Integrating Nature's Loss and its Risks within the Finance Sector: A Look at India's Finance Landscape

ACKNOWLEDGEMENT

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FOREWORD

In an increasingly interconnected world, the relevance of environmental sustainability extends far beyond conservation efforts—it has become a critical factor influencing financial stability and long-term economic growth. For India, a nation that is both a biodiversity-hotspot and highly vulnerable to the impacts of climate change, the need to understand and mitigate nature-related risks is urgent than ever.

The financial sector plays a pivotal role in shaping how we address these risks. Whether through investments, lending practices, or risk management, financial institutions are uniquely positioned to drive change by incorporating nature-related factors into their decision-making processes. This report aims to shed light on the significant nature-related risks—such as biodiversity loss, water stress, air pollution, and climate change—that are increasingly impacting India's economy, businesses, and financial markets. The pressures we put on the ecosystems can lead to reduction in ecosystem services provided and this can ultimately affect the economic productivity and performance.

As India continues to grow as one of the world's largest economies, the intersection of environmental sustainability and financial risk cannot be ignored. Nature-related risks threaten to disrupt industries, create systemic vulnerabilities, and undermine the stability of financial systems if left unaddressed. By integrating nature-related risk assessments into the financial sector's strategic frameworks, institutions can help build a more resilient, sustainable economy.

This report provides an examination of how these risks manifest within India's specific context, offering insights into emerging regulatory frameworks, best practices for risk management, and opportunities for innovation. It calls for greater collaboration between policymakers, financial institutions, and businesses to ensure that nature-related risks are properly understood, quantified, and mitigated in ways that promote long-term sustainability for both the economy and the environment.

In the coming years, how we address nature-related risks will be one of the defining factors of India's financial landscape. It is essential that the finance sector not only recognizes these challenges but also seizes the opportunity to lead in sustainable finance. This report is an important step in that direction.

Gopal Murli Bhagat
Chief Executive (Officiating)
Indian Banks' Association

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Relevant Terms and Definitions

Biodiversity: The variability among living organisms from all sources, including, inter alia, terrestrial, marine, and other aquatic ecosystems, and the ecological complexes of which they are part. It includes the diversity within species, between species, and of ecosystems (Convention on Biological Diversity, 1992).

Cumulative impact: A change to the state of natural capital that occurs due to the interaction of activities of different actors operating in a landscape, not only the target organisation (as referenced in the Taskforce on Nature-related Financial Disclosures Beta framework).

Dependencies: Aspects of ecosystem services an organisation or other actor relies on to function. Dependencies include ecosystems' ability to regulate water flow, water quality, and hazards like fires and floods, provide a suitable habitat for pollinators (who in turn provide a service directly to economies), and sequester carbon (in terrestrial, freshwater and marine realms) (as referenced in the Taskforce on Nature-related Financial Disclosures Beta framework).

Direct impact: A change in the state of natural capital caused by a business activity with a direct causal link (as referenced in the Taskforce on Nature-related Financial Disclosures Beta framework).

Ecosystem condition: "The quality of an ecosystem measured in terms of its abiotic and biotic characteristics. Condition is assessed with respect to an ecosystem's composition, structure and function which, in turn, underpin the ecological integrity of the ecosystem, and support its capacity to supply ecosystem services on an ongoing basis" (as referenced in the Taskforce on Nature-related Financial Disclosures Beta framework).

Ecosystem services: The contributions of ecosystems to the benefits that are used in economic and other human activity, drawn from UN SEEA's Ecosystem Accounting (as referenced in the Taskforce on Nature-related Financial Disclosures Beta framework).

Impacts: Changes in the state of nature that may result in changes to the capacity of nature to provide social and economic functions. Impacts can be positive or negative. They can result from the actions of an organisation or another party, and can be direct, indirect, or cumulative (as referenced in the Taskforce on Nature-related Financial Disclosures Beta framework).

Indirect impact: A change in the state of natural capital caused by a business activity with an indirect causal link (for instance, indirectly caused by climate change and greenhouse gas emissions)

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Natural capital: The stock of renewable and non-renewable natural resources (such as plants, animals, air, water, soils, and minerals) that combine to yield a flow of benefits to people (as referenced in the Taskforce on Nature-related Financial Disclosures Beta framework).

Nature: The natural world, with an emphasis on the diversity of living organisms, including people and their interactions among themselves and with their environment (as referenced in the Taskforce on Nature-related Financial Disclosures Beta framework).

Nature-related risks: Potential threats to an organisation linked to their and wider society's dependencies on nature and nature impacts. These can derive from physical, transition, and systemic risks (as referenced in the Taskforce on Nature-related Financial Disclosures Beta framework).

Provisioning services: "The contributions to benefits that are extracted or harvested from ecosystems (e.g. timber and fuel wood in a forest, freshwater from a river)" (as referenced in the Taskforce on Nature-related Financial Disclosures Beta framework).

Regulating services: These services regulate natural processes and provide benefits to humans, such as climate regulation, water purification, and flood control.

Supporting services: These services are necessary to produce other ecosystem services, such as nutrient cycling and soil formation.

Cultural services: These services provide non-material benefits to humans, such as aesthetic and recreational values, spiritual and cultural experiences, and educational opportunities.

Resilience (of ecosystems): "The level of disturbance that an ecosystem or society can undergo without crossing a threshold that creates different structures or outputs. Resilience depends on factors such as ecological dynamics and the organisational and institutional capacity to understand, manage and respond to these dynamics" (Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services, 2019, as referenced in the Taskforce on Nature-related Financial Disclosures Beta framework).

EXECUTIVE SUMMARY

Central banks and financial supervisors can start integrating nature-related risks into macro- and micro prudential supervision and prepare the finance sector to take into account this cross cutting dimension into traditional financial risk management.

Our economic growth and development are interlinked with and fueled by the planet's health. However, the unbridled economic growth and emission-intensive business activities are resulting in significant nature loss. The *Living Planet Report 2024* showcases that Earth has experienced an average 73 percent decline in the relative abundance of wildlife populations since 1970. This unprecedented nature loss, amplified by climate change and ecosystem degradation, creates an array of risks that threaten the stability and resilience of the world we live in. With a significant part of our GDP dependent on nature and biodiversity, the dwindling ecosystem services threaten both the direct performance of industries as well as the financial investments going into these business activities. While the financial sector is beginning to acknowledge climate change related financial risks, the understanding of nature-related risks is still at a nascent stage. In this report, our analysis reflects significant dependence of the lending portfolio of the FIs on ecosystem services. That is, 53 percent of the lending portfolio of SCBs, amounting to a value of US$863 billion (INR 64 lakh crore) as of May 2022, is extended towards sectors with significant dependencies on at least one ecosystem service.

Similar to climate-related risks, nature-related risks can also translate into real economic risks, and can be categorized as[1]:

- Physical risks, from the potential for reductions in the quantity and quality of services provided by natural systems;
- Transition risk, arising from actions or changes that occur to combat or reduce nature and biodiversity loss; and
- Liability risks, from litigation against entities held responsible for biodiversity loss and resulting damages.

The financial sector has the potential to act as a driving force to redirect the economies towards a low-carbon, nature-positive[2] pathway. In recent years, there have been policy

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developments and commitments on reversing nature loss, both globally and nationally. India became a signatory to the Kunming-Montreal Global Biodiversity Framework (GBF) in 2022, which aims to address biodiversity loss, restore ecosystems and protect indigenous rights. Additionally, India has also committed in its NDCs – to create an additional carbon sink of 2.5 to 3 billion tons of CO2 equivalent through additional forest and tree cover by 2030[3]. These commitments provide further opportunities for policy development aligned with nature-positive outcomes, such as developing a nature-aligned taxonomy which encompasses nature-related matrices across critical sectors. Moving forward, these policy mechanisms will aid businesses and financial institutions to gain a competitive advantage by aligning practices and projects with nature-positive outcomes.

This report sets out to highlight nature related risks and opportunities for the Indian finance sector, and provide impetus for the financial sector regulators as well as financial institutions to play a leadership role in aligning the Indian economy with our environmental commitments at the world stage. In this backdrop, this report scans India's financial landscape on four parameters which the authors believe to be the key for a successful transition towards a more sustainable finance sector:

- Availability of an appropriate financial sector toolkit to encourage finance for nature;
- Central bank's economic and policy incentives to improve nature finance flows;
- Inclusion of nature risks across banking and financial services (strategy, governance, and decision- making process) and;
- Creating a pipeline of bankable projects with a sound framework aimed at replicating and expanding successful investments in nature.

