and Supply-side drivers of sustainable agriculture in India: current and project scenarios**

Drivers	2022-2023	2050	References
<b>Demand-side</b>			
Population	1,425 million	1,668 million	(33), (34)
Prosperity in Gross Domestic Product (GDP)	US\$ 8,415,912 million	US\$ 33,363,210 million	(35)
Average Annual Income	INR 1,70,620	INR 4,01,839	(36), (37)
Calorific intake	2169 kcal/cap/day	2,450 kcal/cap/day	(38), (39)
Food requirement		50% increase expected over FY23	(16)
Crop Yields		Might decrease to 30% over FY23	(40)
<b>Supply side</b>			
Urbanization	31% (2011)	Approx. 65%	(41), (42)
Land degradation		0.09 ha/cap	(43)
Climate change		Average annual temperatures are expected to rise by 1°C to 2°C by 2050.	(44)
Water resource depletion		India projected to be the most severely affected by water scarcity by 2050	(45)
Soil health	29.3% (96.4 million Ha) of the land is degraded	Restoration of 26 million hectares of degraded land by 2030.	(6)

29. [https://www.un.org/development/desa/pd/sites/www.un.org.development.desa.pd/files/wpp2022\\_summary\\_of\\_results.pdf](https://www.un.org/development/desa/pd/sites/www.un.org.development.desa.pd/files/wpp2022_summary_of_results.pdf)

30. UNCCD Global Land Outlook 2017. [https://www.unccd.int/sites/default/files/documents/2017-09/GLO\\_Full\\_Report\\_low\\_res.pdf](https://www.unccd.int/sites/default/files/documents/2017-09/GLO_Full_Report_low_res.pdf)

31. [https://www.sac.gov.in/SACSITE/Desertification\\_Atlas\\_2016\\_SAC\\_ISRO.pdf](https://www.sac.gov.in/SACSITE/Desertification_Atlas_2016_SAC_ISRO.pdf)

32. [https://www.oav.de/fileadmin/user\\_upload/5\\_Publikationen/5\\_Studien/170118\\_Study\\_Water\\_Agriculture\\_India.pdf](https://www.oav.de/fileadmin/user_upload/5_Publikationen/5_Studien/170118_Study_Water_Agriculture_India.pdf)

33. <https://www.un.org/en/desa/india-overtake-china-world-most-populous-country-april-2023-united-nations-projects#:~:text=24%20April%202023%20%2D%20China%20will,the%20population%20of%20mainland%20China>

34. [https://www.un.org/development/desa/pd/sites/www.un.org.development.desa.pd/files/wpp2022\\_summary\\_of\\_results.pdf](https://www.un.org/development/desa/pd/sites/www.un.org.development.desa.pd/files/wpp2022_summary_of_results.pdf)

35. <https://data.oecd.org/gdp/gdp-long-term-forecast.htm>

36. <https://www.indiabudget.gov.in/economicsurvey/doc/stat/tab11.pdf>

37. <https://icar.org.in/files/Vision-2050-ICAR.pdf>

38. <https://bmcpublihealth.biomedcentral.com/articles/10.1186/s12889-020-08951-8>

39. <https://www.ceew.in/publications/pathway-sustainable-land-use-and-food-systems-india-2050#:~:text=The%20average%20daily%20energy%20intake,national%20level%20from%202020%20onwards>

40. <https://gca.org/about-us/the-global-commission-on-adaptation/>

41. <https://www.teriin.org/resilient-cities/urbanisation.php#:~:text=India's%20urban%20population%20is%20expected,6.3%20billion%20inhabitants%20by%202050>

42. <https://population.un.org/wup/Publications/Files/WUP2014-Highlights.pdf>

43. [https://www.sac.gov.in/SACSITE/Desertification\\_Atlas\\_2016\\_SAC\\_ISRO.pdf](https://www.sac.gov.in/SACSITE/Desertification_Atlas_2016_SAC_ISRO.pdf)

44. <https://www.worldbank.org/en/news/press-release/2018/06/28/climate-change-depress-living-standards-india-says-new-world-bank-report>

45. The United Nations World Water Development Report 2023

## Scaling sustainable agriculture in India

The structural issues present in the existing Indian agriculture sector and the growing demand to secure nutritious diet for burgeoning population by 2047, makes a strong case for accelerating towards sustainable agriculture practices. Sustainable agriculture offers solutions that help in address these challenges while promoting environmental stewardship, economic viability, and social equity. These approaches not only enhance productivity and minimize environmental impact but also create a fair and inclusive agricultural system that benefits farmers, consumers, and the overall ecosystem.

The Indian government has undertaken a range of key initiatives and policy measures, both pre-harvest (such as improving soil health, nutrient management, water use efficiency, and organic farming) and post-harvest (such as promoting electronic trading platforms like eNAM to enhance market access and reduce dependence on intermediaries), which have begun to have positive impacts on the agriculture sector. The scale and pace can further come through use of advanced technologies like Internet of Things (IoT), artificial intelligence, geographic information systems (GIS) mapping, irrigation techniques, deep data driven decision making for promoting water management, precision farming, fostering market linkages, climate smart practices, farmer education and awareness etc.

Notably, the agriculture sector has witnessed the rise of start-ups, accounting for almost 5% of the total start-ups in India since its inception in 2016 till 2022<sup>46</sup>. These start-ups are focused on developing innovative solutions and technologies for the agriculture industry. Some of the noteworthy developments in both Pre and Post-harvest are:



### Pre-harvest advancements

- ▶ Biotechnological innovations: Genetically Modified (GM) crops are being developed and are put in use with the intent of increasing crop productivity. Bt cotton is the sole GM crop (resistant to bollworm pests) is cultivated in India across 95% of its total cotton cultivations and adopted by 7 million plus farmers over 12 years<sup>47</sup>.
- ▶ Precision agriculture: Smart farming or precision agriculture utilizes advanced technologies such as remote sensing, GIS, IoT, and global positioning systems (GPS) to optimize the use of inputs like fertilizers, water, and pesticides.
- ▶ 'Kisan Drone' is being promoted by the government for its use in crop assessment, digitization of land records, spraying of pesticides and nutrients.



### Post-harvest phase advancements

- ▶ Post-production supply chain: This includes improving the efficiency, traceability, and quality of agricultural products from farm to market through various interventions such as cold-chain infrastructure, blockchain technology, IoT-based monitoring systems, etc.
- ▶ Agriculture waste management is critical in ensuring sustainability, due to high farm waste generation (around 500 million tonnes/ year<sup>48</sup>) and post-harvest losses being faced by the Indian agriculture sector. The ICAR lists 140 technologies for utilizing agriculture waste to high-value products<sup>49</sup>. Bio-waste to energy plants (such as biogas plants and biomass -based power plants) are also being set up in India for production of electricity.

