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Global Climate Finance Taxonomy

Lessons for India



RENU KOHLI AND KRITIMA BHAPTA



Global Climate Finance Taxonomy: Lessons for India

Authors:

Renu Kohli and Kritima Bhapta

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6, Dr Jose P. Rizal Marg, Chanakyapuri,

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Executive Summary

India is at a pivotal moment in shaping the future of sustainable finance. As the country scales up its climate ambitions, the effective mobilisation of private capital remains a critical challenge. A central obstacle has been the absence of a clear, standardised system for identifying and classifying environmentally sustainable activities. Recognising this gap, the Government of India (GOI) recently released a “draft Climate Finance Taxonomy Framework,” a significant step toward providing much-needed clarity for investors, regulators, and financial institutions.

The draft framework sets out guiding principles, environmental objectives (EOs), and a sectoral structure that will be used to build the taxonomy. This report examines the government’s draft framework and places it in context by comparing it with leading international taxonomies. It argues that for the taxonomy to succeed in mobilising finance at scale, it must be more than just a technical classification; it should function as a practical, inclusive, and dynamic policy tool that reflects India’s developmental realities and capacities. A green taxonomy should not only promote transparency and improve investor confidence but also support a wide range of stakeholders, especially micro, small, and medium enterprises (MSMEs), which often face barriers in accessing green finance due to high compliance costs and limited capacity.

The report explores four interconnected themes that are critical for the effective design and implementation of India’s climate finance taxonomy, all of which are aligned with the priorities articulated in the draft framework:

- **Global Comparison:** We present a comparative analysis of green taxonomy frameworks adopted globally, including those of the European Union (EU), China, the Association of Southeast Asian Nations (ASEAN), Singapore, Indonesia, South Africa, and Australia. The report examines their core structures, classification methodologies, and implementation experiences. While these taxonomies have played an important role in scaling up sustainable finance, many have encountered challenges related to technical complexity, inconsistent data, limited interoperability, and a lack of regulatory integration. This analysis distils specific lessons, both positive and cautionary, for India as it operationalises its taxonomy and tries to offer solutions.
- **Mapping of Domestic Economic Activities:** A key feature of any taxonomy is the identification of eligible economic activities, which is typically done using domestic or international classification systems. The idea is to create broad, clearly defined categories under which green technologies, projects, and corresponding technical screening criteria (TSC) can be organised. This report undertakes a structured mapping of India’s economic activities using the National Industrial Classification (NIC) system, aligned with international frameworks such as the International Standard Industrial Classification (ISIC). This exercise forms the initial groundwork for identifying eligible activities under India’s taxonomy. While not a standalone tool for determining environmental sustainability, the mapping provides a starting point for defining technical screening thresholds and environmental performance benchmarks in the future.
- **MSME Inclusion:** Recognising that MSMEs play a vital role in India’s economy but are often excluded from climate finance flows, the report highlights the importance of incorporating simplified, proportionate, and flexible evaluation mechanisms tailored to the needs of smaller enterprises. Drawing on examples from countries such as Indonesia and the Philippines, we examine alternative models that could be adapted for India to alleviate the burden of compliance and promote broader participation in the green economy.

- **Green Technology:** The report also focuses on indigenous green technologies and their alignment with the objectives of the draft framework. By analysing innovations in the power, mobility, and agriculture sectors, the study demonstrates how locally developed technologies can contribute to mitigation, adaptation, and transition goals. At the same time, it identifies key barriers to scaling these innovations.

The report shows that India has the opportunity to learn from international experiences while creating a taxonomy that reflects domestic priorities, supports green innovation, and expands access to finance for all stakeholders, including MSMEs. The recommendations presented in the final section aim to help bridge the gaps, ensuring that the taxonomy becomes a credible, interoperable, and widely adopted tool. If executed effectively, India's taxonomy can set a global benchmark for emerging economies.

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Abbreviations

ACWI	All Country World Index
AFOLU	Agriculture, Forestry, and Other Land Use
ASEAN	Association of Southeast Asian Nations
BESS	Battery Energy Storage Systems
BUR	Biennial Update Report
CCTS	Carbon Credit Trading Scheme
CCUS	Carbon Capture and Storage
CDP	Carbon Disclosure Project
CFPPs	Coal-Fired Power Plants
CGT	Common Ground Taxonomy
DFIs	Development Finance Institutions
DNSH	Do No Significant Harm
EO	Environmental Objective
ESG	Environmental, Social, and Governance
ETS	Emissions Trading Schemes
EU	European Union
FF	Foundation Framework
FSC	Forest Stewardship Council
GDP	Gross Domestic Product
GFT	Green Finance Taxonomy
GFTF	China–Singapore Green Finance Taskforce
GHG	Greenhouse Gas
GOI	Government of India
GVA	Gross Value Added
ICMA	International Capital Market Association
ICNEA	Industrial Classification for National Economic Activities
ICT	Information and Communication Technologies
ILO	International Labour Organisation
ISIC	International Standard Industrial Classification
KPI	Key Performance Indicator
MAS	Monetary Authority of Singapore
MSMEs	Micro, Small, and Medium Enterprises
NBFCs	Non-Banking Financial Companies
NDC	Nationally Determined Contributions
NIC	National Industrial Classification
OECD	Organisation for Economic Co-operation and Development
PLI	Production Linked Incentive
PM-KUSUM	Pradhan Mantri Kisan Urja Suraksha Evam Utthaan Mahabhiyan
PS	Plus Standard
PSL	Priority Sector Lending
PSPs	Pumped Storage Plants
PV	Photovoltaic

R&D	Research and Development
RBI	Reserve Bank of India
RMT	Remedial Measures to Transition
RSPO	Roundtable on Sustainable Palm Oil
SBFN	Sustainable Banking and Finance Network
SBTi	Science-Based Target Initiative
SDT	Sector-Agnostic Decision Tree
SEBI	Securities Exchange Board of India
TSC	Technical Screening Criteria
TCFD	Task Force on Climate-related Financial Disclosures
UAVs	Unmanned Aerial Vehicles
UNESCAP	United Nations Economic and Social Commission for Asia and the Pacific
UNFCCC	United Nations Framework Convention on Climate Change
UoP	Use of Proceeds
VRFBs	Vanadium Redox Flow Batteries
y-o-y	Year-on-Year

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01

Introduction

India, like many countries, stands at a critical point of securing adequate financing to meet its ambitious goals outlined in its nationally determined contributions (NDCs). To meet these climate commitments, India's NDC submission estimated a need for USD 2.5 trillion over the period 2015–2030 (Ministry of Environment, Forest and Climate Change [MoEFCC], 2021). While many of the financing concerns have centred around mitigation, the cost of adaptation is equally significant. According to India's Fourth Biennial Update Report (BUR) to the United Nations Framework Convention on Climate Change (UNFCCC), adaptation alone is likely to require a total expenditure of INR 85.6 lakh crore, or approximately USD 1.03 trillion¹ by 2030 (MoEFCC, 2024).

India's green transition hinges on substantial investments in cutting-edge green technologies, increasing energy efficiency, renewable energy installations, and sustainable infrastructure. While public funding is crucial for foundational infrastructures and policy support, the immense scale of climate action demands deep involvement of the private sector. Developed countries have fallen short of meeting their commitment to provide USD 100 billion to developing countries as climate finance each year. Despite efforts within, private capital flows into green projects are obstructed by uncertainties and risks surrounding such investments, where the absence of standardised criteria for assessing their sustainability is a major problem. Presently, the lack of a taxonomy is a major stumbling block for investors, who may be willing to finance projects, as well as for governments trying to access funding for green investments. As India advances with initiatives such as the domestic carbon market and green credit program, a clear and inclusive taxonomy will be crucial for directing investments and monitoring the growth of green finance.

The government has made recent efforts to plug this gap. As part of its broader climate finance strategy, the development of a climate finance taxonomy, which is vital for directing capital towards climate-resilient infrastructure and projects, has advanced significantly. A draft framework for the taxonomy was recently released for public consultation by the government. This is a major step forward and is especially important because greenwashing (misleading and false claims about the sustainability of a project, service, or business operation) has emerged as a major challenge in climate finance.

¹ At an average exchange rate of USD 1 = INR 82.78.

Equally important are the transition financing challenges for MSMEs, which usually face limited resources and the capacity to meet complex compliance requirements. The draft framework responds to these concerns. It introduces the proportionality principle and suggests simplified reporting mechanisms, although specific implementation guidelines are yet to be finalised. The proposed framework also emphasises the need to promote indigenous technologies, ensuring the local context is reflected in the taxonomy.

Motivated by this context, this report evaluates the current global landscape of green taxonomies, highlighting their key characteristics and methodologies. It is organised as follows: Section 2 provides an overview of the concept of a green taxonomy, emphasising its role in standardising what defines sustainability. It draws upon established frameworks like those of the World Bank, United Nations Economic and Social Commission for Asia and the Pacific (UNESCAP), Sustainable Banking and

Finance Network (SBFN) Toolkit, and Climate Bond Initiative to put forth the key general characteristics of a green taxonomy. Section 3 examines existing global taxonomies like the EU, ASEAN, China, and some others to identify best practices, methodologies, and implementation lessons. Structured into two parts, the cross-taxonomy comparison examines differences in design, structure, and underlying principles, followed by an evaluation of their respective implementations in practice and an assessment of the extent to which the intended objectives are met.

Section 4 explores how global taxonomies address MSMEs' inclusion and evaluates existing thresholds, proportionality principles, and simplified compliance mechanisms that could possibly be adapted to meet India's needs. Section 5 reviews the existing indigenous green technologies for India and their integration into the draft framework while identifying key barriers to scaling. Section 6 offers policy recommendations.

02

Designing a Green Taxonomy Framework

According to the International Capital Market Association (ICMA, 2021), “a green taxonomy is a system that identifies activities, assets, or project types aligned with key climate, environmental, social, or sustainability objectives (based on specific thresholds or targets) as green.” As green financing tools such as green bonds, carbon credits and offsets, green loans, and emissions trading schemes (ETS) gain traction, the need to establish clear definitions of green activities or investments has become more urgent. This has substantially accelerated the advancement of green or climate finance classification frameworks.

A green taxonomy offers multiple advantages. **First, it directs green investment** by guiding environmentally conscious investors to identify climate-aligned opportunities through clear and credible signals about which investments qualify. Private capital is more likely to be directed toward environmentally responsible sectors as a result of a taxonomy framework, thus enhancing the pipeline of eligible projects with manageable risks and potential returns.

Second, it helps **mitigate greenwashing**, a practice where companies falsely claim their projects to be environmentally friendly in order to attract investments in supporting the low-carbon transition. This misrepresentation can lead to funds being improperly allocated to initiatives that do not meet sustainability standards, undermining both investor trust and environmental goals. A taxonomy, therefore, eliminates these subjective interpretations of what is considered “green.”

Third, a taxonomy also **reduces information asymmetry** among its stakeholders by setting out uniform definitions and evaluation criteria that help bridge information gaps between investors, project developers, financial institutions, and regulators. The specific advantages to each of the main stakeholder groups are detailed below:

- i. **Funders/Investors:** This includes a broad spectrum of institutional investors, asset managers, venture capitalists, and other entities that allocate capital across various sectors and geographies. For them, a green taxonomy serves as a critical tool in: (a) identifying credible investment opportunities by establishing clear definitions of what qualifies as environmentally sound; (b) facilitating portfolio diversification into climate-aligned assets;

- (c) enabling access to emerging markets recognised as sustainable; and (d) supporting Environmental, Social, and Governance (ESG) objectives.
- ii. **Policymakers:** This consists of central ministries, planning bodies, and other government agencies that are responsible for setting climate goals, drafting national plans, and aligning investment with development priorities. A green taxonomy helps them by: (a) measuring progress toward climate goals by identifying investment gaps and monitoring the allocation of green capital; (b) aligning domestic policy frameworks with international environmental commitments; and (c) identifying priority sectors for stimulating green investments, innovation, and employment creation in environmentally aligned industries.
 - iii. **Banking Entities/Financial Institutions:** Commercial banks, non-banking financial companies (NBFCs), development finance institutions (DFIs), and other lenders play a pivotal role in financing infrastructure, enterprises, and public-private initiatives. For these institutions, a green taxonomy: (a) provides a standardised framework that enhances their ability to assess and manage financial and environmental risks; (b) supports regulatory compliance by offering clear guidelines for classifying and reporting climate-aligned financial products; (c) strengthens an institution's public reputation and credibility; and (d) enables the development of innovative financial instruments by providing clarity on what qualifies as environmentally sustainable.
 - iv. **Financial Regulators:** Central banks, securities regulators, and financial oversight bodies are supported with a green taxonomy that: (a) provides a basis for assessing and mitigating systemic risks related to climate change; (b) encourages standardised reporting across financial institutions, improves the efficiency of regulatory oversight, and enables better data comparability; and (c) empowers regulators to design targeted incentives

or mandates that promote sustainable investment practices.