While notable progress has been made by the Indian financial sector in recognising the financial risks linked to climate change and nature loss, certain key policy gaps remain. This report seeks to provide recommendations

to three key stakeholders which are crucial to effect this change- the government, the central bank (Reserve Bank of India) and financial institutions.

The government can set the tone for national action with a finance sector roadmap on climate and nature priorities, and guide implementation of national efforts to align with the Global Biodiversity Framework (GBF). It can provide appropriate tools to foster a nature positive financial ecosystem, supported by policy incentives and enabling conditions that catalyse public and private sector investment for nature conservation. Fostering the creation of the right data infrastructure, such as a natural capital accounting framework and a robust monitoring, reporting and validation (MRV) mechanism, will have a multiplier effect for this transformation.

The central bank and financial supervisors can start integrating nature-related risks into macro- and micro prudential supervision by:

- Demanding regulated entities to adopt a "Double materiality approach" i.e., evaluating the expected impact of Environmental and Social (E&S) issues on their risks and value creation; and addressing the impacts of their business activities on nature and society.
- Incorporating E&S considerations in the calculations of minimum capital requirement, with differentiated risk-based approach to encourage comprehensive integration of risks in investment decisions.
- Requiring the regulated entities to set climate and nature-related science-based targets, in order to align their portfolios with the Paris goals as well as the global biodiversity conventions.
- Preparing the finance sector to strengthen non-financial disclosures on nature, and taking into account these cross- cutting dimensions into traditional financial risk management to ensure the necessary coordination and convergence of practices.
- Integrating nature-related risks within its macro-prudential supervision and encouraging regulated entities to reduce their exposure to high-risk sectors.

Lastly, it is the financial institutions which enable business activities, making them a key stakeholder to enable this transition. Financial institutions must start recognizing and disclosing on the exposure of their lending portfolio to nature-related dependencies and impacts. Here, the development of a nature-aligned national green taxonomy will play a crucial enabling role. They can start by identifying nature related risks to their value chains and incorporating them across their strategy, governance, risk assessment frameworks and decision-making processes. They can make efforts to drive growth in sustainable finance and investment opportunities by developing and offering innovative financial instruments for climate and nature finance.

An environmentally conscious finance sector that is mindful of its impact on nature and biodiversity, can re-direct significant investments towards sustainable businesses and projects, and thereby hasten the transition to a sustainable economy.

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INTRODUCTION

Sustainable development is a guiding principle to ensure a habitable planet for present and future generations. While the global economy is inextricably linked to the ecosystem services of the planet, Earth's biodiversity and many of its material ecosystems have steadily declined over time due to unsustainable linkages. Consequently, for the continued sustenance of humanity, a shift towards a low-carbon and nature-positive trajectory is imperative. This transformational journey can provide novel opportunities and catalyse substantial investment in new technologies and environment-friendly businesses. Research has established the financial rewards that can accompany such a transition, and the financial sector is gradually responding to these demands.

Governments and financial regulators alike have begun to acknowledge the need for the sustainable management of natural resources. The collapse of select ecosystem services provided by nature—such as wild pollination, and the provision of food from marine fisheries and timber from native forests—could result in a decline in global GDP of US$2.7 trillion annually by 2030[4]. While climate change has captured the minds of the people and decision-makers alike, the loss of nature and biodiversity remain at the periphery of the conversation and, consequentially, policies.

This report highlights that climate change and the loss of nature are inextricably linked, and synergistic efforts are required to address them effectively. The relationship between climate change and the loss of biodiversity (and nature) is such that one crisis exacerbates the other. This is known as the negative feedback loop—climate change exacerbates the loss of biodiversity, and the loss of biodiversity further intensifies the impact of climate change.

Consequently, the context of financial decision-making is swiftly evolving in response to these global challenges. The financial sector relies heavily on natural resources, forming a reciprocal relationship referred to as 'double materiality,' which essentially means that the financial institutions are materially affected by and have a significant impact on biodiversity and ecosystems. Understanding these dependencies is essential to build resilience within the financial sector.

Biodiversity and ecosystem provides both private and public goods, while private goods such as the 'wood' maybe accounted for and paid for, however, the public goods such as 'loss of carbon storage' is neither accounted nor any compensation is paid for it.[a] In addition this, certain industries such as the fisheries are dependent on natural capital and resources that are not regulated by property laws and are thus being over-exploited & facing immense pressure.[b]

If the pressure on biodiversity and natural capital continues to increase unabated, it will undermine the ecosystem services that underlie numerous economic activities (such as production and the availability of raw materials), thereby exacerbating economic vulnerabilities and risks.

Here, it is imperative to acknowledge that while the wealthy extract substantially more ecological resources (via their consumption patterns), it is the marginalised groups that more dependent on the ecosystem services with their livelihoods inextricably linked to the ecosystem services. However, the traditional metrics of calculating GDP do not fully account for these dependencies. Given this higher dependence, the economists have called for the valuation of the contribution of ecosystem services and natural capital to the livelihoods of the marginalised communities as "GDP of the poor".[c] Natural resources such as- fresh water, marine ecosystem, land, biodiversity, soil etc. form the basis of livelihoods of these communities. In order to offer a 'numerical measure of this economic dependence of communities' an ecosystem dependency ratio or index was devised as: "the ratio of the sum of values of ecosystem services and total

a Pavan Sukhdev, "Costing the Earth", Nature (Vol. 462, November, 2009).

b Ibid.

c Pavan Sukhdev, "Costing the Earth", Nature (Vol. 462, November, 2009).

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incomes of the economy of the ecosystem under consideration."[d]

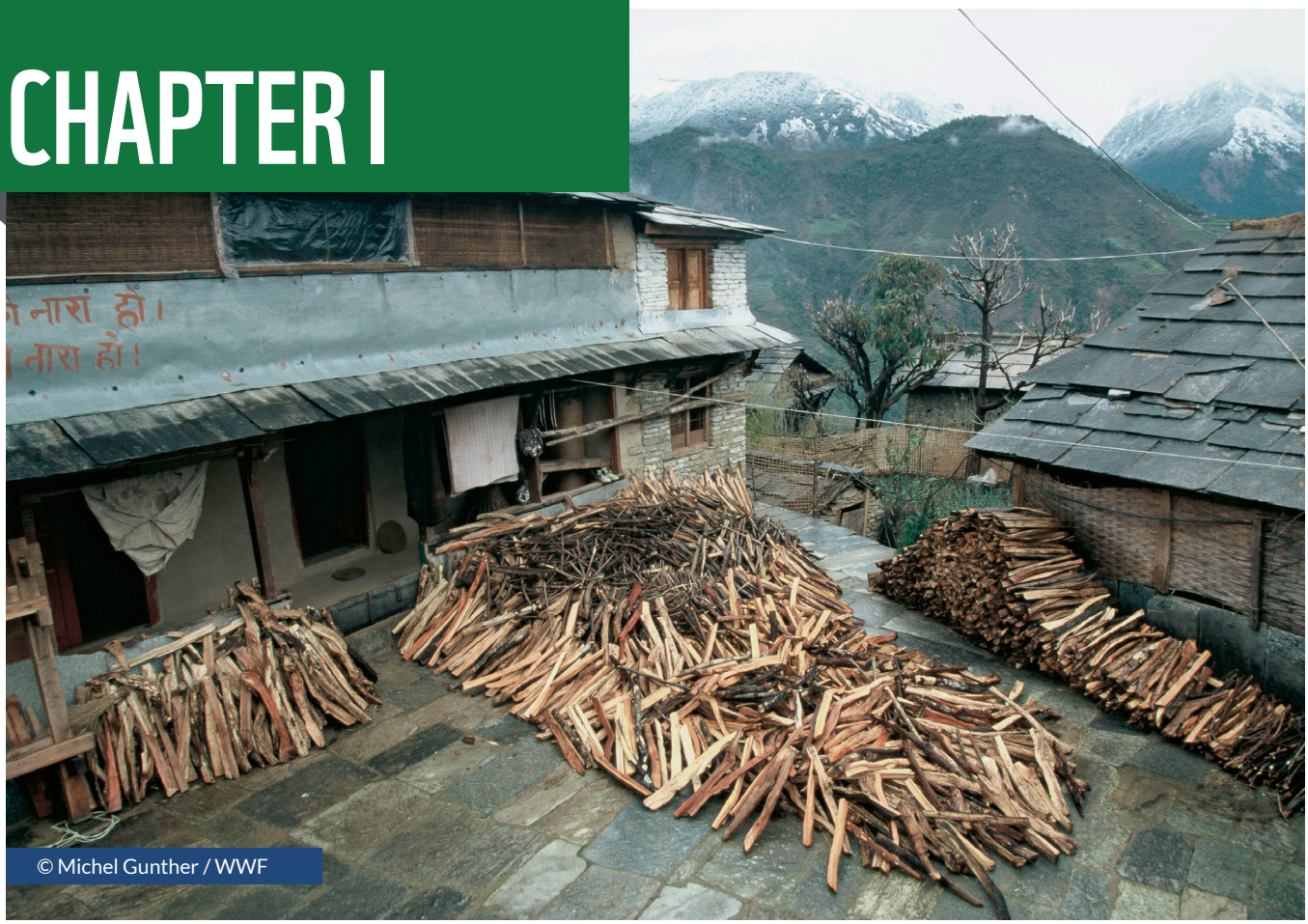
As the dependencies of human society and economies on nature become apparent, the 'conservation conversation' shifts from the 'need for conservation' to 'how to finance conservation'. The key message of this report is that financial decision-making must pivot towards generating holistic value through business activities, harmonising economic, social, and environmental benefits, with a strong emphasis on the timeliness of this transition.