### Drones in sustainability

- ▶ Drones can advance sustainability by providing access to more data from specific or large areas
- ▶ Precision agriculture is a rapidly evolving field where drones help optimize the use of fertilizers and pesticides
- ▶ Drones can also play an important role in gathering data from hazardous environments, such as mining and in monitoring and controlling air pollution

46. <https://www.pib.gov.in/PressReleaseDetailm.aspx?PRID=1823347>

47. <https://www.nature.com/articles/nindia.2016.30>

48. <https://timesofindia.indiatimes.com/india/why-its-time-to-put-farm-and-food-waste-to-use/articleshow/92910335.cms>

49. <https://icar.org.in/sites/default/files/Creating-Wealth-From-Agricultural-Waste.pdf>

### Box 1: A case of leading sustainable agriculture practice in India

#### 100% Organic State - Sikkim, India

Sikkim achieved a significant milestone in January 2016 by becoming India's first state to adopt full organic farming. Over a decade, 75,000 hectares of farmland were transformed into certified organic farms. Today, Sikkim produces around 65% of India's total organic output showcasing that organic farming can coexist with productivity and development without compromising the preservation of nature's services.<sup>50,51</sup>

### Box 2: A case of energy efficiency in agriculture sector in India

#### A smart renewable energy microgrid project by an educational institution in Uttar Pradesh<sup>52</sup>

- ▶ The project introduces a Solar-Agriculture farm with versatile land use and a hybrid AC/DC Microgrid powered by renewable energy sources.
- ▶ Integration of solar photovoltaic (SPV) and biogas ensures system stability.
- ▶ It also focuses on creating renewable energy-driven equipment for agriculture and dairy, emphasizing sustainable practices and increased efficiency.

### Current landscape of sustainable finance in the sector

Estimates by UNEP (2022)<sup>53</sup> indicate that finance flows to Nature-based solutions (NbS) are currently US\$154 billion per year. This is less than half of the investment of US\$384 billion per year investment needed by 2025. The public sector plays a leading role in financing NbS, including sustainable agriculture.

Innovative financing models led by government agencies, and select initiatives by the private sector, have played a key role in financing sustainable agriculture in India

Here is a snapshot of one such initiatives from the private sector:

- ➔ *In India, a private bank introduced a Value Chain Finance (VCF) model\* to extend small-sized loans to smallholder farmers.*
- ➔ *This model helped farmers better manage production, supply chain issues, and address market and climate risks.*
- ➔ *It enabled access to finance for farmers, and made it easier for them to access social transfers and government subsidies through their (newly opened) bank accounts.*

\*Making Climate Finance Work in Agriculture, World Bank

Other key financing mechanism available to sustainable agriculture including funds via impact investing and philanthropy/CSR. As per estimates from India Impact Investors Council (IIC), approximately US\$846 million was channelled by impact investors in the agriculture sector in 2022. While much of the impact investing is mobilized towards impacting farm-based livelihoods, sustainability and climate-based agriculture is a key theme being integrated across such investments. **The Social Stock Exchange initiative** that was launched in India in 2022 will also play a key role in providing the additional boost towards financing sustainable agriculture, as an important avenue of funding available to leading social/impact enterprises (for-profit and not for profit).

50. <https://www.downtoearth.org.in/news/agriculture/organic-trial-57517>  
51. [https://www.unccd.int/sites/default/files/documents/2017-09/GLO\\_Full\\_Report\\_low\\_res.pdf](https://www.unccd.int/sites/default/files/documents/2017-09/GLO_Full_Report_low_res.pdf)  
52. <https://www.dei.ac.in/dei/files/NAAC%20Self%20Qualitative%20Assessment/smart%20initiative%20report%206.5.5/Writeup%20for%20DEI%20Smart%20Campus.pdf>  
53. State of Finance for Nature 2022 - UN Environment Programme



**NET ZERO  
EMISSIONS**



## Robust financing required to achieve India's net zero target by 2070

The IPCC report is a reminder that sole compliance to NDCs will be insufficient to limit global warming trends and the increasing temperature will pose significant risks to mankind and ecosystems. Climate change threatens to cost the Indian economy approximately US\$35 trillion in absence of any mitigation measures. This scenario presents scope for Indian industries and corporates to benefit by mainstreaming climate actions into business. Green financing can be an effective investment for climate adaptation and mitigation efforts.

India's green finance flows are far below the country's needs. In 2019/2020, green finance amounted to INR309 thousand crores (~US\$44 billion) per year, only a quarter of what India requires. According to the study 'Landscape of Green Finance', India needs approximately INR11 lakh crores (US\$170 billion)<sup>55</sup> per year to meet its climate goals.

### *Achievement of India's Net Zero Target - Associated Outcomes and Impact*

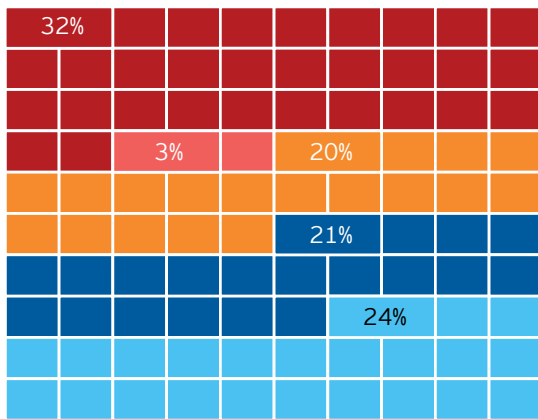
	Net-Zero target achievement by 2070	Net-Zero target achievement by 2050
Cumulative investment required for achieving net zero emissions	US\$10.1 trillion	US\$13.5 trillion
Number of additional jobs created by 2060	12 million (peaking at 15 million in 2047)	13 million (peaking at 20 million in 2032)
Increase in GDP compared to baseline	3.5% in 2060 (peaking at 4.7% in 2036)	3.4% in 2060 (peaking at 7.3% in 2032)

Getting India to Net Zero, Asia Society Policy Institute, 2022

55. Landscape of Green Finance in India, Climate Policy Initiative, 2022



## Current landscape of green finance mobilized - by source



Green finance by domestic sources FY 2020

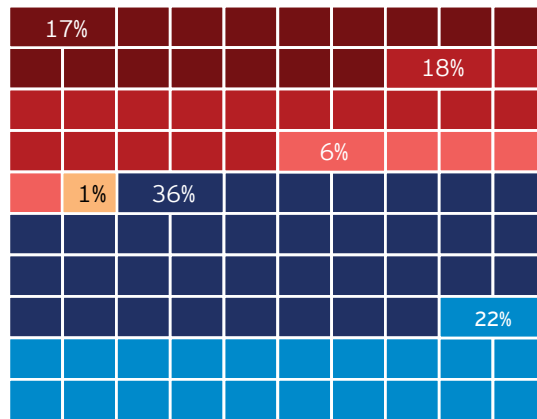
### Private

- Commercial FIs (187,157)
- Corporation (36,515)
- Residential, Commercial & Institutional (90,269)

### Public

- Public Sector Undertaking (98,488)
- Union & State Government Budgets (114,953)

Unit: INR thousand crores FY20



Green finance by international sources FY 2020

### Private

- Foreign Direct Investment (9,081)
- Commercial FIs (6,435)
- Corporations (2,638)
- Philanthropy (284)

### Public

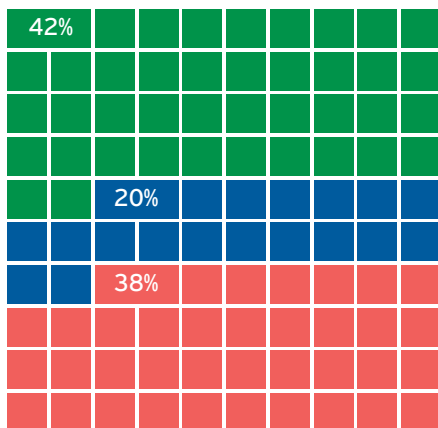
- Bilateral DFIs, 16,247
- Multilateral DFIs, 11,027

Unit: INR thousand crores FY20

Since FY2017-18, green finance flows have increased by 150% in FY2019-20. Public sector flows grew by 179%, and private sector flows by 130%. However, private sector finance mobilization must exceed public sector finance in the future. Domestic players consistently accounted for approximately 85% of the total flows over the four-year period from FY2017 to FY2020. Reporting remains limited, especially in the private sector, affecting the understanding of the current level of green finance mobilisation.