2.1 Global Approach to Designing a Taxonomy

As the number of taxonomies grows, so does the need for comparability amongst them. The objective of taxonomies extends beyond encouraging domestic investments to facilitate cross-border capital flows. Therefore, taxonomies must be built on consistent foundations that can reduce market segmentation and enhance interoperability. In other words, the classification systems are best based on comparable norms for uniform applicability across different regions and stakeholders. When taxonomies are interoperable, they can enable investors to allocate capital across borders more efficiently. There should be no gaps in understanding.

In response to this, international agencies like the UNESCAP (UNESCAP, n.d.), the World Bank (Hussain et al., 2020), Climate Bonds Initiative and UK PACT (2022), ASEAN Taxonomy Board (2024), and others have founded guidelines for alignment towards these objectives. The same have been summarised below, along with the various steps involved in designing a taxonomy.

- i. **Define the Taxonomy's Objectives and Goals:** The main objectives might include classifying activities as environmentally sustainable or not, encouraging investments in green projects, mobilising capital to achieve a net-zero transition and meet climate-related targets, and monitoring the flow of investments into green initiatives. Meanwhile, the environmental goals should align broadly with the country's declared climate action strategies, such as its NDCs and other developmental priorities. These objectives can typically encompass areas like climate change mitigation and adaptation, preventing and controlling pollution, recycling waste, conserving resources, protecting ecological and biodiversity systems, and transitioning towards a circular economy.

ii. **Identify Sectors Defining Taxonomy Scope:** After establishing the objectives, the next step involves selecting priority sectors such as electricity generation, manufacturing, construction, and transportation. These sectors might be chosen based on their economic significance and environmental impact. For economic relevance, the sector's impact on the country's overall gross value added (GVA) could be considered. For the environmental impact, factors such as the amount of greenhouse gas (GHG) emissions they produce or their emission intensity could be examined (ASEAN Taxonomy Board, 2021).

iii. **Assess and Identify Projects in Priority Sectors:** This process can follow different approaches. For instance, China's whitelist-based method directly identifies and lists green projects recognised as environmentally friendly. In contrast, the EU classifies activities as green or non-green using its domestic industrial classification system (ISIC aligned), ensuring international harmonisation (ICMA, 2021). Beyond identifying the primary projects and activities that directly achieve environmental goals or are already low-carbon, it is essential also to recognise **enabling activities** (activities that support other actions in achieving environmental goals) and **transitional activities** (activities that support the shift from high- to low-carbon practices) (European Commission Technical Expert Group on Sustainable Finance, 2019).

iv. **Identify Beneficiaries:** A crucial step in designing a taxonomy is clearly identifying its primary users and intended beneficiaries. We have already outlined the key actors involved, but further detailing their specific roles and expectations can help refine the taxonomy's usability and relevance.

v. **Guidelines for Reporting and Compliance:** For a taxonomy to be functional and credible, it must be accompanied by clear guidance on

reporting and compliance. This includes defining how entities should report taxonomy-aligned activities, specifying the metrics or indicators to be used, and outlining the process for assessing compliance. The framework should also provide clarity on verification mechanisms, whether self-declared, third-party certified, or regulator-audited.

vi. **Implementation:** A phased and strategic roadmap is critical to guide the rollout of the taxonomy. This should include timelines and milestones for when different actors, especially private sector entities, are expected to begin aligning with and disclosing taxonomy-compliant activities. It should clarify the responsibilities of various regulatory bodies in terms of supervision, oversight, and enforcement. The roadmap should also indicate when the taxonomy is likely to become mandatory and provide a mechanism for periodic updates or expansions based on emerging technologies, global developments, or national policy shifts (SBFN, 2024).

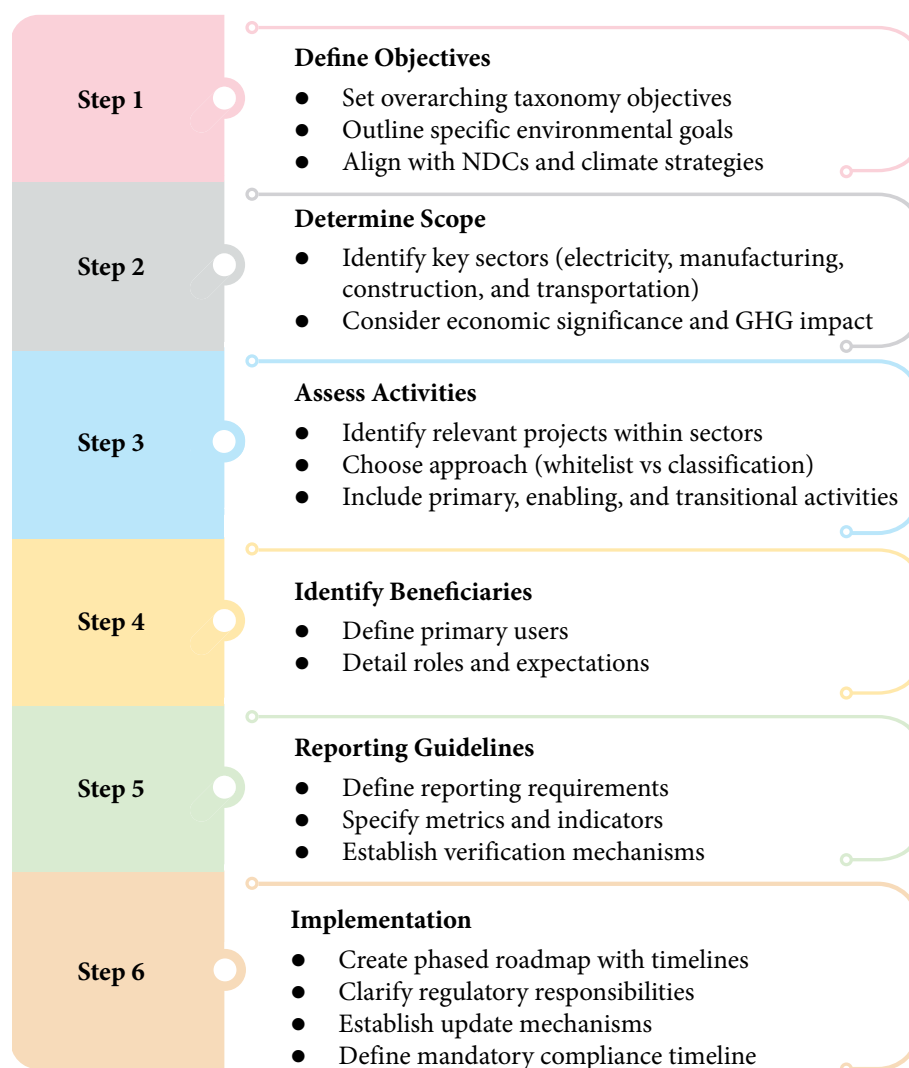
Regardless of the chosen approach, the taxonomy must adhere to the following principles:

- i. **Eligibility Criteria:** Ensure that activities and projects meet specific screening standards to qualify for the taxonomy. These criteria can be technology-based, promoting the use of particular technologies (especially indigenous ones) to qualify a project or activity. Alternatively, they may involve meeting certain thresholds or standards, such as maximum limits on GHG emissions, pollution levels, or electricity usage.
- ii. **Flexibility:** Maintain adaptable frameworks to accommodate evolving activities and projects. As technologies, markets, regulations, and policies change over time, the taxonomy frameworks must be flexible.

- iii. **Do No Significant Harm (DNSH):** Adopt the principle of avoiding significant negative impacts on other EOs. Activities and projects should be evaluated to ensure they do not cause substantial harm to other existing environmental goals, maintaining a balanced approach to sustainability.
- iv. **Consistency:** Ensure comparability and uniformity across different sectors, regions, and countries. This allows for easy comparison and benchmarking of green investments, preventing conflicting classifications and promoting standardised evaluation criteria.
- v. **Scientific Basis:** Ground the taxonomy in scientific evidence and maintain transparency. Whenever possible, the taxonomy should be based on scientific research and data, ensuring that classifications are reliable and transparent.

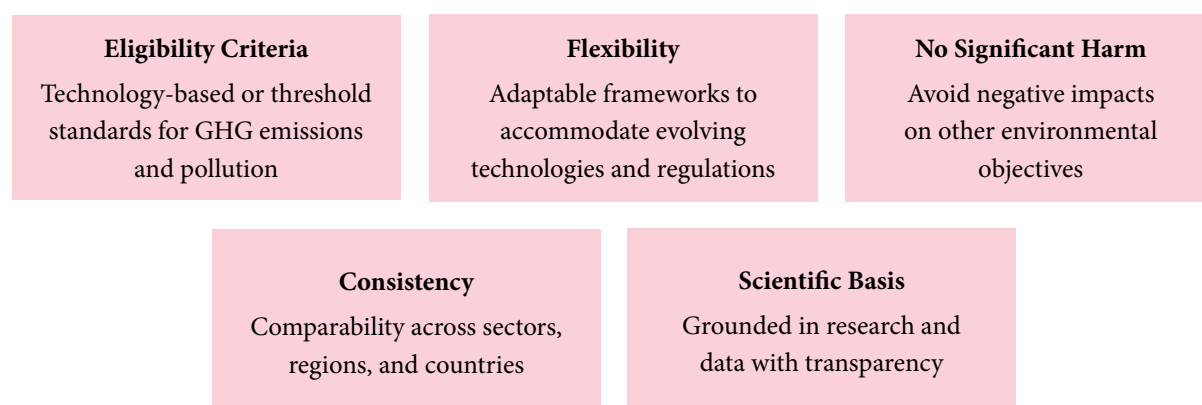
Figures 1 and 2 summarise the steps involved in designing a green taxonomy and some of its key principles:

Figure 1: Taxonomy Design Process



Source: UNESCAP (UNESCAP, n.d.), the World Bank (Hussain et al., 2020), Climate Bonds Initiative and UK PACT (2022), ASEAN Taxonomy Board (2024), SBFN (2024).

Figure 2: Key Principles Throughout the Process



Source: UNESCAP(UNESCAP, n.d.), the World Bank (Hussain et al., 2020), Climate Bonds Initiative and UK PACT (2022), ASEAN Taxonomy Board (2024), and SBFN (2024).

03

Cross-Country Comparison

There is no single approach when it comes to green taxonomies, despite there being many commonalities. Countries worldwide are actively developing green taxonomies that cater to their unique policy priorities, economic structures, and EOs. While the overarching aim is the same, to define an environmentally sustainable activity, the approaches vary considerably in terms of methodology, definitions, and classification standards. This section attempts a cross-country comparison of existing taxonomies. The first part examines the design of different frameworks, including structure, scope, and guiding principles. The second part evaluates how these have been implemented in practice, viz., their usage, progress, and associated challenges. The insights provide a clearer perspective of what works, what does not, and what lessons can be drawn for countries engaged in building their own green finance frameworks.