d Ghosh, N. (2020): "Promoting a 'GDP of the Poor': The imperative of integrating ecosystems valuation in development policy", Occasional Paper No. 239, March 2020, Observer Research Foundation. The ecosystem dependency ratio is:

$$EDi = \frac{EVi}{Yi} \ldots (1)$$

Where
EDi = Ecosystem dependency ratio of the ith economy (at any scale)
EVi = Sum of values of ecosystem services of the ith economy
Yi = Total income of the economy.

CHAPTER I



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VALUING BIODIVERSITY AND NATURAL CAPITAL

CLIMATE CHANGE & BIODIVERSITY LOSS: TWO SIDES OF THE SAME COIN

Climate change and biodiversity loss are two of the biggest environmental challenges facing the world today, and they are closely linked, where one is accentuated by the other. Climate change is causing changes in ecosystems, such as changes in temperature and rainfall patterns, which will in turn affect critical changes in the distribution and abundance of species. Similarly, biodiversity loss will have impact on the climate system, such as the loss of carbon stored in forests and other ecosystems, which can exacerbate climate change.

Consequently, addressing climate change and biodiversity loss requires complementary strategies that work together to promote sustainable development and conservation. For example, efforts to reduce greenhouse gas emissions and transition to a low-carbon economy can help to mitigate climate change, while also promoting sustainable land use and protecting biodiversity. Similarly, efforts to protect and restore ecosystems, such as forests, wetlands, and grasslands, can help to conserve biodiversity, while also promoting carbon sequestration and storage, and mitigating climate change.

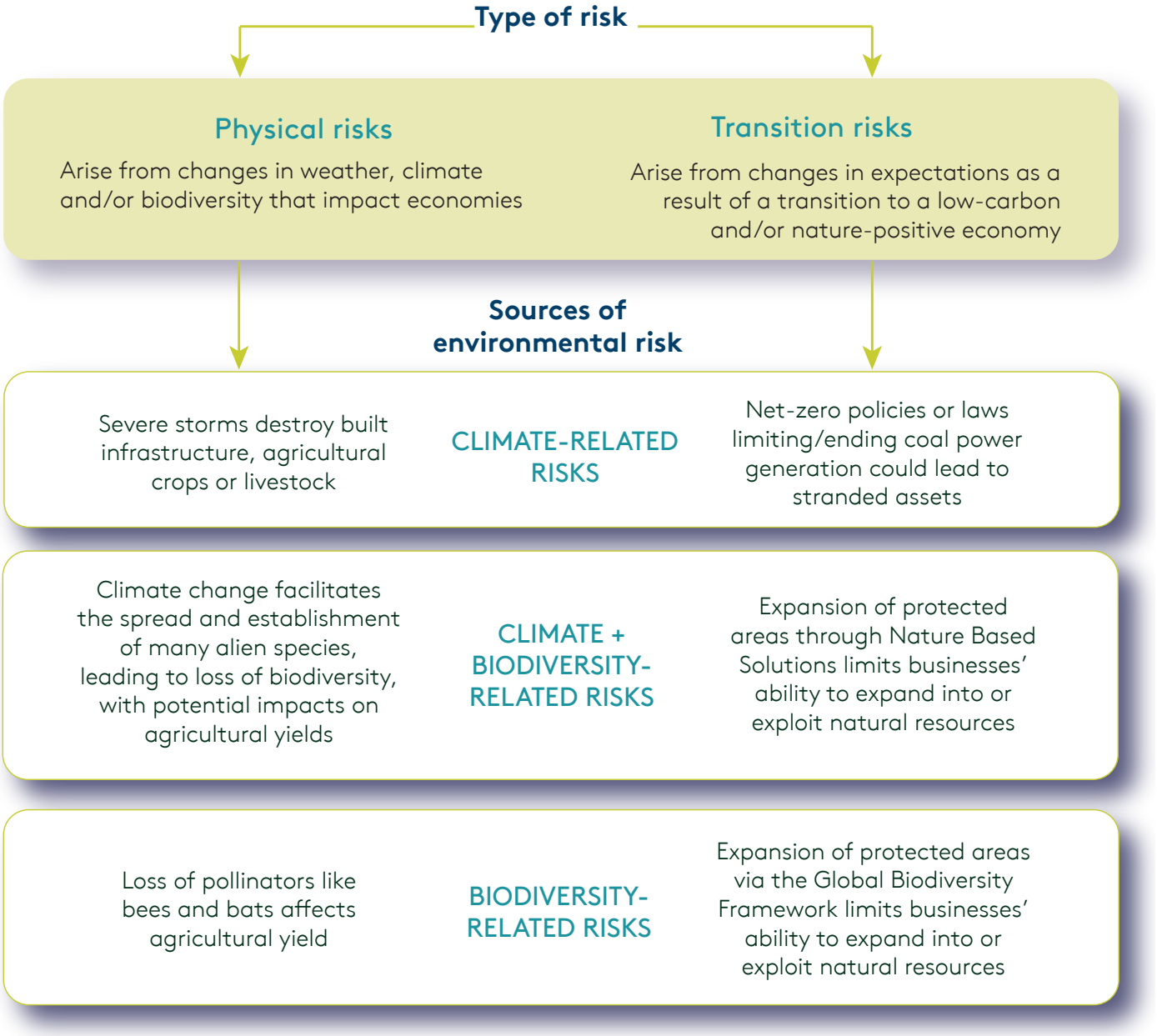
In addition, there are many co-benefits associated with addressing both climate change and biodiversity loss, such as improved food security, water management, and human health outcomes. It is therefore imperative, rather than optional, to take a comprehensive approach that considers both climate action and biodiversity conservation. It is only through addressing the interconnected challenges facing the planet in holistic and synergistic ways, can we effectively work towards a more sustainable future for all.

Globally and in India, there has been an increasing focus on climate action. In line with its global peers, India has committed to Net Zero emissions by 2070 and less than 45% emission intensity by 2030. Globally, 165 countries accounting for 91% of global emissions, have submitted their Nationally Determined Contributions (NDC) stating their intended GHG reduction commitments. In the face of unprecedented biodiversity loss, the global community signified its commitment to the Kunming-Montreal Global Biodiversity Framework (GBF), in December 2022. The GBF with its overarching aim to 'halt and reverse' nature loss by 2030, calls upon the financial sector to play a key role in achieving a nature-positive future. This comprehensive framework is built upon four overarching goals to be accomplished by 2050, along with 23 action-oriented targets for 2030. The GBF explicitly urges the financial institutions to align their business activities (and financial flows) to the objectives of the framework.

Climate change as well as loss of biodiversity translate into both physical as well as transition risks for the financial sector. These crises reinforce one another to compound their impact on the related economic activities.