While there was a decrease in domestic flows to green finance from FY2019 to FY2020, international sources of finance increased by around 27%<sup>56</sup>. The growth can be attributed to a significant increase in finance flows from commercial financial institutions and bilateral development finance institutions, demonstrating growing confidence in India's commitment to meeting its NDCs. However, green finance still represents only about 3% of total FDI inflows to India.

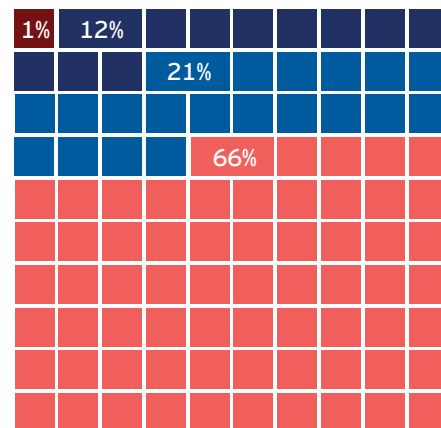
## Green finance flows to sectors



Unit: INR thousand crores

- Clean Energy 129,824
- Clean Transportation 60,719
- Energy Efficiency 118,860

## Flow to adaptation sector by sector



Unit: INR thousand crores

- Disaster Monitoring and Emergency Response System 298
- Disaster preparedness and capacity building 4,303
- Drought management 7,682
- Flood and cyclone mitigation 24,492
- Disaster Risk Reduction <0.5%

56. Landscape of Green Finance in India, Climate Policy Initiative, 2022

The funds allocated for mitigation were evenly distributed between clean energy and energy efficiency sectors, with clean transport receiving a smaller share. Domestic sources dominated the financing, with public and private contributions playing significant roles.

Solar projects received the largest share of investments in the clean energy sector. Clean transportation received substantial funding from public sources, while the private sector drove financing in the energy efficiency sector.

Funding for electric vehicles showed significant growth. Most funds for adaptation sectors came from domestic sources, specifically the Central and State government budgets.

Closing the green financing gap requires increased private sector finance and improved reporting. While public sector finance has shown promising growth, private sector finance mobilization must outpace it to meet India's ambitious climate goals.

**CSR Financing, Climate Change, and Interlinkages**

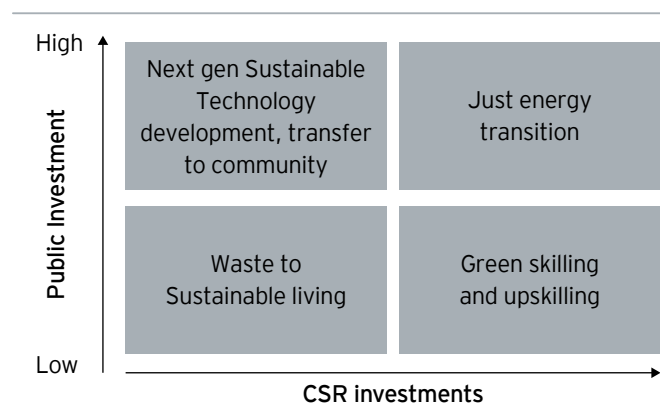
Climate sustainability is multi-dimensional and requires public-private and community partnership to drive this at scale. While several government programs are now looked through climate lenses, the private sector needs to bring in technology, skill and process efficiency to enhance climate agenda and involve the community for harmony and growth. Redirecting CSR expenditures towards sustainability and climate-linked objectives can help mobilize additional financing for the climate agenda. CSR is finely integrated with the pillars of Sustainable Development, operating on economic development, social equity, and environmental justice.

India's goal relies on an inclusive growth and collective effort between partners, government, private sector, and civil society. Studies shows that CSR spend affects the sustainable development in a positive way (Chatterjee et.al, 2017). Amongst others, the CSR investment in environment has a higher effect (Gautam, et.al, 2023) . In India, CSR and SDGs have a greater potential of developing a cohesive sustainable growth model. CSR encourages companies to bring innovations to address social and environmental concerns of the country, aiming at mainstreaming the business practices to more socially, economically, and environmentally responsible. It provides scope for private partners to contribute to Government initiatives and schemes as well. Their interventions have found linkages with National Missions and Programme, like National Action Plan on Climate Change, National Solar Mission, Green India Mission, National Mission on Sustainable Agriculture, Water Mission, and others.

Both nationally and internally public finances have dominated over private finances, with contribution of approximately about 60% of total flow. In fact, between 2017/18 and 2019/20 public sector flow was 50 percentage point more than private sector. A connection needs to be initiated to promote climate sustainable inclusive growth in the society with more private investment. Currently, the government is heavily investing in institution of future and private sector must help the government in bringing these disruptive technologies to grassroots to reap the demographic dividend to drive the scale.

There is now interest for enhanced efforts towards climate-linked CSR initiatives, and generate market-driven scalable solutions, towards carbon neutrality and India's goals of reaching net-zero by 2070. Incorporation of green lens in the existing CSR interventions can be a step in this direction. Through the integration of sustainable finance in CSR, market players can align their financial activities with environmental and social objectives and can contribute to just transition.

The introduction of Business Responsibility and Sustainability Reporting (BRSR) is a conscious step towards combating climate change in India, which is tightly aligned with the Carbon Disclosure Project Framework and enhances transparency and accountability. Under the Paris Agreement, more such reporting requirements are envisaged and impacts will be accounted for (for various targets - NDC, SDG, Net Zero, etc.).