To begin with, China uses a *whitelist* system. This means the government provides a fixed list of activities and technologies that are officially recognised as climate-friendly. The EU's approach, in contrast, is termed *technology-neutral*. Instead of naming specific technologies, it sets environmental performance standards that must be met by any activity to be considered green. This allows for flexibility and encourages innovation, as multiple technologies can qualify as long as they achieve the desired outcomes. A third approach, as observed in ASEAN's foundation framework (FF), is *principle*-based. This framework allows activities to be evaluated based on how well they align with environmental goals, using qualitative principles instead of detailed technical criteria (Climate Bonds Initiative & UK PACT, 2022). Together, these diverse approaches highlight the essential role that well-defined green and climate finance taxonomies play in standardising criteria and aligning investment flows with climate objectives.

3.1 Design and Structure of Global Green Taxonomies

Before examining the approaches adopted by other countries, we first review India's draft framework, outlining its key elements to establish a reference point for comparison.

India

The *Draft Climate Finance Taxonomy* (Ministry of Finance, Department of Economic Affairs, 2025) is the country's initial attempt to establish a structured system for identifying and monitoring green activities. India has adopted a hybrid approach in its framework, starting with qualitative principles and gradually introducing numerical thresholds as better data and technologies become available.

- i. **Core Objectives:** The framework is built around three central aims: (i) supporting mitigation of GHG emissions; (ii) enabling adaptation to climate impacts; and (iii) facilitating the transition of sectors that are difficult to decarbonise. These goals are tied closely to India's national climate commitments and its developmental vision under *Viksit Bharat 2047*.
- ii. **Priority Sectors:** To deliver on these objectives, the taxonomy highlights key areas of focus. These include energy and power, agriculture, transport, construction and buildings, food and water systems, as well as heavy industries such as iron and steel and cement.
- iii. **Classification of Activities:** Economic activities are grouped into three categories.
 - Climate Supportive-Tier 1 will consist of activities that directly cut GHG emissions and emissions intensity and enhance resilience.
 - Climate Supportive-Tier 2 will include those that improve efficiency, lower emission intensity with pathways for improvement, and provide adaptation benefits, but may lead to some GHG emissions.
 - Transition activities capture projects in sectors like steel or cement, where no affordable or viable low-carbon alternatives exist today, but which remain essential for India's economy and future decarbonisation.

- iv. **Guiding principles:** The design of the taxonomy rests on several key principles:
 - Alignment with climate and development priorities so that activities support India's national goals.
 - The principle of DNSH, ensuring one objective is not pursued at the expense of another.
 - Context-specific pathways, reflecting India's unique development challenges and opportunities.
 - Interoperability with international taxonomies, promoting consistency with global frameworks.
 - Proportionality, particularly to ensure MSMEs are not excluded.
 - A strong focus on indigenous technologies, encouraging home-grown innovation and deployment.
 - Science-based and transparent processes to build credibility and trust in the framework.
 - A living framework: The draft taxonomy will be designed to evolve, incorporating emerging technologies, new policy targets, and updated datasets.

The EU (2020)

The EU was the first global actor to establish a legally binding green taxonomy. It has since served as a benchmark for numerous other countries seeking to design their own green finance frameworks. To date, it remains the most comprehensive taxonomy globally, with the widest sectoral reach and level of detail, encompassing nine sectors and 88 sub-categories. These include agriculture, forestry, manufacturing, construction and real estate, utilities (electricity, gas, steam), waste, sewerage and water management, transportation, information technology, finance, insurance, and professional services.

Its mandatory application extends to all EU member states and financial entities (e.g.,

insurance firms, pension funds, and venture capital managers) that market their investment products as environmentally sustainable. Furthermore, large non-financial corporations (with more than 500 employees) are required to report the share of their revenue, capital investment, and operating costs that are aligned with taxonomy-compliant activities. Significant reporting obligations also apply to major banks and asset managers, who must disclose performance indicators related to sustainability compliance.

Although the taxonomy is not compulsory for all banks, many adopt it voluntarily to boost transparency and attract investors committed to sustainable outcomes by acting as lenders, issuers of green bonds, and service providers. Similarly, financing projects is also voluntary, which is particularly beneficial in sectors such as infrastructure and industry, where financial alignment with environmental goals is more easily defined. It is relatively straightforward to identify which components are taxonomy-eligible, such as building a wind park. The EU Taxonomy is not yet compulsory for all green bond issuers. However, in July 2021, a voluntary EU Green Bond Standard was proposed, requiring the full allocation of bond proceeds to taxonomy-aligned activities.

At its core, the EU taxonomy defines six key EOs: (i) reducing GHG emissions (mitigation); (ii) adapting to climate change; (iii) improving water and marine resource use; (iv) circular economy; (v) pollution control; and (vi) protecting and restoring ecosystems. The EU uses the NACE codes (the industrial classification system in the EU and comparable with the UN's ISIC) to categorise activities, which rest on three guiding criteria: (i) significant contribution to at least one environmental goal; (ii) no adverse impacts on other objectives; and (iii) adherence to social safeguards while allowing for technology neutrality. Activities are further classified as those that enable greening, those being greened themselves, or those facilitating transition, especially of the hard-to-abate sectors. Fossil-fuel-based and coal-linked activities are categorically excluded.

The framework combines both quantitative and qualitative criteria. The quantitative aspect is reflected in the TSC—technical performance standards are articulated through metrics such as emission limits or energy efficiency ratios, aligning activities with the EU's environmental ambitions. On the other hand, qualitative conditions include the principle of “social safeguard” requirements that reference global labour, human rights, and corporate governance standards set by bodies like the International Labour Organisation (ILO), Organisation for Economic Co-operation and Development (OECD), United Nations, and “DNSH.”

China

In contrast, China's sustainable finance classification, or the Green Bond Endorsed Projects Catalogue (2021), functions as the main reference for the issuance of green bonds in the domestic market. Developed as a regulatory tool, it mandates use by all bond issuers, such as corporates, financial institutions, and state-owned enterprises, ensuring that only projects with demonstrable environmental benefits receive green financing. The framework identifies the following sectors: (i) energy conservation, (ii) clean manufacturing, (iii) clean energy, (iv) ecological restoration, (v) sustainable infrastructure, and (vi) environmentally oriented services. These domains reflect China's strategic environmental priorities and are organised into a four-level classification system (the Industrial Classification for National Economic Activities [ICNEA]) covering over 200 specific activities.

While the taxonomy does not explicitly list mitigation and adaptation as its environmental goals, its categories implicitly support these objectives. The three overarching goals are: (i) climate action; (ii) environmental quality enhancement through pollution control and ecological restoration; and (iii) efficient resource use, including support for recycling, circular economy models, and waste management. To be eligible, an activity should: (i) contribute to at least one environmental

goal; (ii) meet regulatory conditions defined in the Green Industry Guiding Catalogue and supporting documents; and (iii) comply with environmental, safety, and quality norms.

China's approach is primarily qualitative, favouring the use of mature, proven technologies prevalent in its domestic market. Therefore, it is not technology-neutral. There is no separate DNSH test or EU-style minimum safeguard regime. However, certain Environmental, Health, and Safety (EHS) regulations (e.g., labour security standards and industrial sanitary codes) serve as baseline protections. While some activities refer to domestic technical standards or performance benchmarks, quantitative thresholds such as specific emission limits are largely absent or only selectively applied. For example, green building materials must meet national standards, but there are no overarching numerical caps on energy consumption or emissions. In a major shift toward international credibility, the 2021 revision excluded "clean coal" and fossil fuel-based power from eligibility.

The Association of Southeast Asian Nations (ASEAN)

ASEAN Taxonomy Board (2024) provides a voluntary framework designed to act as a guide for its member jurisdictions, central bankers, financial institutions, regulators, stock exchanges, fund managers, and rating agencies. The framework identifies six sectors, including agriculture, energy, manufacturing, transportation, water and waste, and construction. It also includes enabling sectors such as information and communication technologies (ICT), carbon capture (CCUS), and scientific services, recognising their role in facilitating broader sustainability goals. While the taxonomy does not impose legal obligations, it encourages alignment and consistency in how green activities are defined and financed across the region.

ASEAN's classification system is structured around four environmental priorities: (i) mitigation, (ii) climate resilience, (iii) biodiversity protection, and (iv) circular economy transition. Activities are evaluated using a traffic-light model: green for fully aligned initiatives, amber for those transitioning toward sustainability, and red for harmful or non-compliant activities. The taxonomy operates on two layers. The FF provides a principle-based evaluation using policy alignment and sectoral readiness, while the plus standard (PS) introduces quantitative screening metrics for more advanced users. Criteria under the PS include emissions intensity, resource use efficiency, and adherence to circular economy principles. To ensure robust safeguards, the framework incorporates DNSH, provisions for social equity, and Remedial Measures to Transition (RMT) protocols, ensuring amber activities can progress to green. The ASEAN taxonomy is more flexible. For example, a gas power plant can be labelled as "amber," meaning it is seen as a transition activity moving toward sustainability, unlike the EU and China taxonomies.

Singapore

Singapore's green taxonomy (Monetary Authority of Singapore [MAS], 2022) is another voluntary framework that encompasses 10 critical sectors, including agriculture, energy, water, transport, construction, industry, forestry, ICT, CCUS, and waste management. Although it is not mandatory, it is tailored for use by financial institutions, regulators, corporates, and researchers, and is compatible with global disclosure regimes such as the Task Force on Climate-Related Financial Disclosures (TCFD), Carbon Disclosure Project (CDP), and the Science-Based Target Initiative (SBTi). The taxonomy outlines five environmental goals of mitigation, adaptation, ecosystem protection, promotion of the circular economy, and pollution control.

Singapore adopts a traffic-light model similar to ASEAN's, classifying activities as green, Amber, or Red based on emissions performance and sustainability commitments. Activities that are aligned with the 1.5°C climate trajectory fall under the green category, while those in the Amber zone must have measurable transition plans. These activities are subject to *sunset dates* (generally by 2030), after which they must convert to green or become ineligible. The Red category includes activities deemed fundamentally incompatible with climate targets. Quantitative indicators such as science-based emissions thresholds are used alongside qualitative assessments that consider DNSH compliance and alignment with broader environmental and social objectives. Oversight is provided by the Sustainable Finance Association of Singapore, which ensures coherence with international standards and continuous updates. A distinguishing feature of Singapore's approach is the inclusion of criteria for phasing out coal and supporting early retirement of high-emission assets within a defined timeline.

Indonesia

Indonesia's sustainable finance taxonomy, the TKBI (Indonesia Taxonomy Board, 2025), is similarly structured as a voluntary tool but is explicitly designed to address the country's unique development context. It applies across multiple sectors, including energy, agriculture, industrial processes, waste management, forestry, and land use. Stakeholders—including financial institutions, government agencies, corporations, and investors—are encouraged to use the taxonomy for sustainable investing, disclosure, and policy development. Activities are categorised using Indonesia's KBLI classification codes and fall into three buckets: green (sustainable), transition (moving toward sustainability), and unqualified (ineligible).

EOs embedded in the TKBI include mitigation, adaptation, biodiversity conservation, and promotion of a circular economy. Both qualitative and quantitative evaluation methods are employed. Performance

thresholds, such as emissions per unit or best-in-class criteria, are used in conjunction with qualitative checks that assess alignment with international standards, including those from the ILO and OECD. The taxonomy introduces simplified assessment mechanisms for MSMEs and more technical criteria for larger entities. It also incorporates DNSH principles, social impact evaluations, and transitional support mechanisms to ensure environmental integrity while avoiding greenwashing.

South Africa

South Africa's taxonomy (National Treasury, 2022) draws heavily from the EU framework but adapts its criteria to reflect domestic socioeconomic and environmental realities. It is currently a voluntary standard used by public and private entities, including regulators, financial institutions, corporations, and municipalities. Mining houses and non-financial businesses reporting under sustainability frameworks also fall within its scope. The taxonomy spans a broad set of sectors: agriculture, forestry, fisheries, manufacturing, mining, transport, construction, ICT, energy, waste and water management, professional services, and enabling activities related to social resilience and infrastructure.