Research indicates that financial risks emerging from the decline in biodiversity can be categorized in a manner analogous to financial risks associated with climate, which includes physical risks (such as alterations in ecosystem services due to biodiversity loss and ecosystem deterioration), transition risks (such as regulatory changes aimed at reversing biodiversity decline or reducing the use of natural resources), legal risks (such as breaches of legal frameworks concerning the protection of biodiversity)[5] and systemic risks (due to compounded economic effects across an entire economy, eventually impacting all participants in the financial sector)[6].

Figure 1: Interactions between biodiversity and climate risks



Source: NGFS 2022, Almeida 2021

BIODIVERSITY, NATURAL CAPITAL AND ECOSYSTEM SERVICES

The progression of human development is intertwined with nature. The human-nature dynamic involves complex interactions; to holistically appreciate and acknowledge nature's role in human development, a comprehensive understanding of biodiversity, natural capital, and ecosystem services is crucial. The interplay among these elements forms the foundation for the resilience, productivity, and operational harmony of all ecosystems.

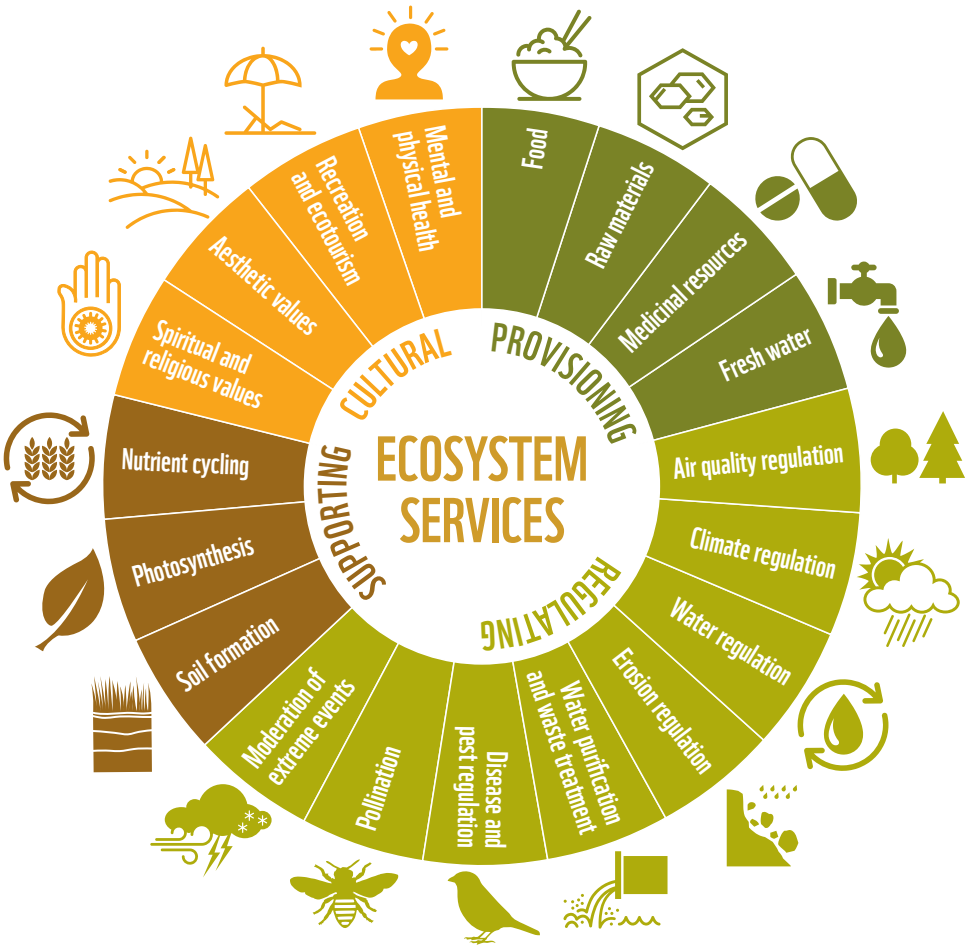
Biodiversity refers to the variety of living organisms and ecosystems on earth. Regrettably, human activities and unbridled exploitation of natural resources have significantly strained Earth's biodiversity. The deterioration resulting from excessive use, habitat degradation, and land transformation collectively contribute to the dwindling of biodiversity. According to the findings of the WWF's Living Planet Report 2024, there has been an estimated average decline of 73% in species populations since 1970.

Besides biodiversity, two additional concepts are relevant to this discussion: natural capital and ecosystem services. "Capital" most simply put, refers to the total amount of resources available inside a specific system at any given time. **Natural capital** refers to "the stock of renewable and non-renewable resources (e.g., plants, animals, air, water, soils, minerals)". In this context, natural capital is the stock of natural resources, which provide benefits for the larger human population. Natural capital includes all the resources and services provided by nature, such as clean air and water, fertile soil, and climate regulation.

Ecosystem services are the products and services that are received by human beings. The term "ecosystem services" is the most accurate way to express the usefulness of ecosystems to human beings, and to exemplify nature's contribution towards human development. Biodiversity is a critical aspect of natural capital as it provides the foundation for ecosystem services such as food production, carbon sequestration, and pest control. Natural capital can be simply understood as the material and processual elements constituting natural ecosystems that sustain and nurture human communities.

Natural ecosystems provide us with valuable services, these services are typically grouped into four categories: Provisioning services, Regulating Services, Supporting services, Cultural services

Figure 2: Ecosystem Services



Source: WWF: Living Planet Report 2016[7]

Biodiversity and natural capital (including ecosystem services) are interdependent and mutually reinforcing. Biodiversity provides the basis for natural capital, while natural capital supports biodiversity by providing the resources and services necessary for the survival of species and ecosystems. Thus, conserving biodiversity is essential for maintaining the health and functioning of natural capital and ecosystem services, and in turn, the well-being of human societies.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Nearly all of humanity's most productive endeavours are supported by the ecosystem services provided by natural systems. However, the advent of rapid urbanisation and modernisation has muted this reality

within the human consciousness, thus, leading to mismanagement of ecosystems. The degradation of ecosystems as a result of poor management and abuse is causing a drop in the services provided by ecosystems. A majority of these ecosystem services are either partially or absolutely irreplaceable. However, these services are often undervalued in economic decisions, this leads to insufficient economic incentives to maintain and responsibly utilise ecological services.

HOW ARE NATURAL CAPITAL & ECOSYSTEM SERVICES VALUED?

Since so much of human economic activity depends on natural capital, it is critical to account for these as comprehensively as possible, failing which we can only have a partial idea of the health of an economy. Valuing natural capital involves assessing the economic, social, and environmental benefits that natural resources provide, as well as the costs associated with their depletion or degradation. Valuing ecosystem services, like natural capital, is a multifaceted and comprehensive task. There are several methods for valuing ecosystem services, and the most appropriate approach will depend on the type of service being evaluated and the specific context.

The valuation process of ecosystem services/ natural capital is process of making explicit the value that people hold for nature. The different types of valuation processes are reflective of the stakeholders and interest groups who design and implement them. That is to say that the 'type and quality of information' collected and employed for the valuation process is influenced by the existing power relations in any society, and interest groups whose shared values of nature is recognised. Based on the diverse disciplines and knowledge systems influencing the various existing valuation processes, the IPBES (Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services) divided these into four non-disciplinary categories/ "method-families" namely: "(i) nature-based valuation gathers, measures or analyses information about the properties of nature and its contributions to people; (ii) statement- based valuation directly asks people to express their values; (iii) behaviour-based valuation identifies how people value nature by observing their behaviour and practices; and (iv) integrated valuation brings together various types of values assessed with different information sources."[e]

Another approach is to use non-market valuation methods, such as stated preference surveys or revealed preference analysis. These methods involve asking people about their willingness to pay or willingness to accept compensation for changes in ecosystem services. For example, a survey may ask people how much they would be willing to pay to protect a particular ecosystem or how much compensation they would require for the loss of a specific service.

In some cases, a combination of market and

e IPBES, Summary for Policymakers of the Methodological Assessment Report on the Diverse Values and Valuation of Nature of the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services, IPBES secretariat, Bonn, Germany, 2022.

non-market valuation methods may be used to provide a more comprehensive assessment of ecosystem service values.