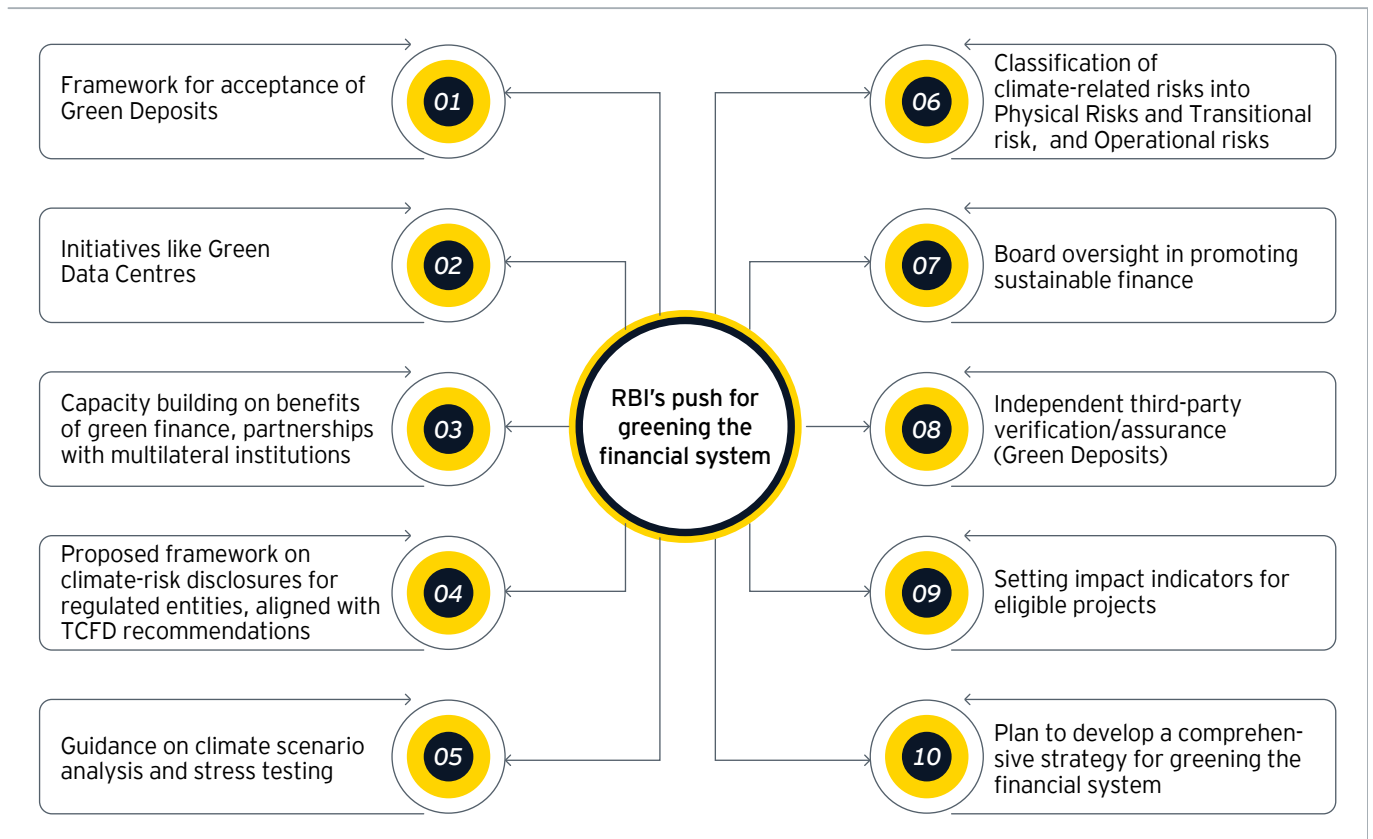


**RBI's key initiatives and progress for greening the Indian financial system**

Since April 2021, the RBI has been a member of the Network for Greening the Financial System (NGFS), and has released key frameworks and guidelines for sustainability and financial stability.

Of this, a key initiative has been on green deposits. In July 2022, the RBI released a framework for the acceptance of green deposits, expecting Regulated Entities (REs) to align their operations and product design with the guidelines. The RBI has also facilitated green bonds finance by liberalizing ECBs and authorizing Indian companies to raise green bonds. Additionally, the creation of the RBI-mandated Sustainable Finance Group (SFG) in 2021 provides a climate change framework for banks and regulated entities.

An RBI survey conducted in 2022 noted that while banks have begun taking steps in the area of climate risk and sustainable finance, there remains a need for concerted effort and further action in this regard<sup>57</sup>. 85% of the banks in the survey had indicated a need for change in their lending and investment approach to support green financing.



In 2023<sup>58</sup>, the RBI proposed a disclosure framework on climate-related financial risks and identifying various risks for regulated entities. The RBI aims to extend stress testing guidelines, integrate climate-related risks, and prepare a comprehensive strategy for greening the financial system aligned with TCFD recommendations. These initiatives can help create an ecosystem to position India as a leader in sustainable finance.

Issued in January 2023, India's inaugural sovereign green bond raised US\$ 1 billion, and importantly achieved this at a lower cost of capital (yield lower by 6 bps).

*An RBI survey conducted in 2022 noted that while banks have begun taking steps in the area of climate risk and sustainable finance, there remains a need for concerted effort and further action in this regard. 85% of the banks in the survey had indicated a need for change in their lending and investment approach to support green financing.*

57. Report on the survey of climate risk and sustainable finance, RBI, July 2022  
 58. Discussion Paper on Climate Risk and Sustainable Finance - Reserve Bank of India, 2023

## Vision for 2047

Capacity building across the banking sector and for bankers will be a key imperative for growth. Raising awareness on risks and opportunities including embedding Environment, Social and Governance considerations into financial decision making will require concentrated efforts at the industry level. Tie-ups with business schools and industry bodies to design relevant sustainable finance certifications, industry round tables and workshop can act as effective means for knowledge dissemination.

Primarily, detailed below are a few key aspects that will boost sustainable finance:

- 01 Mobilization of private investments
- 02 Collaboration with international institutions
- 03 Innovative financing solutions
- 04 Voluntary carbon markets

### Mobilization of private investments

Uncertainties surrounding the development of climate-related technologies, the financial returns of climate projects, and future carbon policies and emission pathways, often make climate-related investments risky. In order to private finance in this sector, we need to start from the first principles- understanding and eliminating the constraints. Policies around emissions trading, clean technology subsidies can go a long way in building a positive investor sentiment.

Till date, domestic borrowings from commercial banks have been the go-to source for Indian corporates and MSMEs for their transition financing. Majority of this funding has gone to the renewable energy sector. Of late, the financing is slowly expanding to other sectors as well such as electric mobility, sustainable waste management, energy efficiency and climate smart agriculture. In 2021, two leading banks collaborate and launched a new initiative of EUR 100 million to finance high impact climate action projects. In FY22, A state owned bank partnered with a clean energy company for financing Asia's largest waste to energy plant at Indore, Madhya Pradesh<sup>59</sup>.

The RBI's recent guidelines on the Framework for Green Deposits is expected to enhance the fund-raising capabilities of banks and NBFCs and establish a dedicated corpus of funds specifically allocated for environmental activities

Setting up of dedicated climate financing entities and green banks can be another step to facilitate the fund flow. India has already started making forays into the same through launch of Green Climate Fund by NABARD to facilitate climate mitigation and adaptation projects. SIDBI has also launched different schemes like Supporting the market for Energy Service Companies, Green Finance Scheme, End to End Energy Efficiency (4E) Scheme, and Technology Information Forecasting and Assessment Council (TIFAC) for innovative technology projects and can potentially translate itself into a green finance bank for Indian MSMEs. The Alliance for Green Commercial Banks, a global initiative by HKMA and IFC can open up further collaboration opportunities for green banking in India.

Developing a climate focussed liquid market would be another key step. Green, Social, Sustainability bonds and Sustainability-linked bonds (GSSSBs) have proven to be scalable options in the recent times. Globally, this market is expected to reach US\$ 1 trillion by 2023 as per the recent studies by S&P<sup>60</sup>. The Asia Pacific market can potentially reach US\$ 240 billion in 2023. Recent issuance of green bonds by REC Limited also saw an over-subscription of 3.5<sup>61</sup> times from 161 investors from multiple geographies- Asia Pacific (APAC) 42%, Europe, Middle East & Africa (EMEA) 26% and the US 32%. This is largest ever senior USD tranche by an Indian NBFC (largest ever senior Green Bond Tranche by a South & South-East Asian issuer) and first Green Bond issuance by an Indian Company post India's G20 Presidency. Focussed instruments such as transition bonds, blue bonds, yellow bonds, catastrophe bonds, social impact bonds can bring in dedicated capital inflows to support dedicated activities.