The environmental goals outlined in the framework encompass climate change adaptation and mitigation, resource use efficiency, pollution control, protection of aquatic systems, and ecosystem restoration. Activities must contribute substantially to at least one objective while meeting DNSH safeguards and minimum social criteria, which are grounded in ILO and UN principles.

Mitigation-related activities include renewable energy, clean transportation, and carbon sequestration. Adaptation measures, on the other hand, must rely on localised climate risk data and provide resilience to climate shocks. South Africa's approach incorporates both quantitative benchmarks and qualitative reviews, making it flexible

and responsive to scientific and technological developments. The taxonomy is structured as a living document, with plans for periodic revision to integrate emerging priorities and updated technical criteria.

Australia

Australia's Sustainable Finance Taxonomy is the newest to be developed. The first version has been released for voluntary use by a wide set of actors, including corporates outside the financial sector, banks and other lenders, bond issuers, investors, asset managers and owners, as well as public bodies. The taxonomy covers the sectors of agriculture and land, mining and metals, manufacturing and industry, power generation and supply, construction and buildings, and transport. It sets out six EOs: mitigation, adaptation and resilience, biodiversity and ecosystem protection, sustainable use and management of water, pollution prevention and control, and the move toward a circular economy. In its initial stage, the taxonomy focuses on creating performance thresholds for climate mitigation.

Its most notable element is the two-tier system of green and transition. Activities qualify as green if they fall into one of three categories: low or zero-emission activities or substitutes, high-performing activities where no low-emission alternatives are available, and enabling activities. Transition refers to the decarbonisation of high-emitting activities so that their performance aligns more closely with a 1.5°C pathway. Transition criteria apply when financing is sought to decarbonise parts of an activity (such as assets, facilities, or projects) that have significant Scope 1 and 2 emissions and continue to have demand in a net-zero economy. Where a low-emission substitute exists, new activities must meet green requirements. Where no substitute exists, such as in mining, transition criteria can apply.

The framework also applies the principles of DNSH, ensuring mitigation-aligned activities do not undermine the other objectives, and Minimum Social Safeguards (MSS) (Australian Sustainable Finance Institute, 2025). Table 1 summarises the mandates, sectors, objectives, classification methods, principles, and key features of major green taxonomies across seven countries and regions.

Table 1: Global Green/Climate Finance Taxonomies-Cross-Country Comparison

Country/ Region	Mandate	Sectors Covered	Environmental Objectives	Classification Approach	Principles	Key Features
European Union	Mandatory for EU member states, financial market participants, and large corporates; voluntary for banks and project finance.	Agriculture, forestry, manufacturing, electricity, water, transport, ICT, finance, real estate, and professional services; and 88 sub-categories.	Six (Mitigation, Adaptation, Water, Circular Economy, Pollution, and Biodiversity)	NACE-based (EU industrial classification system), technology-neutral, with TSC, DNSH, and social safeguards.	Quantitative (TSC), qualitative (DNSH, social safeguards).	Legally binding for some entities, most comprehensive, updated by expert platform, excludes coal and fossil fuel-based activities.
China	Mandatory for green bond issuers, comprising financial institutions, State-owned enterprises (SOEs), and corporates.	Clean energy, infrastructure, green services, clean production, sustainable infra, restoration.	Three (Climate Action, Environment Quality Enhancement, and Efficient Resource Use).	Whitelist approach (four-level classification system: ICNEA, 2024 activities, sectoral catalogue.	Qualitative in nature environment, health and social (EHS) standards, no DNSH.	Unified national benchmark, removed fossil fuel-based activities in 2021, non-tech neutrality (prefers domestic technology).
ASEAN	Voluntary guide for ASEAN governments, regulators, banks, investors, and corporates.	Agriculture, energy supply, manufacturing, transport, water/waste management, and construction/real estate) + enabling (ICT, scientific services, CCUS).	Four (Mitigation, Adaptation, Biodiversity, and Circular Economy)	Traffic-light (Green, Amber, Red).	Quantitative (PS) and qualitative (FF), DNSH, RMT, and social aspects.	Regional alignment, traffic-light model, and transition flexibility (amber activities can progress to green).
Singapore	Voluntary tool for financial institutions, corporates, regulators, academia, and policy makers.	Energy, transport, water, agriculture, industry, forestry, CCUS, ICT, and waste, real estate, and construction.	Five (Mitigation, Adaptation, Biodiversity, Circular Economy, and Pollution)	Traffic-light (Green, amber, and red), 1.5°C-aligned, and ISIC codes mapped.	Hybrid (quantitative + qualitative), DNSH.	1.5°C-aligned, transition category, institutional oversight, TCFD, CDP, and SBTi aligned.
Indonesia	Voluntary taxonomy for regulators, financial institutions, investors, and MSMEs.	Energy, agriculture, waste, forestry (FOLU), and IPPU.	Four (Mitigation, Adaptation, Biodiversity, and Circular Economy)	KBLI (Indonesia's Classification) code-mapped; green, transition, and unqualified.	Hybrid (quantitative + qualitative), DNSH, RMT, SA, and simplified path for MSMEs.	MSME-specific pathway.

Country/ Region	Mandate	Sectors Covered	Environmental Objectives	Classification Approach	Principles	Key Features
South Africa	Voluntary reference for government departments, financial institutions, corporates, and municipalities.	Agriculture, forestry, fisheries, manufacturing, mining, transport, construction, ICT, energy, waste and water, and professional services + enabling activities.	Six (Mitigation, Adaptation, Water, Pollution, Circular Economy, and Biodiversity)	EU-modelled	Hybrid (Quantitative + Qualitative) TSC-based, DNSH, Minimum Social Standards, evolving thresholds.	EU-aligned but contextualised, supports mining and non-financial reporting, evolving document.
Australia	Voluntary for corporates, financial institutions, issuers, investors, asset owners and managers, and public bodies	Agriculture and land, mining and metals, manufacturing and industry, electricity, construction and buildings, and transport	Six (Mitigation, Adaptation/ Resilience, Biodiversity, Water, Pollution, and Circular Economy)	Two-Tier: Green (low/ zero emissions, high-per- forming no alternative, enabling) and transition (de- carbonisation of high-emis- sion activities aligned with 1.5°C).	Hybrid (Quantitative + Qualitative) plus DNSH and MSS.	Distinct green/ transition categorisation.
India	No announcement as of now	Power, agricul- ture, buildings, transport, food and water, and hard-to-abate sectors (iron and steel).	Three (Mitigation, transition, and adaptation).	ISIC/NIC.	Hybrid- qualitative with phased quantitative thresholds.	Living docu- ment, MSMEs proportionality, and focus on indigenous technology.

Source: Authors' summary of Section 3.1 based on multiple sources.

Mapping of Activities: A central component in developing any taxonomy is the identification and classification of economic activities. Most countries rely on existing industrial classification systems, either their domestic versions or international standards such as the ISIC, to anchor their taxonomy structures. We have adopted a similar approach for India, using the NIC system. The NIC 1998 system, which corresponds directly with ISIC Revision 3 up to the four-digit level, provides a useful basis for this alignment.

We have compiled an indicative list of economic activities relevant to India's mitigation and adaptation goals, corresponding to the sectors outlined in the draft framework. This list, presented in

Appendix 1, serves as a starting point for mapping and organising activities within a standardised framework.

It is important to emphasise, however, that a simple mapping of activities using industrial classification codes does not determine whether they are environmentally sustainable or not. The purpose of this exercise is to broadly organise activities under larger economic categories and to align them with the structure adopted by other countries. To truly assess whether an activity qualifies as green or sustainable, additional criteria must be applied, e.g., technical screening thresholds, performance benchmarks, or qualitative principles, some of which are elaborated on further in this section. While these elements

are essential for determining environmental sustainability, they are beyond the current scope of this report. Our objective here is limited to mapping activities for foundational alignment and reference.

3.2 What has Been the Progress?

Besides examining structure and design, it is equally important to assess how the green taxonomies have been implemented in practice. Designing a taxonomy is only the starting point; what truly matters is how effectively it is used on the ground. Examining the practical aspects of implementation helps us understand whether these taxonomies are meeting their original goals, how different stakeholders are applying them, and what challenges have emerged along the way. Here, we focus on how various countries have operationalised their taxonomies, with examples of successful adoption and key barriers faced. This analysis is particularly relevant for India, which is currently developing its own green taxonomy. It can benefit from other countries' experiences, make more informed choices about inclusions or otherwise, and identify the potential pitfalls to prepare for in the rollout and adoption stages. Australia has not been included in this review, as its taxonomy is still relatively new and there is limited evidence available on its performance.

European Union

Implementation: *Partially Implemented.* Adopted in 2020, the EU taxonomy mandated mitigation and adaptation disclosures from January 2022 and set criteria for all six objectives by 2024 (European Commission, n.d.). However, complexity and reporting burdens have hindered full uptake. The proposed 2025 Omnibus Package, aimed at easing compliance, is still awaiting approval (Lustermans et al., 2025).

Key Achievements: Recognised for its rigorous benchmarks, the EU's taxonomy has shaped sustainable finance frameworks globally. The European Commission (2024) reports that capital investment in taxonomy-aligned

activities (those meeting the TSC) within the EU surged from EUR 191 billion in 2023 to EUR 249 billion in early 2024, with electricity providers leading this shift. Germany, France, Spain, and Italy accounted for the highest aligned investments. In 2023, a vast majority (90 per cent) of green bonds issued by public institutions in the EU made use of the taxonomy as a reference. Banks and lenders are using it more in financing decisions, and firms demonstrating higher alignment have shown improved stock market performance. EY's 2024 Barometer shows rising eligibility (activities within the scope) among non-financial firms: 35 per cent for turnover and OpEx, and 43 per cent for CapEx. Financial firms have begun reporting metrics, such as the Green Asset Ratio (Niewold et al., 2024).

Challenges: The implementation remains challenging because of its intricate, sector-specific criteria and the extensive effort required to map over 100 evolving activities, particularly across complex global supply chains. Additionally, data gaps, inconsistent key performance indicator (KPI) definitions, and reliance on third-party disclosures complicate reporting, especially for financial institutions and insurers (Hofstetter & Babayéguidian, 2024). While eligibility was high in 2024, actual alignment remains low: 11 per cent for revenue, 14 per cent for CapEx, and 10 per cent for OpEx. Financial institutions also struggle with missing or inconsistent data from their borrowing firms, many of whom claim to be green but show low alignment (Jespersen et al., 2025).

China

Implementation: *Partially Implemented.* China's primary green taxonomy framework, the Green Bond Endorsed Projects Catalogue (2021), has been legally binding since July 2021 but continues to evolve. China's broader framework is not a single document but a dynamic collection of regularly updated catalogues, including the recently finalised catalogue on industry guidance (2024 Edition) (Chen, 2020).

Key Achievements: Wang (2022) highlights that China's green bond market has experienced rapid expansion, becoming the world's fastest-growing in 2021 (with an increase of USD 44.4 billion over the previous year). The 2021 Green Bond Endorsed Projects Catalogue has played a crucial role in guiding domestic green bond investments toward low-carbon objectives and promoting international cooperation. In 2024, specialised bonds, including carbon-neutral (7 per cent year-over-year [y-o-y]), blue (519 per cent y-o-y), and transition bonds (53.6 per cent y-o-y), demonstrated significant growth. Green insurance has also seen substantial growth, and green bond funds have rebounded strongly, launching new funds totalling RMB 56 billion in 2023 (Yue & Nedopil, 2025). The Climate Bonds Initiative (2025) reports that China's issuance of its first sovereign green bonds in London in 2025, raising RMB 6 billion (USD 824 million), further diversified its green financing avenues.

Challenges: Overall, however, China's green bond market faced an 18 per cent decline in issuance in 2024, presumably also due to macroeconomic factors. A critical challenge is the absence of a unified domestic framework for transition finance, with existing standards limited to local levels, leading to inconsistencies and the risk of "transition-washing."² Furthermore, green financial instruments beyond loans remain underdeveloped, with green bonds constituting less than 1 per cent of the domestic bond market (Yue & Nedopil, 2025).