Ultimately, the valuation of natural capital and ecosystem services is important as it helps decision-makers understand the trade-offs and benefits of different land use or development scenarios, and can inform policies and management practices that promote the sustainable use of natural ecosystems, and the conservation of biodiversity.

Globally, the value of ecosystem services is estimated to be more than USD 125- USD 140 trillion annually, representing a value greater than global GDP.[8] The Economics of Ecosystems and Biodiversity (TEEB) estimates indicate that the total annual ecosystem service value has declined by at least USD 5 trillion since the late 1990s.[9] This means that each year the world economy forfeits ecosystem services worth about 6% of global GDP. These numbers reflect the importance of these services to our economy and the urgency for nature conservation and preservation of ecosystem services.

THE IMPORTANCE OF BIODIVERSITY TO INDIA'S FUTURE

India is one of the 17 mega-diverse countries worldwide. It is home to four of the 34 globally recognised biodiversity hotspots and harbours nearly 8 percent of the recorded species in the world despite having only 2.4 percent of the global land area.

However, the *Living Planet Report 2020* states that India is experiencing an unprecedented decline in its biodiversity. According to the International Union for Conservation of Nature (IUCN) red list, India has lost six plant species and approximately one-third of its wetlands[10]. India has also lost over 90 percent of the area under biodiversity hotspots, and the Indo-Burma hotspot has lost 95 percent of its vegetation[11]. Given that, in India, about 300 million people are dependent on forests for their sustenance and around 70 percent of rural households still depend primarily on agriculture for their livelihood (with 82 percent of farmers being small and marginal), biodiversity loss is likely to have a severe impact on human development.

A substantial part of India's GDP[12] is heavily dependent on ecosystem services and the natural biodiversity of the region,[13] with the agriculture, construction, and food & beverage sectors among the most environmentally reliant value chains. Further, these sectors account for over 20 percent of India's GDP, and also provide employment to a majority of the rural population.

India is the fastest-growing major economy globally and is expected to become a US$5 trillion (INR 371 lakh crore)[14] economy by 2027 and a US$34 trillion (INR 2710 lakh crore) economy by 2050. However, the projected growth in national GDP is highly contingent on the availability of relevant natural ecosystem services; for instance, by 2050, water demand in India is projected to increase by 40 percent, energy demand is expected to grow by 50 percent, and food consumption is expected to increase by 32 percent.[15] These demands will have a direct impact on various ecosystem services, wherein regulating services, for example, will have to deal with increased levels of waste generation, pollution, and so on, while supporting services will be expected to replenish nutrients in the soil at a faster pace to deal with the increased demand for food.

According to the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services, there are five major drivers of biodiversity loss:

- Land/sea use change;
- Direct exploitation (overexploitation of animals, plants, and ecosystems);
- Climate change;
- Pollution; and
- Invasive species (plants, animals, or other non-native organisms entering or expanding their presence in each habitat).

In addition to increased pressures due to economic growth, India's inherent vulnerability to climate change will present an additional challenge in preventing biodiversity loss. India, as the seventh-most vulnerable country with respect to climate extremes,[16] is already feeling the impacts of these drivers. Recent events are littered with examples, such as extreme weather events increasing over the past decade (for instance, super cyclone Biparjoy in the Arabian Sea, Amphan in the Bay of Bengal, landslides and floods in Uttarakhand and Kerala).

As such, in addition to services (energy, water, and food), investments in adaptation and resilience infrastructure (such as early warning systems), wetland conservation and management, water harvesting systems, and improved dryland agricultural crop production are critical to arrest further losses in biodiversity value, thus enabling the country to maintain the quality of life for its growing population.

THE VALUE OF ECOSYSTEM SERVICES FOR THE INDIAN ECONOMY

Natural ecosystems create economic value through ecosystem services such as food and raw material provision, carbon sequestration, and water regulation. Nature's benefits are multifold, including security, health, and well-being. It also buffers humankind from natural disasters, can potentially prevent the next pandemic, and provides people with water and nutritious foods.


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The *2022 Global Risk Report* by the World Economic Forum (WEF) ranks biodiversity loss as the third most likely adverse risk facing our planet.[17] The WEF also states that over 33 percent of India's GDP is moderately or highly dependent on nature and its ecosystem services, with the agriculture, construction, and food and beverage sectors among the value chains with the highest dependency.[18] A few examples that showcase this dependency include:

- The total economic value of pollinators is estimated to be 8.72 percent of India's annual agricultural value, where more than 50 percent of India's cultivated plants are dependent on pollinators to produce fruits, seeds, and nuts;[19]
- The wetlands in East Kolkata save about US$62.1 million (INR 4600 million) annually by naturally treating about 80 percent of the city's wastewater and sewage;[20] and
- The wide forest cover in India sequester about 11 percent of the country's GHG emissions instead of allowing them to be released into the atmosphere.[21]

However, nature is consistently undervalued in most economic decisions. GDP, the most common indicator of economic progress, is the market value of all final goods and services produced by a country during a specific time period. However, the full value of ecosystem services is not factored into the price/market

value of these goods and services. This is primarily because most ecosystem services are public goods (i.e., considered as free, such as clean air). While most businesses and communities have recognised the importance of ecosystem services, these services are not priced sufficiently in day-to-day decisions, economic accounts, and market prices. The true cost of products and services is thus not fully accounted for, and, thereby, not paid for, resulting in insufficient economic incentives to conserve and sustainably use ecosystem services.

In this report, we have valued the contribution of ecosystem services in India. The valuation has been carried out based on globally accepted methodologies laid out by TEEB initiative and Costanza et al. (2014). This valuation considers four main types of ecosystem services: regulating, cultural, provisioning, and supporting services. The aggregate valuation of the ecosystem services (regulating, cultural and provisioning taken together) is between US$3 trillion and US$4.1 trillion, representing 1.4 times the country's 2021 GDP. While the valuation of supporting services is between US$ 0.3 to 0.4 trillion. Here, the valuation of the 'supporting services' has been not been added in the aggregate valuation in order to avoid the error of 'double counting'.[f] For more details about the valuation approach, refer to Appendix 1.

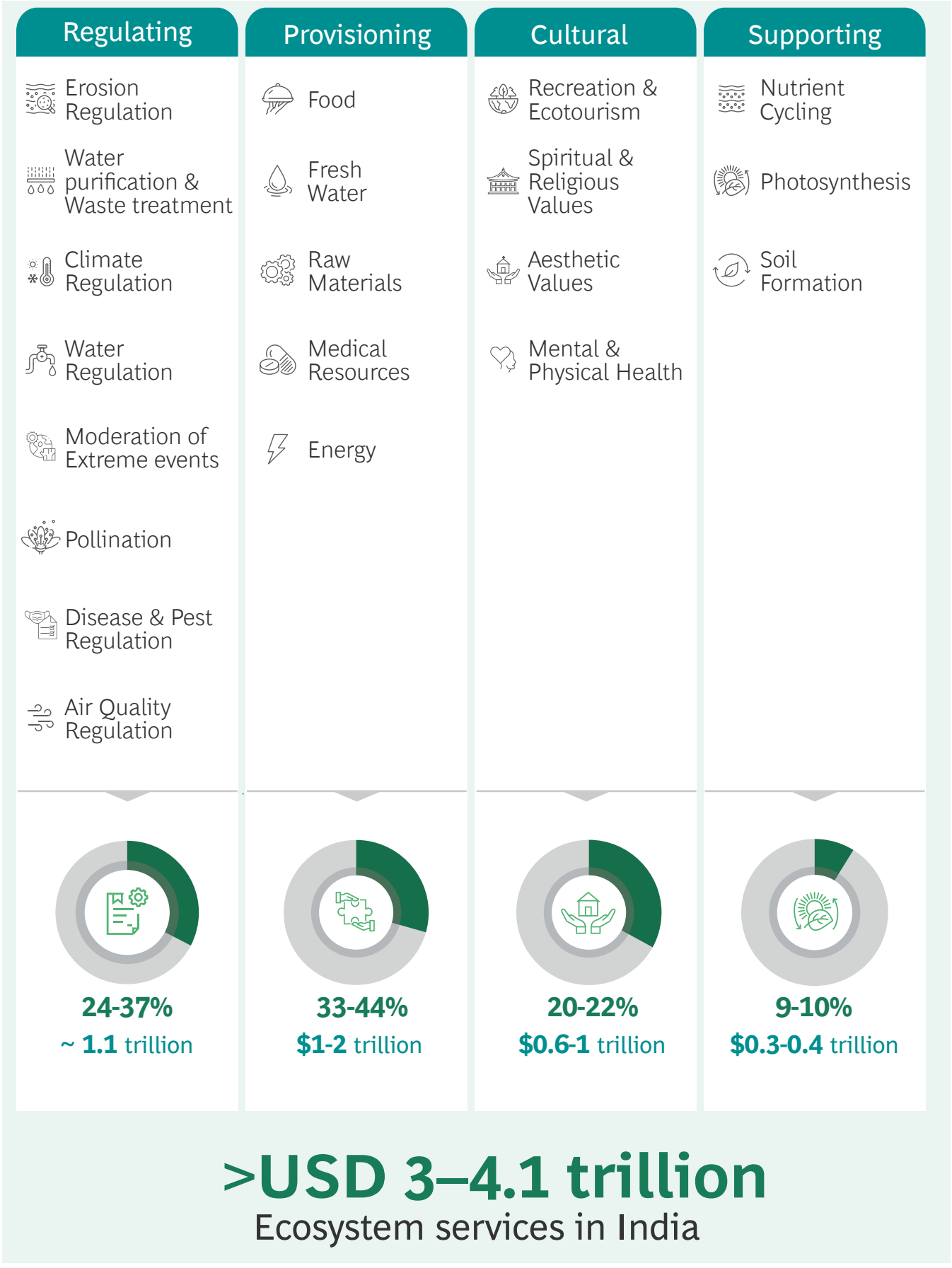
The value obtained in lieu of the Indian ecosystem services is split across the four previously defined categories:

- Provisioning: between US$1 trillion and US$2 trillion; between 33 percent and 44 percent of total ecosystem value
- Regulating: approximately US$1.1 trillion; 37 percent of total ecosystem value
- Supporting: between US$0.3 trillion and US$0.4 trillion; between 9 percent and 10 percent of total ecosystem value
- Cultural: between US$0.6 trillion and US$1 trillion; between 20 percent and 22 percent of total ecosystem value

Notably, this valuation of natural capital and biodiversity is not static, and its true worth probably far exceeds the value of ecosystem services calculated here. The value presented in our analysis represents a conservative estimate of the value that natural ecosystems provide.

f "This is mostly because supporting services (e.g., soil formation, gene-pool protection, pollination, etc.) notionally also provide 'intermediate services' that enable the 'final services' (that are provisioning, regulating, and cultural in nature)." See, Expert committee (2022). Compensatory Conservation in India: An Analysis of the Science, Policy and Practice, Report submitted to the Hon'ble Supreme Court by the 7-Member Expert Committee pursuant to the directions dated 25th March, 2021 in Special Leave Petition (Civil) No. 25047 Of 2018, New Delhi, India. (Pg. 59)

Figure 3: Value of Ecosystem services in India



Source: BCG

CHAPTER II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THE ECONOMICS OF NATURE LOSS

RELATIONSHIP BETWEEN BIODIVERSITY LOSS AND FINANCIAL RISK

The economics of the loss of biodiversity is critical to this conversation. This will entail mapping the dependence of economic activities against specific biodiversity products and services. While the global GDP is highly dependent on biodiversity, it also drives biodiversity loss. Between 1992 and 2014, the global produced capital per capita expanded by 90 percent, whereas the natural capital decreased by 30 percent.[22] Biodiversity loss is not just an environmental crisis, it is also a development crisis. The loss of biodiversity will severely affect human development, undermining developmental gains in any society.

Biodiversity, natural capital, and ecosystem services are interconnected with varying degrees of dependence among the economic sectors. Biodiversity loss can have significant impacts on financial and macroeconomic stability in a variety of ways:

- **Loss of ecosystem services**: This can have a direct impact on agricultural production and food security, which can


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affect the economy and financial stability.

- **Resource depletion**: Biodiversity loss can also lead to the depletion of natural resources, such as timber, fisheries, and minerals. This can impact industries that rely on these resources and can lead to economic instability.
- **Risk mitigation**: Increased risk of natural disasters, such as floods, landslides, and wildfires. This can have significant financial costs, both in terms of immediate response and longer-term recovery efforts.
- **Tourism**: Impact on the tourism industry, which relies on healthy and diverse ecosystems to attract visitors (directly impacting local economies and employment).
- **Regulatory and legal risks**: Increased regulatory and legal risks for companies that rely on natural resources or operate in areas with high biodiversity. This can impact their financial performance and stability.

Overall, biodiversity loss can have significant impacts on the economy and financial stability, and addressing it requires a holistic approach that takes into account the interdependent relationships between natural ecosystems and economic systems. The loss of biodiversity can impact the performance of businesses, and these risks are then transferred to the financial institutions invested in them and the larger financial sector. It is imperative to effectively identify, measure, and mitigate nature-related risks for a sustainable future.

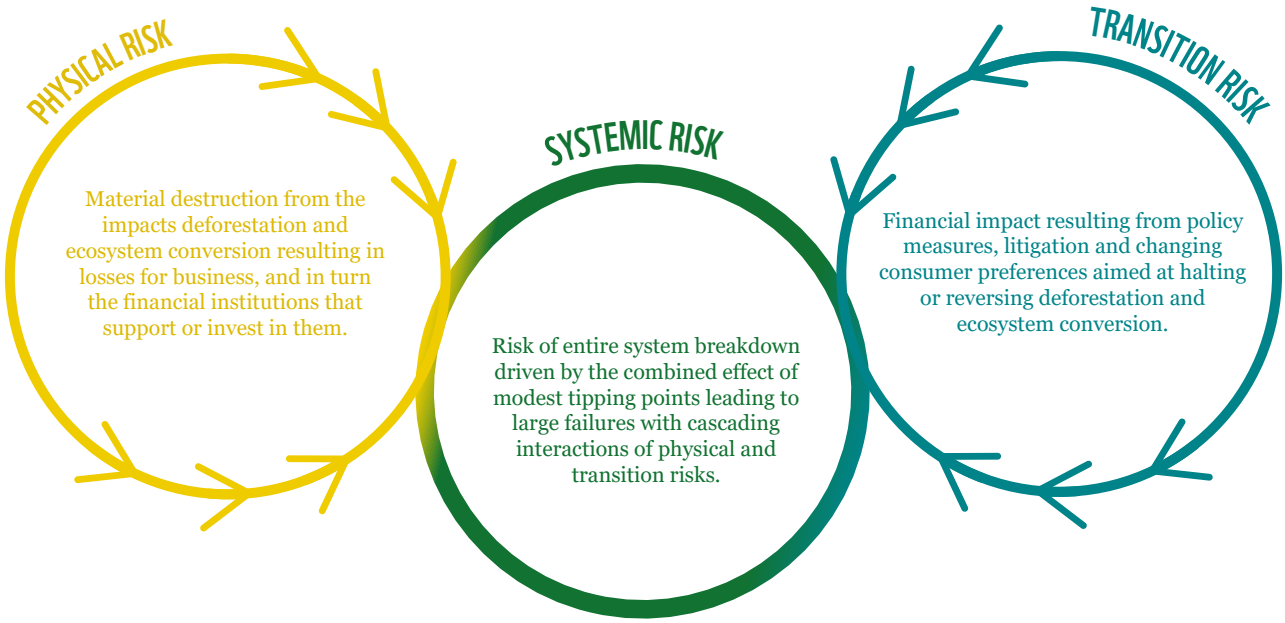
Nature-related financial risks can be categorised as either physical or transition risks. These risks can take the form of reduced valuation of financial assets and increased default probabilities, reflecting the deterioration in the financial performance of affected companies.

Physical risks may be chronic (for instance, a gradual decline of species diversity of pollinators resulting in reduced crop yields, deforestation, or water scarcity) or acute (for instance, the increased probability of new pandemics).

Transition risks could result from a misalignment between economic and financial entities' strategies and advances made in societies to reduce or reverse environmental damages.

When coupled together, the impacts of physical and transition risks can give rise to **systemic risks**, which are a result of a breakdown of the entire system rather than the failure of individual parts. These risks are characterised by modest tipping points, as one loss triggers a chain of others and stops systems from recovering their equilibrium after a shock.