### Collaboration with international institutions

In recent years, Multilateral Development Banks (MDBs) have significantly increased their funding for sustainable finance projects. These institutions provide the two most important catalysts - lower financing cost and loss absorption cushion that some of the less-mature banks and NBFCs can potentially leverage. India has also seen a number of large ticket deals in 2022-23 with:

59. Integrated Annual Report, FY2021-2022, HDFC Bank

60. Sustainable Bond Issuance will return to growth in 2023, published by S&P Global Rating, 2023

61. Press Information Bureau, 2023



- ▶ Asian Development Bank (ADB) launching a new Country Partnership Strategy (CPS) for India in May 2023
- ▶ ADB and GOI signing loan agreements totalling US\$1.22 billion for developing infrastructure projects for improving the power and transportation sector across different Indian cities

However, the quantum of funding needed versus the availability remains a key challenge and calls for more structural reforms around MDB funding. Added to that, the increasing interest rate investments along with the currency inflation has led to increase in borrowing costs from these entities. India's G20 presidency offers a global platform to focus on the agenda of MDB reforms to increase the fund inflows into middle- and low-income countries. India has created an expert group on "Strengthening Multilateral Development Banks" to focus on:

- ▶ Creating a roadmap for an updated MDB ecosystem suited to emerging needs around SDGs and transboundary challenges like climate change and health
- ▶ Evaluation of estimates around the scale of funding required by member countries
- ▶ Coordination mechanism among MDBs

The above actions could potentially unlock more fund inflows through MDB route to India and provide the much-needed concessional capital required to build some of the innovative financing products discussed in the next section.

## Innovative financing solutions

Pooled investment funds, layered risk funds, credit guarantees, debt-for-nature swaps, sustainability-linked bonds/loans, green revolving funds are some of the innovative financing products emerging in the sustainable finance arena.

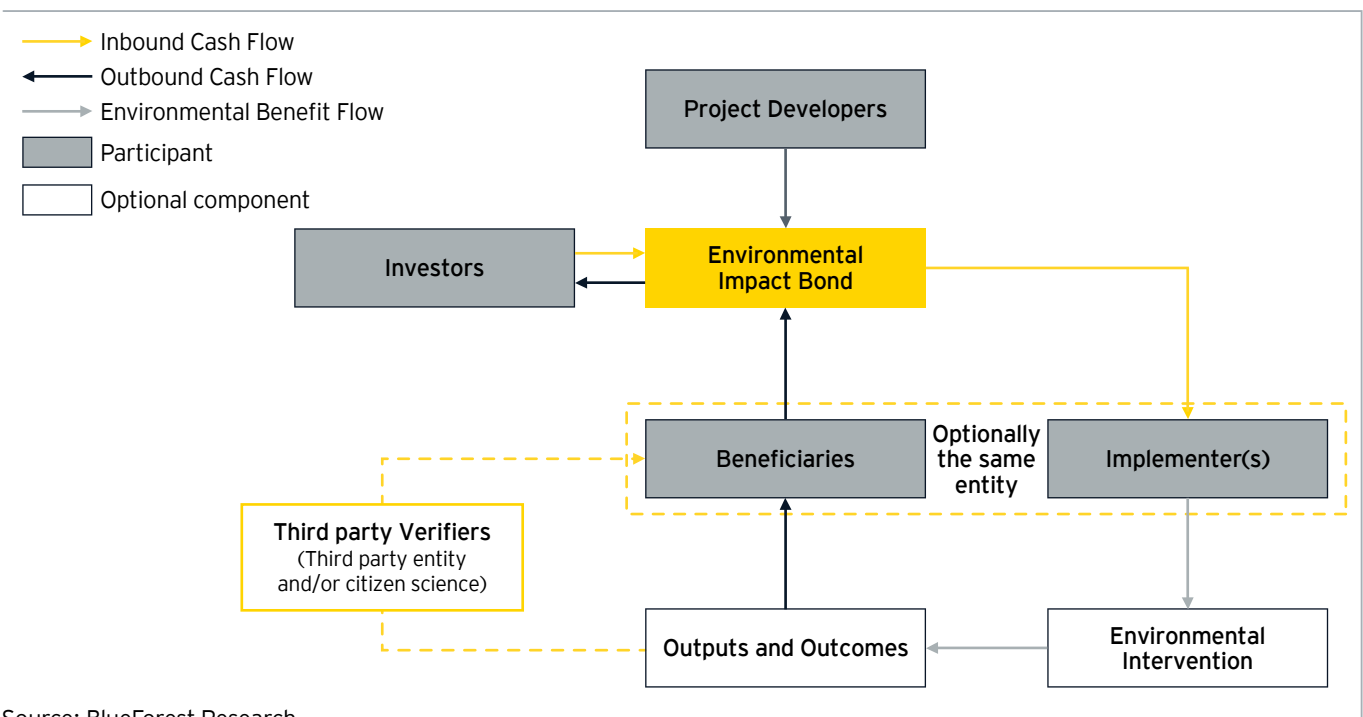
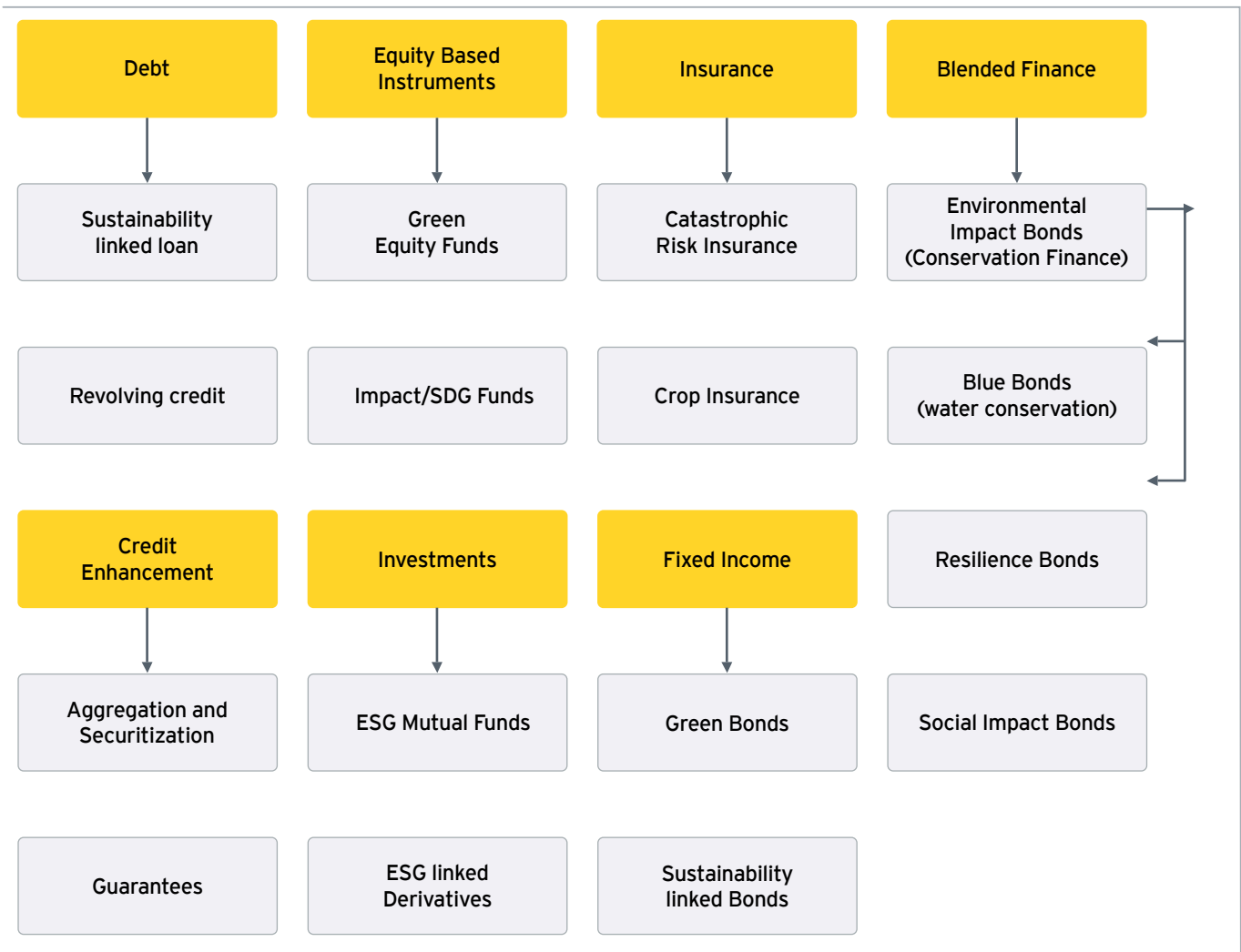
**Blended finance (BF)** is perhaps one of key tools that India can leverage. The Indian BF market stood at US\$1.30 billion in 2022 and is projected to reach US\$2.64 billion by 2027<sup>62</sup>. In simple terms, BF is the use of catalytic capital from public or philanthropic sources to increase private sector investment in sustainable development.