ASEAN

Implementation: *Partially Implemented.* The ASEAN Taxonomy is still under development, with Version 3 released in March 2024. This version includes TSCs for energy, construction and real estate, transport, and CCUS. Future updates are planned to expand coverage to agriculture, manufacturing, water and waste, and ICT/scientific services (Asian Development Bank, 2024).

Key Achievements: Like the EU, the ASEAN Taxonomy serves as a shared framework for sustainable finance. Its development marks a major regional achievement, uniting ten countries with diverse economies under a common vision. This has spurred parallel efforts: Malaysia, Singapore, Thailand, Indonesia, and the Philippines have all launched national taxonomies.

Challenges: Despite progress, varied interpretations of the ASEAN Taxonomy among member states limit true regional alignment. Differences in classification criteria, such as emissions thresholds and sectoral coverage, create interoperability challenges for businesses and investors (IEEFA, 2024). The flexible, multi-tier (green–amber–red) system, while adaptive, adds complexity. For instance, Indonesia's classification of new coal plant financing as "transitional" has raised concerns among global investors due to its divergence from international norms (Teja, 2024). Investors from jurisdictions with stricter taxonomies, such as the EU, face increased difficulty aligning ASEAN standards with their own regulatory obligations, potentially limiting the taxonomy's utilisation by international capital markets without greater harmonisation (Lai, 2022).

Singapore

Implementation: *Partially Implemented.* As per the MAS (2023), Singapore's Asia Taxonomy is partially implemented, primarily covering climate change mitigation. While TSCs are established for mitigation, criteria for other objectives, such as adaptation, biodiversity, circular economy, and pollution control, are still being developed.

Key Achievements: The Singapore government's commitment to issuing green bonds up to SGD 35 billion by 2030 is supported by its Green Bond Framework, which aligns fully with the green criteria in the Singapore-Asia Taxonomy (Ministry of

² Falsely claiming an activity as supporting the transition to a low-carbon economy.

Finance Singapore, n.d.). The China–Singapore Green Finance Taskforce (GFTF), launched in 2023, is actively working to align the Singapore–Asia Taxonomy with the Common Ground Taxonomy (CGT) of the EU and China (CGT). This alignment aims to facilitate cross-border green bond issuances, loans, and fund investments, notably through a dedicated Green Corridor for Panda bond³ issuances, enabling Singapore-based corporates to access Chinese green capital markets. Such alignment is expected to boost sustainable finance flows between Singapore and China significantly.

Challenges: Only a small percentage of companies in the MSCI All Country World Index (ACWI) are classified as “green” under the Singapore Taxonomy (3.7 per cent vs 4 per cent for the EU), despite significant overlap with EU Taxonomy criteria. The “amber” category, which includes transition activities that the EU excludes, is a point of distinction. While this approach better reflects transition progress in high-emission sectors like cement and steel, it complicates global comparability. Furthermore, some activities deemed eligible but not aligned under the EU framework are classified as “red” in Singapore. To enhance interoperability, the MAS is actively engaging in sector-specific disclosure consultations and promoting dual adoption (Clarity AI, 2023).

Indonesia

Implementation: *Partially Implemented.* The Indonesian Sustainable Finance Taxonomy (TKBI) Version 2 builds upon its energy-focused predecessor by expanding to key sectors like construction, transport, and parts of agriculture, forestry, and other land use (AFOLU). It introduces new criteria for low-income housing, sustainable aviation fuel, CCUS, and climate risk assessment. Future versions (Version 3) will further broaden coverage to manufacturing, waste, and remaining AFOLU sectors (Otoritas Jasa Keuangan, 2025).

Key Achievements: In 2024, SMBC Bank in Indonesia piloted the updated taxonomy, classifying a significant portion of its debtors (29 per cent of 230) as green or transitional (Sumitomo Mitsui Banking Corporation, 2025). The Indonesian taxonomy aligns with the ASEAN Taxonomy by structuring activities around four EOs, positioning it as a crucial tool for mobilising sustainable finance and ensuring regional consistency. It is increasingly being integrated into Indonesia’s green finance system to guide the allocation of funds from green bonds and green sukuk (Islamic finance-based bonds) (UNDP & Ministry of Finance Indonesia, 2018).

Challenges: Despite progress, the taxonomy faces several hurdles. Policy inconsistency, marked by the continued provision of fossil fuel subsidies despite low climate spending, sends mixed signals to investors. Regulatory uncertainty, foreign exchange risks, and lengthy approval processes further deter investment. Commercial banks struggle to fund long-term climate projects due to their reliance on short-term financing (Climate Policy Initiative, 2025). Critics, such as TuK Indonesia (2024), a civil society organisation, argue that the “transition” (yellow) category blurs the lines between green and non-sustainable activities, potentially enabling greenwashing. Moreover, the taxonomy lacks a clear public grievance mechanism, hindering community engagement. Another contentious point is the inclusion of new captive coal-fired power plants (CFPPs) as “green” if they power critical mineral operations for the energy transition. The surge in bank lending to these sectors, despite environmental risks, raises concerns, especially as international investors increasingly prioritise the carbon footprint of sourced materials (Iyer, 2024).

South Africa

Implementation: *Partially Implemented.* South Africa’s Green Finance Taxonomy (GFT) framework (National Treasury, 2022),

³ Bonds denominated in Chinese Yuan (RMB).

launched in April 2022, remains a draft, awaiting further review and finalisation of governance. It currently addresses climate mitigation and adaptation, with future plans to expand its coverage to water use, pollution prevention, circularity, and ecosystem protection.

Key Achievements: South Africa's reliance on foreign investors, who held a substantial R3.3 trillion in corporate assets in 2020, compared to R1.9 trillion held by domestic investors, underscores the critical need for taxonomy alignment to attract international capital and bridge its climate finance gap. Even before the taxonomy's launch, a clear demand for green finance was evident. Despite attracting R131 billion annually in climate finance between 2019 and 2021, only a small fraction originated from domestic sources (Climate Policy Initiative, 2025). With significant annual investments required to achieve net-zero by 2050 and meet 2030 NDCs, scaling up international finance is paramount.

Challenges: Despite initial interest, the application of South Africa's GFT has been limited due to structural and contextual challenges. A primary issue is the lack of regulatory integration; the GFT is not embedded within national frameworks, such as the National Development Plan. There is a lack of leadership from key government bodies, resulting in ambiguity and hindering the ability to guide market practices. Capacity constraints among users, particularly financial institutions burdened by multiple ESG reporting requirements, pose a significant barrier, especially given the complexity of investment chains and fragmented data collection. Although the GFT closely resembles the EU taxonomy, its lack of formal recognition by the EU necessitates reassessment for EU compliance, diminishing its appeal to international investors. Compounding these issues,

South Africa's continued reliance on fossil fuels restricts the availability of credible green projects. Without a strong pipeline of investable opportunities, the taxonomy struggles to serve its core purpose of redirecting capital toward sustainable development (Lötters-Viehof et al., 2023).

None of the above countries has fully implemented their green taxonomies. This is expected, as these frameworks are designed to be dynamic, adapting over time to technological progress, evolving data systems, and shifting environmental and financial conditions. Their flexible structure allows for periodic updates, helping them stay relevant in a changing global context. Even in their early stages, many countries have already experienced benefits, such as increased green bond issuances, improved alignment of capital flows with sustainability goals, and deeper integration of environmental factors into financial decision-making.

At the same time, this comparative review shows that challenges often outweigh initial benefits. Complex classification systems, limited and inconsistent data, varying interpretations across jurisdictions, and weak integration with national policy frameworks continue to impede effective implementation. In several cases, institutional capacity constraints and the absence of clear definitions for transition activities further complicate usage and risk undermining credibility.

As India works toward establishing its own taxonomy, it is important to remain attentive to these challenges. This analysis attempts to anticipate potential barriers that India could encounter and provides an opportunity to address them early in the design process. For ease of exposition, the main generic challenges observed across jurisdictions are summarised in Table 2.

Table 2: Lessons for India

Challenge Area	What it Means	Lessons for India
Fragmented Design	Taxonomies are dynamic by nature, but fragmented frameworks (e.g., China, ASEAN) and overlapping standards slow coordination and increase complexity.	Create a single, comprehensive framework from the start. Avoid scattered guidelines that confuse users.
Complexity	Detailed TSC and activity-based thresholds make implementation and interpretation difficult (e.g., EU).	Balance thoroughness with usability. Start simple and add complexity gradually based on market feedback.
Data Gaps and Inconsistencies	Lack of reliable, granular data and inconsistent KPIs hinder accurate classification and reporting (e.g., EU, South Africa).	Invest in standardised data collection systems early. Define clear metrics before launching.
Limited Interoperability	Singapore's "Amber" category and Indonesia's coal plant classifications don't match global standards, limiting foreign investment.	Design with international alignment in mind, especially for sectors seeking foreign capital.
Weak Regulatory Integration	In some cases, taxonomies are not embedded in broader policy frameworks, reducing their enforceability and influence (e.g., South Africa).	Embed the taxonomy within existing regulatory frameworks, such as those of the Reserve Bank of India (RBI) and Securities Exchange Board of India (SEBI).
Capacity Constraints	Financial institutions and regulators, particularly in emerging markets, often lack the technical capacity, tools, or training (e.g., Indonesia).	Launch training programs for financial sector professionals before full implementation
Transition-Washing Risks	Inadequate or vague definitions for transition activities can lead to mislabelling and reduce market confidence (e.g., Indonesia, ASEAN).	Define strict criteria for transition activities: mandatory emission reduction targets, clear end dates, regular progress reviews, and automatic declassification if targets are missed.
Limited Financial Instruments	Heavy focus on green loans; underdevelopment of other tools like green bonds restricts reach (e.g., China).	Develop diverse financial products (bonds, insurance, equity) to reach different market segments.
Mixed signals	Mixed policy signals, unclear timelines, and lack of grievance mechanisms raise investor risk perception (e.g., Indonesia).	Ensure policy consistency across ministries. Build transparent grievance and audit systems.

Source: Authors' summary of section 3.2 based on multiple sources.

04

MSME Provisions in Green Finance Taxonomies

MSMEs play a central role in India's economic landscape, contributing nearly 30 per cent to the country's gross domestic product (GDP), supporting close to half of its export output, and generating employment for over 200 million people (PIB, 2024). Despite their economic significance, MSMEs remain particularly vulnerable to the adverse effects of climate change due to restricted access to finance, limited technical capabilities, and weak institutional structures. The widespread perception of MSMEs as high-risk and commercially unviable has constrained their access to formal financial support. NITI Aayog (2025) highlighted in its report that Indian banks, in particular, are reluctant to lend to small enterprises due to several reasons, including insufficient collateral, high levels of non-performing assets, elevated transaction costs, and difficulties in assessing creditworthiness. Small firms also struggle to adopt new technologies due to poor human resource management, high raw material costs, and unreliable electricity supply.

India's draft climate finance taxonomy framework acknowledges these barriers and proposes a proportionality provision tailored to MSMEs. This includes simplified reporting and assessment processes to ensure that sustainable finance flows remain accessible to smaller enterprises and are not obstructed by overly complex regulatory requirements.

In this section, we explore the taxonomies of Indonesia and the Philippines, both of which provide differentiated treatment for MSMEs within their frameworks. While other jurisdictions, such as the EU, Singapore, and South Africa, allow voluntary adoption by corporates, making them broadly inclusive of MSMEs, these two countries offer more targeted and explicit approaches. Whether India should follow a similar path is an open question, but these examples present useful insights for developing a taxonomy that is both inclusive and effective.

4.1 Indonesia

Indonesia's sustainable finance taxonomy distinguishes entities based on their size, applying different evaluation methods accordingly. While large firms are assessed through a detailed TSC, MSMEs follow a streamlined, principle-based model known as the Sector-Agnostic Decision Tree (SDT). Recognising that most MSMEs lack the financial and technical bandwidth to engage in rigorous

data-based assessments, the SDT allows a principles-based evaluation model using a structured set of yes/no (binary) questions (Indonesia Taxonomy Board, 2025).