Figure 4: Types of nature related risks



Source: WWF Report (2022)[23]

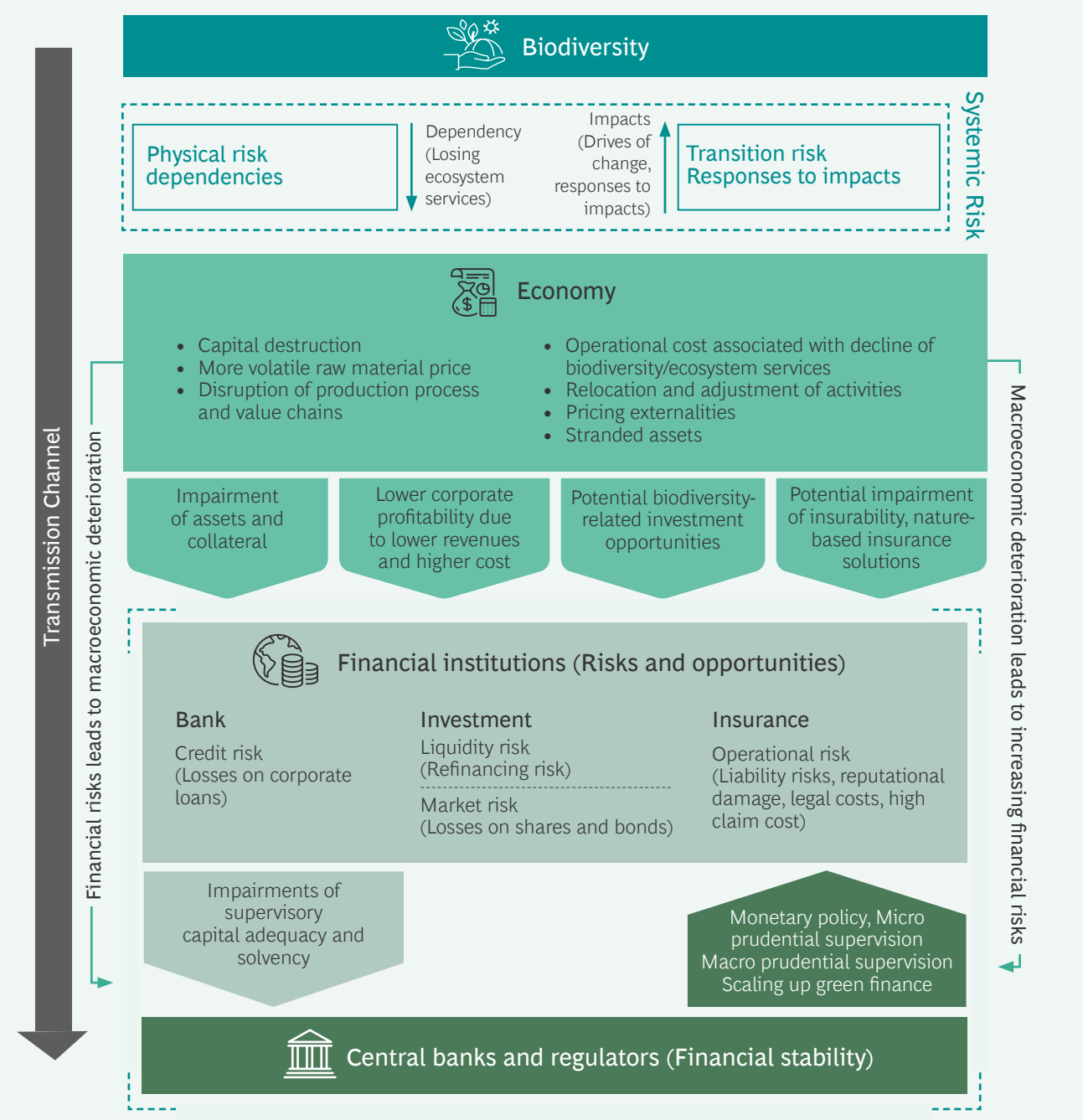
It is important to note that physical and transition risks often interact; for instance, it is likely that the greater the physical risk, the greater the transition risk will be as governments and regulators consider more stringent policy or regulatory decisions.

Physical and transition risks can either directly disrupt production processes or indirectly materialise across value chains of businesses (second- and third-order effects), thus impacting their ability to generate profits and repay debts. Unanticipated, and coupled with the acute lack of timely action, sectors with high dependence on biodiversity may see abrupt write-downs in their asset valuations (stranded assets) as economies transition to more sustainable pathways and higher liability claims (liability risk) arising from impacts and dependencies on biodiversity.

For financial institutions, this adverse impact on the profitability of businesses they lend to may translate into market, credit, liquidity, and operational risks. Risks can thus manifest in the form of higher default rates, higher provisioning, and reduced new business opportunities, detrimentally affecting the asset value of a financial institution. The relationship between financial stability and nature-related risks is explained in Figure 5.

The financial sector is becoming increasingly aware of the relationship between biodiversity loss and financial risk. The biodiversity-related financial and socio-economic risks (BRFRs) assessments are getting prevalent, for example, the central bank of Netherlands De Nederlandsche Bank NV (DNB) was the first to conduct BRFRs assessment on a national scale. As per their assessment, 36% of the listed equity portfolios of financial institutions in the Netherlands are highly or very highly

Figure 5: Relationship between biodiversity and financial stability



Note: The illustration shows where and how central bank responsibilities are affected by the dynamics between biodiversity loss, financial stability, price stability, and the stability of individual financial institutions

Source: NGFS Inspire

dependent on at least one ecosystem services.[g] A similar assessment to appraise the footing of Brazilian banks showcased that, 45% of Brazilian banks' total corporate loan portfolio is exposed to sectors that are highly or very highly dependent on one or more ecosystem services.[h]

g Joris Van Toor et.al. "Indebted to nature Exploring biodiversity risks for the Dutch financial sector" (June 2020).

h Pietro Calice et.al. "Nature-Related Financial Risks in Brazil" (World Bank Group, 2021)

The need to identify the sources of risks and how they flow towards economic and financial actors is made more pressing due to the powerful relationship between climate change and biodiversity loss. Climate change and biodiversity loss share several characteristics that are of relevance to financial sector policymakers. They both call for assessing complex systems, and are subject to tipping points, non-linear change, feedback loops, and cascading impacts. These impacts are subject to high levels of uncertainty, including with respect to the time horizons and locations over which they will materialize, and there are limited historical precedents for their current trajectories, making forecasting challenging.

Thus, as nature-related risks, along with climate-related risks, become increasingly prevalent (even though their precise timing and magnitude are difficult to predict), financial institutions in India will most likely also see a rise in their vulnerability to these risks.

DEPENDENCY OF INDIAN CREDIT PORTFOLIO ON ECOSYSTEM SERVICES

A financial institution's relationship with nature is two-fold, often referred to as a 'double materiality'. This interaction is defined by way of impacts and dependencies of the businesses in which the financial institutions invest.

- **Dependency of activities on nature**: Ongoing biodiversity loss can have negative economic and financial implications for various industry sectors, and, by virtue of their exposure to these sectors, impact the financial sector.
- **Impact of activities on nature:** Adverse activities that are being financed can either contribute to or deteriorate ecosystem services (for instance, unchecked logging and non-sustainable mining).

As India's vulnerability to climate change increases, the exposure of its financial sector to associated climate- and nature-related risks are also likely to increase. To explore this 'financial sector exposure' further, in this report, we have analysed the dependency of scheduled commercial banks (SCBs) lending portfolios on ecosystem services. This analysis is based on Reserve Bank of India (RBI) data on 'sectoral deployment of bank credit' and sector-based dependencies on ecosystem services from the ENCORE biodiversity tool. For detailed methodology, refer to Appendix 2.