**Environmental Impact Bonds (EIBs)** are an emerging mechanism through which India can look at project that delivers climate adaptation benefits but lacks traditional revenue streams to attract investors interested in both a financial return and environmental impact. The issuer can work with a bilateral donor or foundation to structure an EIB to ensure the project is completed.

The impact bond (environmental) is a pay for success financial model to fund a portfolio of local conservation projects run by the partners. Investors provide the upfront capital and the partners implement the conservation projects and outcome payers pay the project costs plus a profit margin once the agreed outcomes have been delivered. These outcomes need to be certified by a third party.

**Green Asset Backed Securities (ABS)** is another tool that is being increasingly used in the global markets and can increase the demand and liquidity in India's secondary markets. Loans to small and medium enterprises to invest in climate-friendly projects could be structured as collaterals for green ABSs. Home mortgages that finance energy-efficient homes could be structured into green mortgage-backed securities.





Source: BlueForest Research

## Voluntary carbon markets

Development of a robust carbon market can act as one of the most effective drivers of emission reduction, helping India achieve its NDCs and net zero goals. By converting the emission reductions and removals into tradable assets, thereby providing a financial value to the impact they generate, India will open up opportunities for companies engaged in carbon capture and sequestration.

The Ministry of Environment and Forests announced the Green Credit program acting upon the government decision to establish a domestic voluntary carbon market. This program aims to leverage a competitive market-based approach for Green Credits, thereby incentivizing voluntary environmental actions of various stakeholders.

The government has identified a set of activities across 7 sectors which qualify for green credits and also announced that programs with co-benefits under removal or reduction of carbon emissions shall also qualify as carbon credits on the carbon market.

One significant challenge for voluntary markets that remains is a growing bifurcation between credit types.

- ▶ avoidance credits- projects that avoid emissions which would have otherwise occurred like preventing deforestation or building renewable energy
- ▶ removal credits- projects that certify direct removal and sequestration of carbon dioxide from the atmosphere like direct air capture

This divide fundamentally points out to a key theme- VCMs are extremely flexible. Therefore, different models and products would need to be formulated to achieve India's multiple more priorities efficiently.





## Technology enables sustainability

### How can emerging technologies enable sustainability & our climate ambitions?

There are a wide range of emerging technologies that can be tapped to enable sustainability journey & create competitive differentiation for our country & enterprises. The role of technology in enabling sustainability includes its impact on following broad areas:

- ▶ Resource optimisation
- ▶ Efficiencies in the value chain
- ▶ Circular economy
- ▶ Emission and Waste reduction
- ▶ Monitoring trends and hotspots
- ▶ Analytics for actionable insights & timely alerts

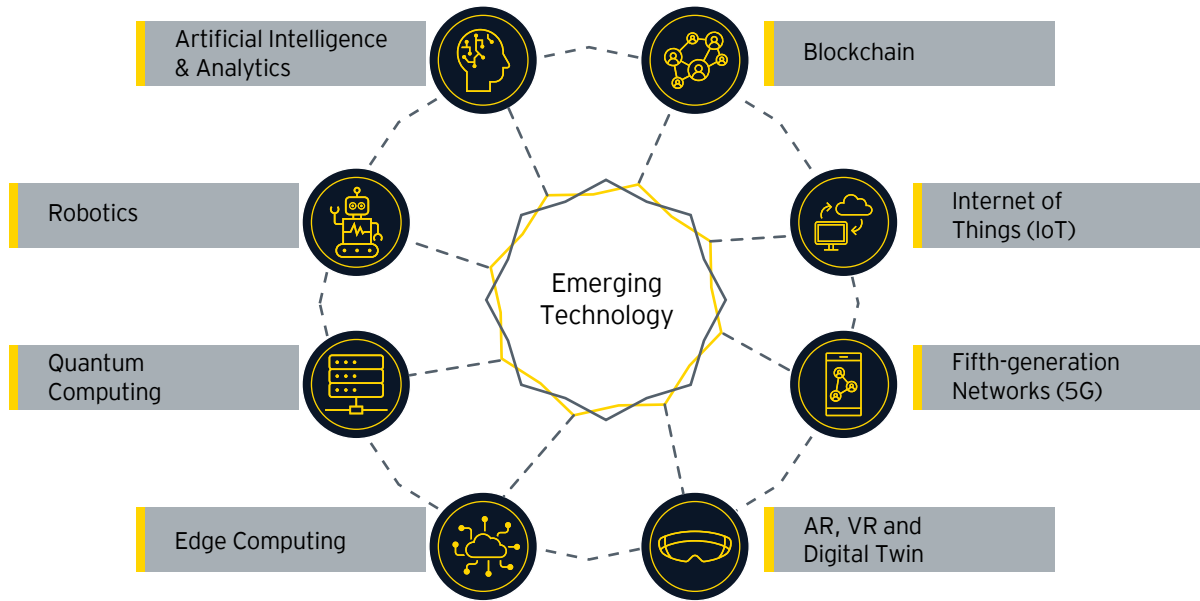
Digital technologies play an important role in mitigating and adapting to the climate crisis. It allows for monitoring and tracking crucial information, as well as predicting and optimizing models to help communities and businesses prepare for and adapt to the impacts of climate change. At the same time, digital technologies support sustainable practices such as enabling secure and trustworthy data exchange and sharing among business ecosystems to achieve sustainability goals.