The assessment follows three stages. First, the MSME must identify the primary EO that its activity supports and respond to a tailored set of questions. For example, for EO1 (Climate Change Mitigation), the questions include: “Does the activity reduce or prevent GHG emissions?” and “Does it help others reduce emissions?” For EO2 (Climate Change Adaptation), MSMEs must determine whether their activities improve climate resilience, strengthen adaptive capacity, or support others in managing climate risks. EO3 (Protection of Ecosystems and Biodiversity) evaluates whether the activity helps conserve biodiversity or enables conservation by others. EO4 (Circular Economy and Resource Efficiency) asks if the business incorporates practices such as reuse, repair, or recycling, manages waste in line with the waste hierarchy, or promotes resource efficiency more broadly.

An affirmative response to any of these guiding questions allows the activity to proceed to the next stage: demonstrating No Significant Harm (DNSH) to the other three EOs. If any harm is identified, the MSME must demonstrate that appropriate RMTs are in place or will be implemented within five years. Failing this, the activity is considered “unqualified.” The final stage involves evaluating social safeguards. The activity must comply with principles such as fair labour standards, avoidance of harm to communities, and inclusive employment. Based on this holistic evaluation, the activity is classified as green (meeting all criteria), transition (aligned in principle but with gaps to be addressed), or unqualified (failing to meet key requirements).

4.2 The Philippines

The Philippines’ process begins with eligibility screening to ensure the activity is not on a list of exclusions and complies with national laws. Next, the activity must align with a recognised Use of Proceeds (UoP) category such as renewable energy, clean transportation, or energy efficiency. For example, if an MSME applies for financing to install rooftop solar panels, this would fall under the “Renewable Energy” UoP category. To validate such claims, the Philippines encourages alignment with domestic clearances or international certifications such as EDGE or ISO 14001.

However, not all MSMEs may easily map their activities to specific UoP categories. For such cases, the taxonomy introduces a traffic light system. This provides a sustainability gradient: green for clearly sustainable activities, amber for those with moderate environmental risk, and red for unsustainable ones. For instance, if an MSME seeks funding to expand its packaging operations and uses biodegradable materials, it would be rated green. If it uses a mix of recyclable and non-recyclable plastics, it would be rated amber. Fully non-recyclable plastic usage would yield a red rating, disqualifying the activity from sustainable finance.

To ensure credibility, the Philippines’ taxonomy encourages third-party verification through globally recognised certifications such as the Forest Stewardship Council (FSC), Rainforest Alliance, Fairtrade, LEED, or the Roundtable on Sustainable Palm Oil (RSPO). National environmental clearances may also be accepted. Importantly, the system recognises the need for human judgment. Financial institutions are expected to perform supplementary reviews, assess an MSME’s operational capacity, and may conduct interviews or use custom questionnaires to ensure due diligence, particularly where certification is lacking (Bangko Sentral ng Pilipinas, 2024). Table 3 summarises these approaches.

Table 3: MSME-Specific Approaches in Green Taxonomies

Aspect	Indonesia	Philippines
Method	Yes/No decision tree (SDT).	UoP categories + traffic light system.
How it Works	MSMEs answer simple yes/no questions under one main environmental goal.	MSMEs map activities to eligible UoP categories; if unclear, they are rated green/amber/red.
Steps	1. Pick the main EO. 2. Answer guiding yes/no questions. 3. Show activity does not harm other objectives (DNSH), if harm identified, the activity must show RMT. 4. Comply with social safeguards.	1. Pass exclusion check (not harmful/illegal). 2. Map to UoP category. 3. Apply traffic light rating if unclear. 4. Provide certification or undergo lender review.
Examples	1. Yes to “does it reduce emissions?” → proceed. 2. Yes to “does it recycle/reuse?” → proceed.	1. Rooftop solar → green. 2. Packaging with mixed plastics → amber. 3. Fully non-recyclable plastics → red.
Final Label	Green, transition, or unqualified.	Green, amber, or red.

Source: Authors’ summary of Section 4 based on multiple sources.

These examples from Indonesia and the Philippines demonstrate that sustainability taxonomies can be designed to accommodate the constraints of small enterprises without diluting environmental integrity. For India, these lessons are particularly timely. A one-size-fits-all taxonomy risks excluding MSMEs from green capital flows at a time when their participation is critical for both economic

resilience and climate goals. Incorporating differentiated evaluation models, such as principle-based tools and adaptive screening mechanisms, could enhance the accessibility and relevance of India’s taxonomy. Ultimately, enabling MSMEs to engage in sustainable finance is not merely a matter of equity; it is a strategic necessity.

05

Promotion of Indigenous Technology: Current Status and Challenges

Promotion of indigenous technology is a key principle in India's Draft Green Taxonomy Framework. In recent years, there has been a rise in indigenous green technologies across sectors such as power, agriculture, transport, water, and waste management. This section highlights some of these technologies. The focus is on three sectors from the taxonomy: power, agriculture, and mobility. The list is not exhaustive, but it serves to illustrate the types of technologies currently being developed in India. This work can be expanded later to include more sectors and technologies. Next, we examine how these technologies align with the draft Climate Finance Taxonomy goals, specifically, whether they contribute to climate change mitigation, adaptation, or the transition to a low-carbon economy. Finally, we look at the main challenges these technologies face, especially the difficulty of competing with cheaper technologies from other countries.

Power Sector

India's clean energy transition is being powered by a growing portfolio of indigenous technologies across the power sector. In the *solar* domain, India has made significant strides in developing and deploying efficient photovoltaic (PV) technologies. High-efficiency monocrystalline and polycrystalline modules are increasingly manufactured locally, alongside innovations like bifacial panels that generate energy from both sides. Rooftop solar systems, solar-powered irrigation pumps, and floating solar arrays (floating installations), such as the 100 MW project in Ramagundam, reflect efforts to tailor solar solutions to its geographic and agricultural needs while optimising land and water use (India Brand Equity Foundation, n.d.).

Wind: The country has developed strong capabilities in designing, manufacturing, and deploying wind turbine technologies, with about 70-80 per cent of components now produced locally (Ministry of New and Renewable Energy, 2025). Indigenous production is driven by around 14 companies, including Indian firms with in-house technologies as well as joint ventures and subsidiaries of global manufacturers. Technological advancements have led to the deployment of increasingly powerful machines, with unit sizes reaching up to 5.2 MW, and India currently has an annual wind turbine manufacturing capacity of approximately 18,000 MW (Ministry of New and Renewable Energy, 2025).

Beyond solar and wind, India is advancing a diverse set of indigenous technologies to support its clean energy transition. In *bioenergy*, locally developed systems convert crop residues, forestry by-products, and urban waste into electricity, biogas, and bio-CNG. Technologies such as bagasse-based cogeneration in sugar mills, rice husk gasifiers for rural micro-grids, and decentralised waste-to-energy plants are increasingly being manufactured and deployed within the country. Initiatives like the National Bioenergy Programme and Waste to Energy scheme have further encouraged domestic innovation in biomass processing, pellet and briquette manufacturing, and municipal waste utilisation (MNRE, 2025).

India is also scaling up *green hydrogen* production under the National Green Hydrogen Mission, with a strong push to domestically manufacture electrolyzers to produce hydrogen from water using renewable power. Financial incentives—an outlay of INR 17,490 crore until 2029–2030—aim to support both the production of electrolyzers and green hydrogen, helping to build a robust local industry (MNRE, 2023). Energy storage technologies are another critical area of focus. Pumped storage plants (PSPs) continue to dominate grid-scale storage, with improvements underway in variable-speed and ternary PSP designs. At the same time, India is expanding its capabilities in Battery Energy Storage Systems (BESS), exploring alternatives to conventional lithium-ion batteries such as lithium iron phosphate (LFP) and vanadium redox flow batteries (VRFBs), which offer greater safety and long-term scalability (Renewable Watch, 2025).

Mobility

Efforts are underway to improve the fuel efficiency of vehicle engines. One such innovation is the fuel cell system (Reliance Industries Limited, n.d.), which generates electricity through an electrochemical reaction, typically between hydrogen and oxygen—without combustion. This technology

is expected to replace conventional internal combustion engines gradually and can power a range of vehicles, including cars, buses, and trucks, as well as serve in stationary applications like telecom towers, data centres, and microgrids. Domestic efforts are also underway to support the production and deployment of fuel cell systems across sectors.

In addition to EVs, India is expanding its use of *alternative fuels* such as ethanol. Indigenous ethanol production draws on a wide range of feedstocks, including sugarcane juice, maize, and agricultural residues like rice straw and corn cobs (PIB, 2025).

Agriculture

In India, technological interventions in agriculture have primarily focused on climate adaptation, aiming to make farming more resilient to water stress, erratic weather patterns, and soil degradation. A major focus has been on expanding the use of *micro-irrigation systems*, particularly drip and sprinkler irrigation, to improve water-use efficiency at the farm level (PIB, 2024). India is also pushing a *solar-powered irrigation* scheme to reduce diesel dependency and promote clean energy.

In recent years, companies like DeHaat, Marut Drones, and Aquaconnect have emerged with solutions that integrate robotics, drones, and AI-powered systems to automate tasks such as precision planting, weeding, harvesting, and crop surveillance. These technologies support real-time monitoring of crop, soil, and livestock health, and use data analytics to improve yield forecasting, resource efficiency, and supply chain management. Artificial Intelligence is increasingly being used to analyse satellite imagery, detect early signs of pests and diseases, predict weather and yields, and optimise the use of critical inputs like water and fertilisers. Drones and remote sensing tools, integrated with AI models, enable precise and timely decision-making at the farm level. Supported by government-backed agribusiness incubators, these startups are also creating solutions for smart irrigation,

automated spraying, climate forecasting, and digital agri-marketplaces (Ministry of Chemicals and Fertilisers, 2024). To reduce chemical fertiliser use, India is promoting the use of indigenous bio-fertilisers and nano-based nutrients. A key innovation is Nano Urea, a liquid fertiliser that enhances nitrogen-use efficiency and lowers emissions.

The following table provides a structured mapping of the indigenous green technologies discussed above in the power, mobility, and agriculture sectors to the core objectives of India's Draft Climate Finance Taxonomy, highlighting whether each technology contributes to climate change mitigation, adaptation, or the broader low-carbon transition.

Table 4: Mapping Indigenous Green Technologies to India's Climate Taxonomy Objectives (Power, Mobility, Agriculture)

Technology	Sector	Taxonomy Objective(s)	Contribution
Solar PV (monocrystalline, polycrystalline, bifacial, rooftop, and floating solar)	Power	Climate Change Mitigation	Reduces fossil fuel dependence and emissions.
Solar-powered irrigation pumps	Power/ Agriculture	Mitigation, Adaptation	Reduces diesel use and enhances resilience in water-scarce regions.
Wind Turbines (up to 5.2 MW, 70-80 per cent indigenised)	Power	Climate Change Mitigation	Generates clean energy and reduces GHG emissions
Bagasse cogeneration, biomass gasifiers, bio-CNG plants	Power	Mitigation	Utilises agricultural and organic waste for energy.
Decentralised waste-to-energy technologies	Power	Mitigation	Reduces landfill methane emissions and provides renewable energy.
Electrolysers for green hydrogen	Power	Mitigation, Transition	Enables zero-emission hydrogen fuel for industry and mobility.
BESS (Li-ion, LFP, and VRFBs)	Power	Mitigation, Transition	Supports renewable integration and grid stability.
PSPs (fixed, variable-speed, and ternary)	Power	Transition	Provides long-duration renewable storage.
Fuel Cell Vehicles (hydrogen-based)	Mobility	Mitigation, Transition	Zero-emission alternative to ICE vehicles.
Micro-irrigation (drip and sprinkler systems)	Agriculture	Adaptation, Mitigation	Improves water use efficiency, reduces energy use.
Solar irrigation pumps	Agriculture	Adaptation, Mitigation	Supports water access using clean energy.
Precision farming (AI, drones, IoT, and mobile apps)	Agriculture	Adaptation, Mitigation	Enhances efficiency, early warning, and input optimisation/
Bio-fertilisers and Nano Urea	Agriculture	Adaptation, Mitigation	Reduces chemical fertiliser use, lowers emissions.

Source: Authors' summary of Section 5 based on multiple sources.

Other countries have also recognised the value of encouraging locally developed technologies within their green and sustainable finance taxonomies. For instance, the **Sri Lanka GFT (2022)** explicitly designates research, development, and dissemination of locally relevant technologies as eligible activities. This includes initiatives such as developing climate-resilient seeds, crops, and heat-tolerant livestock breeds, alongside the adoption of smart agricultural systems designed to address the island's unique climate vulnerabilities. By mandating adherence to national standards, Sri Lanka highlights its commitment to advancing home-grown solutions that can withstand local environmental stresses (Central Bank of Sri Lanka, 2022).

Similarly, **Bangladesh's Sustainable Finance Taxonomy (2020)** emphasises innovation as a driver of sustainability by listing "R&D for sustainable product innovation" as one of its features. In addition, it calls for a systematic assessment of sustainable finance opportunities, which includes evaluating market demand and supply conditions and outlining potential local products and projects based on that. Through this, the framework channels finance into the development of domestic green technologies (Bangladesh Bank, 2020).

This, however, comes with challenges.

- i. **Higher Costs and Import Competition:** Indigenous clean technologies in India often face a cost disadvantage compared to imported alternatives, making market uptake difficult without financial incentives. For instance, Indian-manufactured solar PV modules are nearly twice as costly as their Chinese counterparts, primarily due to higher input costs, limited economies of scale, and lower labour productivity (Wischer, 2024). Similarly, in the battery sector, India still imports the majority of its lithium-ion cells, which account for 75–80 per cent of total battery costs (IISD, 2024). While schemes like the Production Linked

Incentive (PLI) aim to build local capacity, these gaps persist in the short term, and imported options often remain more attractive to consumers and developers solely due to price.

- ii. **Limited Scale and Supply Chain Dependence:** India's manufacturing base for clean technologies remains significantly smaller and less integrated than that of dominant global players like China. Wischer (2024) also highlights that China controls over 75 per cent of global capacity across each segment of the solar PV supply chain and over 85 per cent of global battery cell production. Its dominance extends to processing critical minerals like lithium, cobalt, and graphite (IISD, 2024). In contrast, India relies heavily on imports for upstream materials, components, and equipment, which exposes its transition efforts to global supply disruptions and trade vulnerabilities. Building domestic supply chains at scale remains a long-term but necessary challenge for reducing strategic dependence.
- iii. **Innovation and research and development (R&D) Constraints:** India's low investment in R&D constrains innovation in clean technologies. Gross expenditure on R&D has hovered around 0.66 per cent of GDP, significantly lower than countries like China (2.4 per cent) or Brazil (1.3 per cent), and the country also had only 262 researchers per million population in 2020, compared to over 8,000 in countries like South Korea (Department of Science & Technology, 2023). Without stronger R&D pipelines, India risks lagging in adapting technologies to its unique socioeconomic and climatic contexts.
- iv. **Market Acceptance and Behavioural Barriers:** Even when indigenous technologies are available, social and behavioural resistance often slows their adoption, especially in agriculture.

Farmers may be reluctant to adopt new inputs, such as biofertilisers, drone-based applications, or resilient seed varieties, unless the benefits are clearly demonstrated and the risks are minimised. Factors such as limited awareness, perceived difficulty of use, and low confidence in operating unfamiliar technologies like unmanned aerial vehicles (UAVs) all play a role. Addressing these behavioural challenges will require targeted outreach, training, and farmer engagement to build trust and acceptance (Puppala et al., 2023).

- v. **Policy and Regulatory Uncertainty:** Frequent policy shifts, lapses in implementation, and unclear long-term roadmaps can undermine investor confidence in indigenous technology markets. While flagship schemes such as Pradhan Mantri Kisan Urja Suraksha evam Utthaan Mahabhiyan (PM-KUSUM) for solar irrigation provide critical support, their success is often hampered by inconsistent subsidy structures, delays, or

impending expirations at the state level. In sectors like organic farming, policy support exists but remains patchy, and market infrastructure is underdeveloped. For indigenous technologies to scale, stable and predictable policy environments are essential to encourage sustained investment and adoption.

India's growing portfolio of indigenous green technologies demonstrates its intent to pursue climate action through solutions tailored to local needs, capabilities, and constraints. Across the power, mobility, and agriculture sectors, domestic innovations are beginning to align closely with the objectives of India's draft Climate Finance Taxonomy. However, realising the full potential of these technologies will require addressing persistent challenges, including high production costs, supply chain vulnerabilities, limited R&D capacity, and social barriers to adoption. Policy stability, long-term financing, and targeted capacity building, especially for farmers, MSMEs, and early-stage innovators, will be key to overcoming these constraints.

06

Conclusion and Way Forward

India's draft climate finance taxonomy is important for building a more transparent and credible system for guiding green investments. However, transforming this framework into an effective policy instrument requires careful attention to both global best practices and India's unique development context. Drawing from the comparative analysis of international taxonomies and the challenges they have encountered, several strategic recommendations emerge for strengthening India's approach. While global best practices such as scientific rigour, interoperability, DNSH safeguards, and technical screening thresholds offer a strong foundation (as detailed in Section 2), the taxonomy must also be tailored to India's specific challenges. The following recommendations outline how this can be achieved:

- i. **Alignment with Domestic Frameworks and Market Instruments:** The draft taxonomy excludes some sectors recognised in the RBI and SEBI frameworks, such as pollution prevention, biodiversity conservation, waste management, and sustainable land use. At the same time, it includes hard-to-abate sectors like iron and steel and cement, which are not part of the RBI's or SEBI's current frameworks (RBI, 2023; SEBI, 2023). This creates the risk of mixed signals for financial institutions and investors, who may find themselves navigating inconsistent standards across different regulators. Greater alignment with existing regulatory frameworks or a clear explanation of the rationale for sectoral choices is essential for ensuring coherence.

Equally important is integration with ongoing policy schemes such as the Carbon Credit Trading Scheme (CCTS) so that only taxonomy-aligned activities are eligible to generate tradable carbon credits. Moreover, aligning the taxonomy with CCTS benchmarks would harmonise measurement, reporting, and verification (MRV) processes. Similarly, the Green Credit Programme, which provides credits for activities like afforestation, water conservation, and energy efficiency, will only have integrity if these credits are tied to uniform sustainability standards. India's taxonomy can serve as this reference point. India's Sovereign Green Bond Framework, which already references global standards, could also be strengthened by making taxonomy alignment a prerequisite for bond issuances.

- ii. **Clarify Activity Categories and Reduce Interpretive Ambiguity:** The proposed three-tier structure of Climate-Supportive Tier 1, Climate-Supportive Tier 2, and Transition Activities creates room for confusion, as the distinctions between Tier 1 and Tier 2 are not always clear. Both categories use similar terms such as “emission reduction,” “efficiency improvements,” and “adaptation benefits,” making it difficult for investors and financial institutions to determine the exact classification of projects. This could weaken usability and slow adoption. A clearer alternative is to follow a two-track classification system. One category would be Climate-Supportive Activities, covering projects that either directly contribute to emission reductions, support adaptation, or serve as enabling activities that make other sectors greener. The second would be Transition Activities, reserved for sectors where low-carbon alternatives are not immediately available but where participation is essential to India’s net-zero pathway. Transition activities would need to meet clear criteria, such as mandatory improvement pathways and sunset clauses, so that they cannot remain in a “transition” state indefinitely. Countries like Australia have adopted this binary model (Australian Sustainable Finance Institute, 2025).
- iii. **Balance Technology Neutrality with Indigenous Innovation:** India’s taxonomy emphasises the promotion of indigenous technologies, which is important for strengthening domestic industries and ensuring long-term self-reliance. However, if the framework is too rigid, it may exclude cost-effective imported technologies that can deliver environmental benefits in the near term. This is especially relevant in sectors where indigenous solutions are still maturing and scaling up. For example, while India is advancing domestic manufacturing of solar PV and batteries, some imported technologies may currently offer better efficiency or lower costs. A pragmatic

approach would be to maintain flexibility by allowing foreign technologies that meet defined environmental performance standards while simultaneously prioritising policies that build capacity and scale for indigenous alternatives. Over time, as local production becomes more competitive, the taxonomy can shift toward greater reliance on domestic solutions. This balance would avoid locking India out of affordable options today while supporting a long-term strategy of indigenisation and self-sufficiency.

- iv. **Scaling Up Local Innovation for Cost Reduction and Export Readiness:** To fully capture the benefits of promoting indigenous technologies, India must not only support their development but also scale them to the point where costs fall and global competitiveness improves. The taxonomy could reinforce this by explicitly identifying priority home-grown innovations, such as Nano Urea, biomass gasifiers, and AI-driven agri-tech, as eligible activities. Labelling them as taxonomy-aligned would provide visibility to investors and accelerate research and deployment.

At the same time, government support through production-linked incentives, investment in certification and testing infrastructure, and targeted export promotion policies would help Indian technologies reach economies of scale. By expanding manufacturing capacity and lowering unit costs, India can strengthen its domestic supply chains and also position itself as a provider of affordable green technologies to other developing economies.

- v. **Design MSME-Compatible Criteria and Incentives:** MSMEs are integral to India’s economy but face financial and capacity constraints that can limit their participation in green markets. The taxonomy should offer simplified entry

points for MSMEs by incorporating activity-based or principle-based approaches instead of highly technical thresholds alone. A differentiated framework that enables gradual compliance, capacity-building grants, and easier verification mechanisms can help include MSMEs without compromising environmental integrity. Financial incentives and support mechanisms are also critical. For instance, taxonomy-aligned activities could be integrated into the RBI's Priority Sector Lending (PSL) framework, encouraging banks to lend to sustainable MSME projects in agriculture, renewable energy, or waste management. Complementary measures like concessional loans, capacity-building programs, and easier verification systems could further reduce compliance burdens.

- vi. **Integrate Adaptation More Explicitly:** While mitigation activities are relatively straightforward to define and measure, adaptation projects are harder to capture due to their context-specific nature. The draft taxonomy provides limited clarity on how adaptation-related activities will be assessed, which risks underplaying their importance. A stronger adaptation framework is crucial for India, given its vulnerability to climate-related shocks in key sectors such as agriculture, water, and coastal infrastructure. The taxonomy should include specific indicators for adaptation outcomes, such as improved yield stability under climate stress, better soil moisture retention, reduced flood risk, or enhanced resilience of rural livelihoods. By providing measurable or at least well-defined qualitative benchmarks, the framework would make adaptation activities more tangible

for investors and regulators. Greater emphasis on adaptation would also align the taxonomy more closely with India's development needs, where resilience and vulnerability reduction are as important as emissions reduction.

- vii. **Stakeholder Engagement and Capacity Building:** A formal mechanism for industry feedback, beyond the public consultation phase, should be integrated into the taxonomy's design and update processes. This will foster greater buy-in, improve the realism of thresholds and criteria, and enhance the overall credibility. Alongside this, India should invest in national capacity-building programs targeted at banks, NBFCs, and regulators. These could include training workshops, technical manuals, and digital tools to help institutions consistently classify activities.
- viii **Establish Independent Verification and Assurance Systems:** One of the biggest risks for any taxonomy is that entities misclassify activities or exaggerate claims of alignment. To counter this, India should create an independent assurance mechanism. Accredited third-party reviewers could verify whether corporate disclosures, bond proceeds, and project claims are genuinely aligned with the taxonomy.

India's draft Climate Finance Taxonomy already acknowledges several important priorities. The table below sets out how these can be operationalised across different elements of the framework based on our recommendations.