Agility, innovation, and openness are crucial for realizing the potential of these technologies across sustainability. Proper measurement can offer the insights needed to take the correct decisions. Most importantly, it will also bridge the most important issues for any corporation's leadership team on how to connect capital allocated and financial returns with Sustainability initiatives.

The integration of digital tools and the digitization of processes in business can help enable as well as accelerate the private sector's advancement and progress in addressing environmental challenges and promoting sustainability.



## Emerging Technologies enabling sustainability



### The role of Blockchain in sustainable supply chains

Blockchain technology revolutionizes supply chains by ensuring transparency, traceability, and accountability. It enables ethical sourcing, fair trade practices, and responsible production, reducing the environmental impact. Blockchain enhances sustainability by tracking emissions into the value chain and combating issues such as deforestation, human rights abuses, and unsustainable resource extraction, promoting a more transparent and sustainable value chains.

By leveraging IoT and 5G, supply chains can be optimized for sustainability, reducing carbon emissions across a range of industries, including logistics, manufacturing, energy, and smart city development. These links and automation have made the world more integrated and sustainable. As the cost of IoT devices continues to decrease, they are becoming a crucial tool for driving sustainability.

### The role of Internet of Things (IoT) and Fifth Generation networks in bringing efficiencies and enabling circularity

The implementation of 5G technology plays a significant role in promoting sustainability through efficient resource utilization. It enables real-time data collection, facilitates innovative solutions, and contributes to the reduction of carbon emissions.

Edge Computing, in conjunction with IoT applications can solve issues of food wastage, optimizes energy usage in smart city lighting, and improves water management, contributing to a more sustainable world. Edge computing optimizes resource efficiency by storing data on the edge of the infrastructure, reducing the need for transmitting large amounts of data across the global network and minimizing bandwidth usage.

The combination of IoT devices, cloud computing, edge computing, and 5G networks allows to gather accurate data and gain deeper insights, helping accelerate progression towards more sustainable practices. IoT and 5G technology enables remote operation, improving manufacturing efficiency and reducing energy consumption that help build a strong infrastructure that promotes sustainability. IoT sensors and 5G connectivity optimize resource usage, minimizing waste and promoting energy efficiency through real-time data collecting, analysis, and communication.

It enables companies to leverage their existing hardware and infrastructure, leading to better resource utilization and reduced environmental impact. By choosing Edge computing solutions aligned with sustainability goals, businesses can support principles of a circular economy, prioritize environmentally friendly product procurement, and contribute to a more sustainable and responsible business ecosystem.

## The role of Geospatial data as a telescope in sustainability journey:

Geospatial data makes use of location-based technology and satellite images to detect changes in land use, vegetation, forest cover for efficient resource management. It makes it possible to accurately map, monitor, and manage ecosystems, urban areas, and natural resources.

As per research firm Verdantix, the geospatial data industry is poised to play a crucial role in climate risk analysis. The market is predicted to be worth \$681 billion by 2025 and \$1.14 trillion by 2030. While the industry is highly competitive, few firms have developed comprehensive climate risk offerings.

However, the increasing adoption of regulations aligned with the Task Force on Climate-related Financial Disclosures (TCFD), along with financial stress testing, are expected to drive demand for climate risk digital solutions.

Financial service and insurance firms are leading the way in adopting geospatial climate data, using these to develop climate-resilient products and to predict the impact of climate events on portfolio values

Geospatial information aids in efficient urban planning, environmental protection, disaster risk management, hazard & vulnerability mapping and land suitability assessments. Geospatial data offers insightful information for environmentally conscious choices at local, national, and international levels, enabling decision-makers to put environmental protection into practice.

## The role of Robotics and Quantum Computing in emission and waste reduction, and resource optimization

Robotics plays a crucial role in promoting sustainability by improving efficiency, reducing waste generation, and minimizing environmental impacts. It has the potential to automate processes in manufacturing, transportation, and agriculture, resulting in reduced energy consumption, greenhouse gas emissions, and overall resource usage. Incorporating robotics into business practices can contribute to a more sustainable and equitable way of operating.

Additionally, quantum computing has the potential to make significant contributions to sustainability efforts. It can help optimize energy production and distribution, improve climate modelling and predictions, and optimize supply chains to reduce waste and improve efficiency. By leveraging the power of quantum computing, sustainability challenges can be revolutionized.





## GenAI

GenAI revolutionizes sustainability by integrating machine intelligence and creativity to tackle complex sustainability concerns and develop solutions. Better monitoring and management of resource utilization, helping save time and money, improve the accuracy and reliability of audits, and find opportunities for sustainability improvements.

It harnesses massive amounts of information to optimize allocation of resources, energy conservation, climate change mitigation and waste management strategies by leveraging its computational capabilities.

GenAI enables sustainable decision-making across industries by offering significant findings, supporting sustainable practices and encouraging sustainable growth.



## The Way Forward

As India marches forward to completing 100 years of independence and seizes its potential to become an advanced economy, it is imperative that we plan for factors that can impede our progress. India is among the top ten countries most affected by climate change as per the Global Climate Risk Index report 2021. With India's diverse ecology and critical dependence on agriculture as a source of livelihood, it is imperative for us to have a robust national adaptation plan to combat climate change. Achieving energy independence and decarbonization of power and manufacturing sector are other critical factors to manage.

India's diverse innovation ecosystem shows promise in leading the way to a greener future and resolving complex climate problems. Funding these climate focussed innovations specially in decarbonization of Hard to Abate Sectors, building infrastructure for EVs including the charging stations, climate smart agriculture, green hydrogen needs sufficient capital inflows. There is a need to scale up innovations by blending the traditional knowledge with conventional methods and embracing cutting-edge technologies.

The pledge of investing US\$ 100 billion every year for climate finance by developed nations in 2009 UN summit largely remains unfulfilled. The Loss and Damage Fund agreed upon in COP27 is yet to be operationalised. It remains to be seen the form this fund would possibly take, the countries who would participate and where and how the money would be distributed. However, India cannot delay investments in its own climate transition further, and hence would need to mobilise investments on its own and that too immediately.

This would require focussed efforts not just from the public sector and government spending but equally from private wealth and asset managers, commercial banks, and other large institutional players. Therefore, a comprehensive and robust climate finance strategy is the need of the hour.

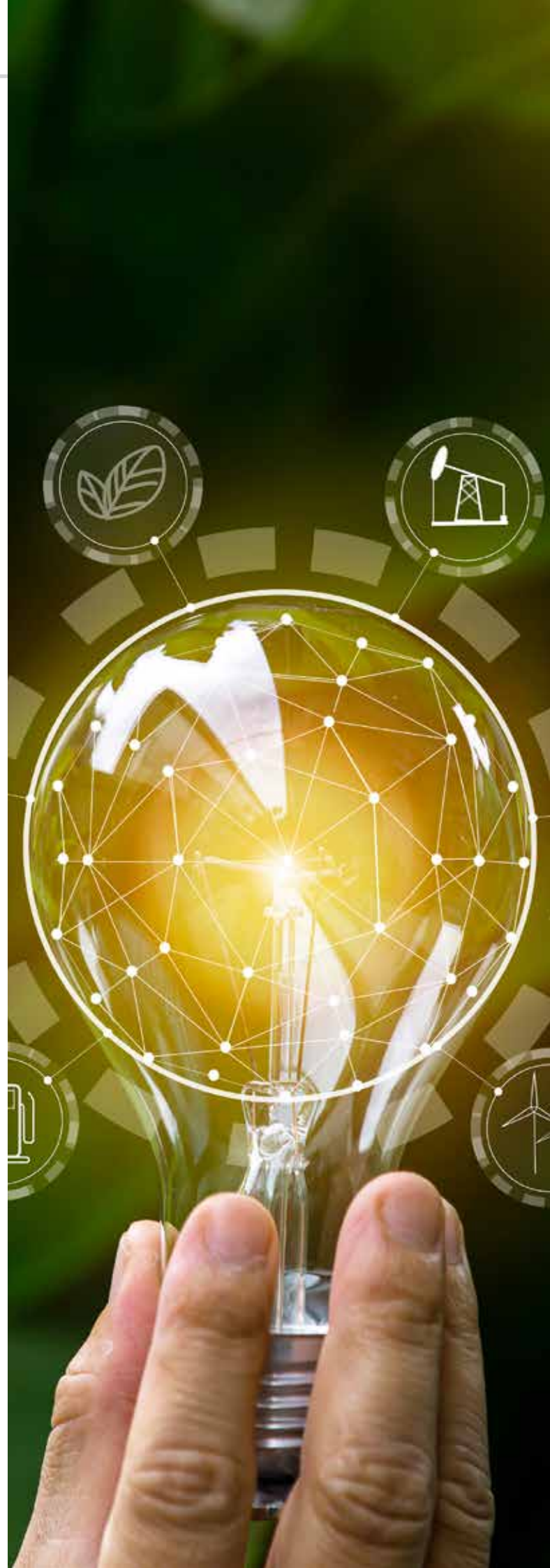
Developing a green taxonomy, strengthening the climate risk management practices and enhancing the quality of climate risk and ESG disclosures will be crucial to build confidence and increase fund inflows from international investors.

India's green taxonomy would need to factor in the specific nuances around geographic issues, cottage industries, MSME ecosystem and yet be simple. The ORF 2022 taxonomy is first step in this direction, and potentially further discussions between policy makers, regulators and industry bodies can help enhance this further. Establishing the taxonomy at the earliest will go a long way in building market discipline and strengthening the investor perception of India.

With respect to the role of Indian companies, ESG will play a core role in their transition to become global pioneers. ESG strategies have become an integral part of leadership discussions in prominent organizations and are integral to ensuring sustained growth and value creation. There is a growing need for companies in India to pursue technology and data-driven strategies on managing ESG-linked objectives, and to enable an ESG-led transformation. Pursuing ESG-related goals and a strategy, and prioritizing digitization in this journey, can enable enterprises to establish themselves as progressive, ESG-aware global leaders.

The growing importance of understanding the impact of climate change, and adaptation strategies, can be an enabler for enterprises to prioritize creating objectives and a strategy in responses to this emerging issue of importance. Digitization of ESG data management flows, processes, and foundational systems will prove crucial in this exercise and it is key to extend the data capture and measurement across the value chain.

To sustain and thrive in this new era of accelerating transformation and stakeholder capitalism, companies should embrace ESG as a strategic business imperative and measure its impact on key indicators including our natural ecosystems(Natural Capital).



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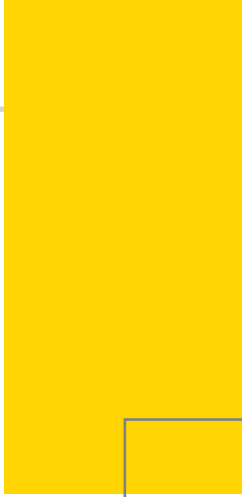
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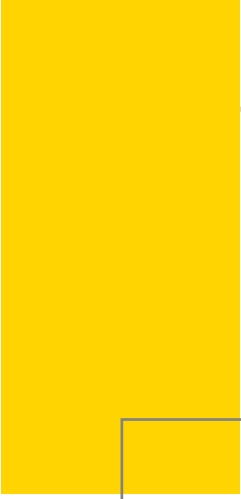
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## Notes

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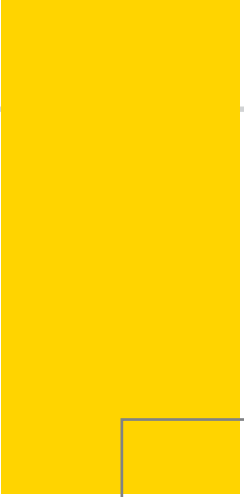
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### Indian Institute Of Sustainable Development (IISD)

<https://iisdindia.in/>

Indian Institute of Sustainable Development (IISD) is registered as a National Not-for-Profit, Independent Public Policy Think Tank and Scientific Research Institute at New Delhi, with an objective of working for ensuring overall improvement of lives and living of Common Man, through Research Innovations and engaging with Communities at grass-root level. IISD strives to put India into a Sustainable Path that is Inclusive and Equitable, involving People, Planet and Business.

### Carbon Minus India (CMI)

[www.carbonminus.org](https://www.carbonminus.org)

CMI is an Indian Institute of Sustainable Development (IISD) initiative, which is again a Leading Indian Public Policy Think Tank and Research Institute at New Delhi, committed to protect Our Only Planet, Mother Earth from Global Warming and other adverse impacts of Climate Change. CMI is engaged to evolve a strategic framework for India, in identifying low carbon growth opportunities and facilitates a series of planned and scaled-up program, striving for lowering the carbon intensity of the economy at the macro and sectoral levels, by creating synergies and addressing the barriers, potential trade-offs and appropriate Carbon Finance Models to remove these blockades. Moreover, CMI works to raise India's consensus efforts and for national preparedness to face and address global climate change adaptation and mitigation challenges.

### The Global Sustainability Summit (GSS) 2023

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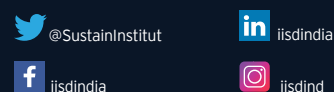
The Global Sustainability Summit (GSS) 2023, is Organized by Indian Institute Of Sustainable Development (IISD) and it's Initiative Carbon Minus India (CMI); Both are National Public Policy Think Tanks and Global Scientific Research Institutes; aims to bring together Distinguished Policymakers, Diplomats and Ambassadors, Thinkers and Thought Leaders, from India and abroad, United Nations Professionals, Top Industry Leaders, Renowned Academicians, Scientists, and Enthusiastic Youths; to a Common Platform for not only exchanging ideas; but also to finding right workable methods and social, environmental and business models, replicating sustainable practices, to provide appropriate solutions to the complex challenges the Planet is encountering today for a Resilient and Decarbonized Society.

To Celebrate India's Global Leadership at G 20 Presidency, 75 years of India's Independence, along with the auspicious Celebration their 15 years of Dedicated Service to the Nation and the Planet in the fields Sustainability and Decarbonization, IISD and CMI, are Organizing the Global Sustainability Summit on 20th July 2023 at Vigyan Bhawan New Delhi.

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