Table 5: Strengthening India's Climate Finance Taxonomy (Pathways for Implementation)

Draft Framework Element	How to Take It Forward
Priority sectors and alignment with national priorities	Align with RBI/SEBI frameworks; integrate with CCTS, green credit programme, and sovereign green bonds, etc.
Classification of activities	Shift to a two-track system: climate-supportive and transition (with clear targets and sunset clauses).
Guiding principle—indigenous technology	Balance openness to efficient imports with strong support for scaling local innovations, cost reduction, and export readiness.
Guiding principle—proportionality (MSMEs)	Use simplified compliance models (yes/no decision trees, traffic-light systems), provide concessional finance, and integrate taxonomy-aligned MSME activities into RBI's PSL.
Core objectives—adaptation	Define clearer indicators and benchmarks for adaptation outcomes (e.g., yield stability, water efficiency, flood protection, and livelihood resilience).
Living framework and governance	Create feedback loops; build capacity with training, manuals, and digital tools.
Science-based and transparent processes	Create accredited third-party mechanisms to verify disclosures, bond proceeds, and project classifications.

Source: Authors' summary of Section 6.

In conclusion, India's taxonomy must be both a guide and an enabler, providing clarity and standards without curbing innovation or economic inclusion. The framework must be more than a technical classification system; it should serve as a dynamic policy instrument that fosters market confidence, promotes

innovation, supports inclusive growth, and makes a meaningful contribution to India's climate goals. With careful design and implementation, India's taxonomy can set new standards for sustainable finance frameworks in developing countries.

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Appendix

Appendix A: List of Activities: Mitigation

S. No.	Sector	Group (as per NIC/ ISIC)	Class (as per NIC/ ISIC)	Activities
1.	Power	351		Electric power generation, transmission, and distribution
			3510	Electric power generation, transmission, and distribution (includes generation by solar, hydro, nuclear, thermal,* and other non-conventional sources)
		251		Manufacture of structural metal products, tanks, reservoirs, and steam generators
			2513	Manufacture of steam generators, nuclear reactors, etc.
		261		Manufacture of electronic components
			2610	Manufacture of electronic components and boards (includes manufacturing of semiconductors, capacitors, microprocessors, etc.)
		271		Manufacture of electric motors, generators, transformers and electricity distribution, and control apparatus
			2710	Manufacture of electric motors, generators, transformers and electricity distribution, and control apparatus (includes power generators, transformers, voltage regulators, electric motors, control and distribution apparatus)
		272		Manufacture of batteries and accumulators
			2720	Manufacture of batteries and accumulators
		273		Manufacture of wiring and wiring devices
			2732	Manufacture of other electronic and electric wires and cables (made of aluminium, copper, and steel)
		281		Manufacture of general purpose machinery
			2811	Manufacture of engines and turbines, except aircraft, vehicle, and cycle engines
			2812	Manufacture of fluid power equipment (such as hydraulic pumps, hydraulic cylinders, hydraulic motors, etc.)
			2815	Manufacture of ovens, furnaces and furnace burners (also includes incinerators, electric and non-electric heaters, etc.)
		331		Repair of fabricated metal products, machinery, and equipment
			3311	Repair and maintenance of fabricated metal products (such as pipes and pipelines, tanks, drums, containers, condensers, steam collectors, etc.)

S. No.	Sector	Group (as per NIC/ ISIC)	Class (as per NIC/ ISIC)	Activities
			3312	Repair and maintenance of machinery (engines, turbines, pumps, etc.)
		332		Installation of industrial machinery and equipment
			3320	Installation of specialised industrial machinery and equipment
2	Hard-to-abate sector	241		Manufacture of basic iron and steel
			2410	Manufacture of basic iron and steel
		242		Manufacture of basic precious and other non-ferrous metals
			2420	Manufacture of basic precious and other non-ferrous metals (for aluminium)
		239		Manufacture of non-metallic mineral products
			2394	Manufacture of cement, lime, and plaster (for cement and lime)
		251		Manufacture of structural metal products, tanks, reservoirs, and steam generators
			2512	Manufacture of tanks, reservoirs, and containers of metals
3	Construction/ Buildings	410		Construction of buildings
			4100	Construction of buildings (also includes alteration, maintenance, repair, etc.)
		421		Construction of roads and railways
			4210	Construction of roads and railways (includes construction and maintenance of roads, bridges, and railways)
		422		Construction of utility projects
			4220	Construction and maintenance of utility projects like power plants, transmission lines, irrigation systems, sewer systems, etc.
		429		Construction of other civil engineering projects
			4290	Construction of other civil engineering projects such as dams, refineries, chemical plants, etc.
		431		Demolition and site preparation
			4311	Demolition
			4312	Site preparation, which also includes cleaning of building sites
		239		Manufacture of non-metallic mineral products

S. No.	Sector	Group (as per NIC/ ISIC)	Class (as per NIC/ ISIC)	Activities
			2391	<i>Manufacture of refractory products like refractory bricks, tiles, ceramic construction products, etc.</i>
4	Transport	291		Manufacturing of Motor Vehicles
			2910	Manufacture of motor vehicles (includes manufacturing of passenger/commercial vehicles, vehicle engines, etc.)
		452		Maintenance and repair of motor vehicles
			4520	Maintenance and repair of motor vehicles
		454		Sale, maintenance and repair of motorcycles, related parts, and accessories
			4540	Maintenance and repair of motor cycles, mopeds, scooters, and three wheelers
		309		Manufacture of transport equipment
			3091	Manufacturing of motorcycles
		302		Manufacture of railway locomotives and rolling stock
			3020	Manufacture of railway locomotives and rolling stock
		491		Transport via railways
			4911	Passenger rail transport
			4912	Freight rail transport
		492		Other land transport
			4921	Urban or suburban passenger land transport
			4922	Other passenger land transport
			4923	Freight transport by road
		501		Sea and coastal water transport
			5011	Sea and coastal passenger water transport
			5012	Sea and coastal freight water transport
		301		Building of ships and boats
			3011	Building of ships and floating structures
		502		Inland water transport
			5021	Inland passenger water transport
			5022	Inland freight water transport
		303		Manufacture of air and spacecraft and related machinery
			3030	Manufacture of air and spacecraft and related machinery (also includes manufacturing of airplanes, helicopters, parts, and accessories)
		511		Passenger air transport
			5110	Passenger air transport
		512		Freight air transport
			5120	Freight air transport

S. No.	Sector	Group (as per NIC/ISIC)	Class (as per NIC/ISIC)	Activities
		279		Manufacture of other electrical equipment
			2790	Manufacture of other electrical equipment (such as battery chargers)
5	Water and Waste	360		Water collection, treatment and supply
			3600	Water collection, treatment and supply
		370		Sewerage
			3700	Sewerage (includes maintenance of sewerage systems, collection, transportation, and treatment of human and industrial waste water)
		381		Waste Collection
			3811	Collection of non-hazardous waste
			3812	Collection of hazardous waste
		382		Waste treatment and disposal
			3821	Treatment and disposal of non-hazardous waste
			3822	Treatment and disposal of hazardous waste
		383		Materials Recovery
			3830	Materials recovery (such as paper, plastic, cans, etc.)
		390		Remediation activities and other waste management services
			3900	Remediation activities and other waste management services (such as clean-up of building sites, ground water, surface water, other pollution control measures, etc.)

Source: NIC (2008).

Note: *Thermal power is included in the list because it cannot be entirely eliminated from India's climate transition strategy. It should be recognised as a transition activity within the framework.

Appendix B: List of Activities: Adaptation

S. No.	Priority Sector	Group (as per NIC)	Class (as per NIC)	Activities
1	Forests	021		Silviculture and other forestry activities
			0210	Silviculture and other forestry activities (includes growing timber and operating forest tree nurseries).
		024		Support services to forestry
			0240	Support services to forestry (management consulting, inventories, pest control, and logging services, such as in-forest log transport).
2	Agriculture**	011		Growing of non-perennial crops
			0111	Growing of cereals (except rice), leguminous crops, and oil seeds (in open fields, including organic and genetically modified crops).
			0112	Growing of rice.
			0113	Growing of vegetables and melons, roots, and tubers.
			0114	Growing of sugar cane.
			0115	Growing of tobacco.
			0116	Growing of fibre crops.
			0119	Growing of other non-perennial crop.
		012		Growing of perennial crops
			0121	Growing of grapes.
			0122	Growing of tropical and subtropical fruits.
			0123	Growing of citrus fruits.
			0124	Growing of pome fruits and stone fruits.
			0125	Growing of other tree and bush fruits and nuts.
			0126	Growing of oleaginous fruits.
			0127	Growing of beverage crops.
			0128	Growing of spices, aromatic, drug, and pharmaceutical crops.
			0129	Growing of other perennial crops.
		013		Plant propagation
			0130	Plant propagation (includes production of planting materials like cuttings, suckers, and seedlings for propagation or grafting to grow crops).
		015		Mixed farming
			0150	Mixed farming (includes mixed crop and animal farming without specialisation; excluded if crops or animals exceed 66 per cent of standard gross margins).

S. No.	Priority Sector	Group (as per NIC)	Class (as per NIC)	Activities	
		016		Support activities to agriculture and post-harvest crop activities	
			0161	Support activities for crop production (includes crop preparation, treatment, harvesting, pest control, irrigation equipment, and agricultural gardening).	
			0163	Post-harvest crop activities (includes cleaning, grading, and disinfecting crops for market, cotton ginning, tobacco processing, and other post-harvest activities).	
			0164	Seed processing for propagation (improving the quality of seeds)	
		201		Manufacture of basic chemicals, fertiliser and nitrogen compounds, plastics, and synthetic rubber in primary forms	
			2011	Manufacture of basic chemicals.	
			2012	Manufacture of fertilisers and nitrogen compounds.	
		202		Manufacture of other chemical products	
			2021	Manufacture of pesticides and other agrochemical products.	
		282		Manufacture of special-purpose machinery	
			2821	Manufacture of agricultural and forestry machinery.	
3	Fishing and Aquaculture	031		Fishing	
			0311	Marine fishing	Involves commercial fishing of marine/ freshwater life like crustaceans, molluscs, pearls, sponges, algae, and includes fishing vessels that also process and preserve the catch.
			0312	Fresh Water Fishing	
		032		Aquaculture	
			0321	Marine Aquaculture	Includes marine/freshwater aquaculture such as farming fish, crustaceans, mollusks, seaweed, hatchery operations, and breeding in brackish or saltwater tanks
			0322	Freshwater Aquaculture	

Source: NIC (2008).

Note: **We have not included animal production and support activities for animal production in the list of activities, as adaptation interventions in this sector are complex and difficult to define at the current stage.

About the Authors



Renu Kohli is an economist with research and practitioner experience on macroeconomic policies and issues. She has previously worked with the RBI, the IMF and other thinktanks. Her work has focused on capital account and financial liberalization, exchange rate management, monetary policy, international macroeconomic coordination, sovereign debt resolution, G20, climate change and macroeconomic impacts including food security and inflation. She has published widely in refereed journals such as the *Review of Development Economics*, *Journal of Development Studies*, *Journal of Asian Economics*, Oxford University Press, *IMF Working Papers*, *RBI Staff papers*, and contributed to several edited volumes. She writes regular opeds on monetary policy, macroeconomic policy, and other economic matters in prominent Indian newspapers. She has exposure to IMF multilateral surveillance and training missions as short-term expert (IMF Institute) in financial programming & policies and macroeconomic diagnostics. Dr. Kohli has wider engagement with the private financial sector and investors through talks, presentations and consultation on Indian macroeconomic policies. She serves as an independent director on the boards Catholic Syrian Bank, NCML Ltd, and NFIN Ltd.



Kritima Bhapta is a Research Associate in the macroeconomics segment of the Growth, Finance and Development vertical. Prior to joining CSEP, she worked as a Young Professional at the Department of Economic Affairs, Ministry of Finance, where she conducted macroeconomic and policy research related to the International Monetary Fund and India. She also participated in the 2022 Article IV Consultations between the IMF and the Government of India.

She holds a Master's Degree in Economics from NTU Singapore and a Bachelor's Degree from University of Delhi.

Her research interests lie in macroeconomics, international economic relations and public policy.

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Centre for Social and Economic Progress

6, Dr Jose P. Rizal Marg, Chanakyapuri, New Delhi - 110021, India



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