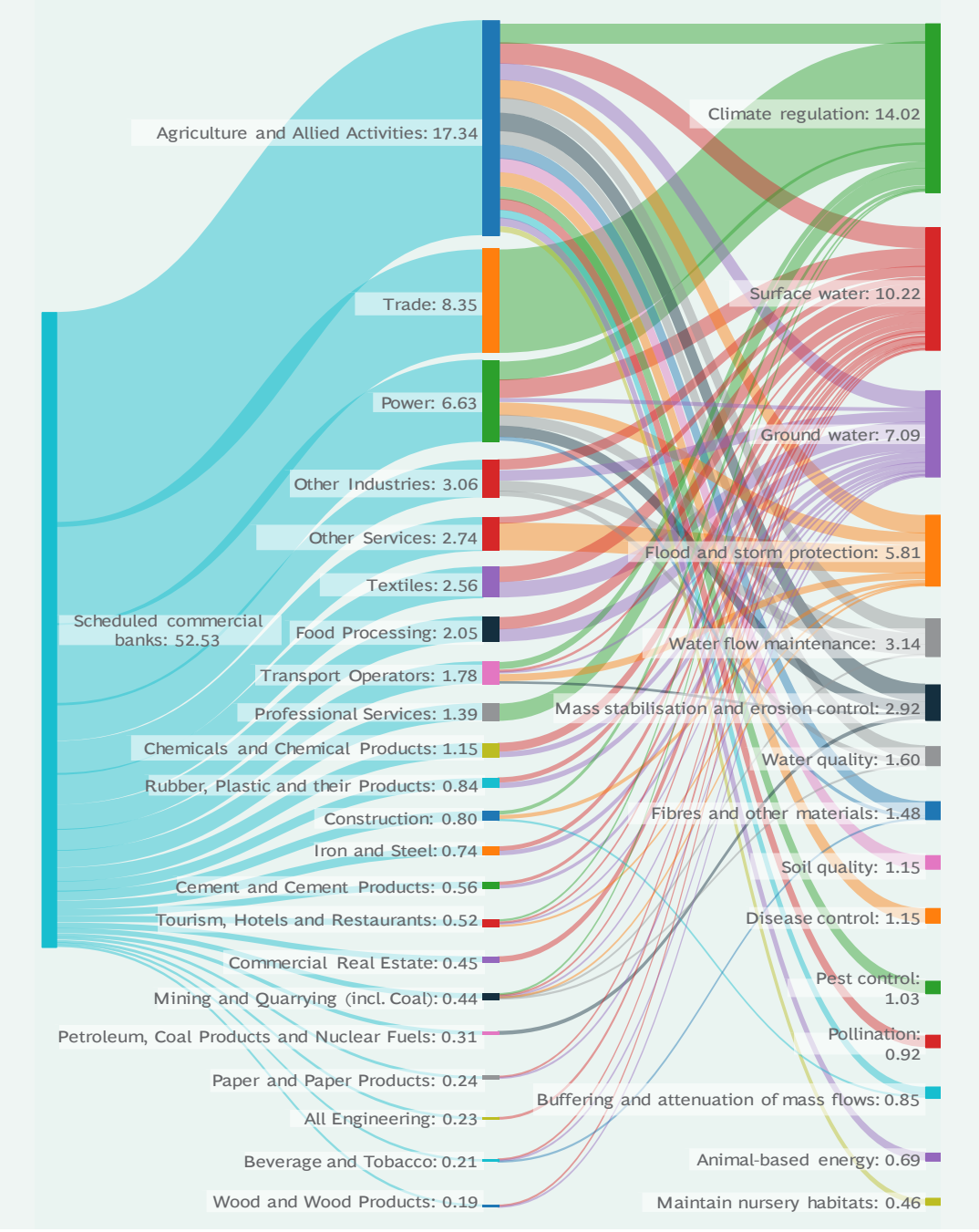
While the analysis currently focuses on first-order dependencies between various sectors and ecosystem services, the total impact of ecosystem service dependencies will account for impacts beyond the outputs quantified in this report. This is because due to the interdependence of various industries, impacts to the output of one economic sector will be felt across the value chains of multiple other sectors, impacting them in turn. These interdependencies and associated impacts are not within the current purview of our study and have not been identified and quantified at this time.

Our analysis shows that 53 percent of the lending portfolio of SCBs, amounting to a value of US$863 billion (INR 64 lakh crore) as of May 2022, is extended towards sectors with significant dependencies on at least one ecosystem service. The agriculture, trade, and

power sectors, together contributing to over 35 percent of the national GDP (and more than half the SCB credit exposure), have the highest dependency on ecosystem services. With India already facing agricultural losses worth approximately between 2 percent and 5 percent of GDP each year,[24] increasing weather fluctuations caused by climate change and nature loss are only going to further exacerbate the risks faced by the sector.

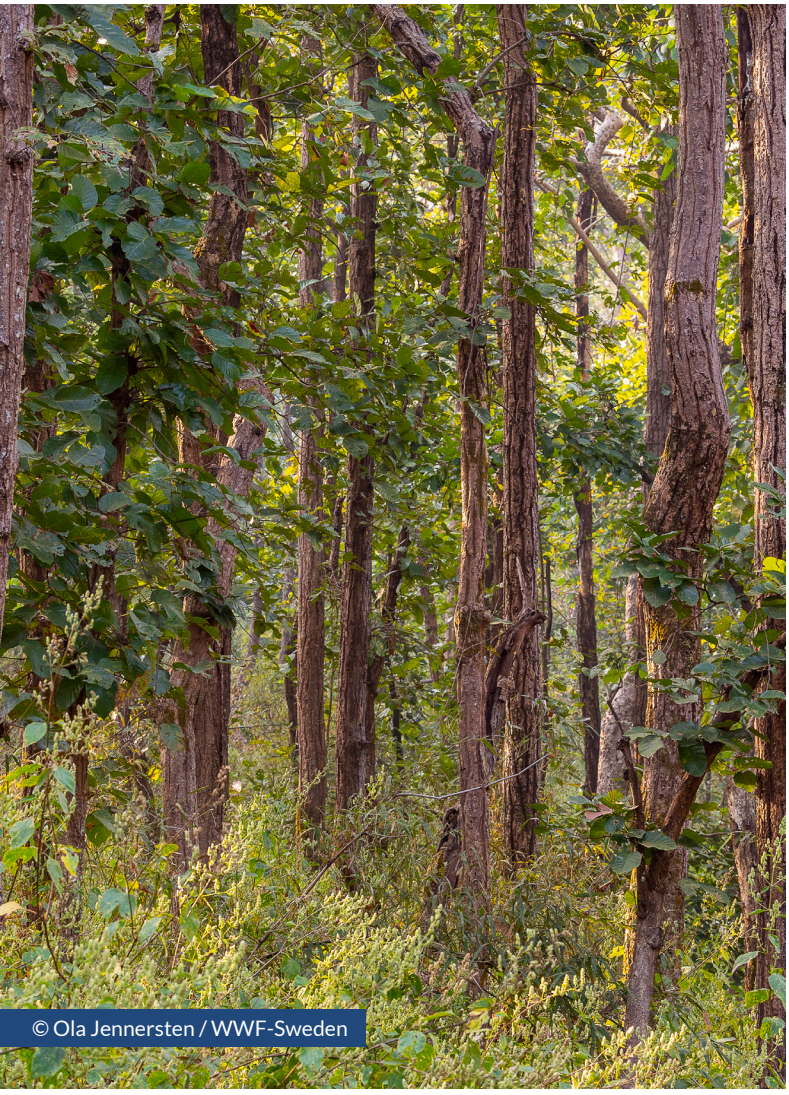
While, unsurprisingly, climate regulation emerges as one of the largest contributors to financial risk (approximately 14 percent

Figure 6: Dependence of Indian SCB's credit portfolio on ecosystem services



Source: WWF and BCG analysis

credit), it is not the only ecosystem service that financial institutions depend on. A dependency on surface water (10 percent) and groundwater (7 percent) is also observed across industries, and needs to be factored into risk assessment and financial-sector planning. Furthermore, increasing extreme weather events and extended periods of unpredictable extreme rainfall are already disrupting manufacturing supply chains, translating into losses experienced by the trading sector. It is evident that there is an urgent need for businesses that are highly dependent on ecosystem services to re-evaluate their business models and adopt resilience measures in relevant areas of operation.



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Thus, nature-related risks, including those associated with biodiversity loss, could have significant macroeconomic implications. A failure to account for, mitigate, and adapt to these implications is a source of risks for individual financial institutions and the overall financial stability of the economy.

A note on the impact of economic activities on ecosystems in India

As financial institutions increasingly face risks due to natural capital loss, their lending activities can often cause or accelerate this very biodiversity loss that impacts them. In 2019, the world's largest banks invested more than US$2.6 trillion (INR 193 trillion) in sectors that are primary drivers of biodiversity loss, such as mining, fossil fuels, and plastics, without sufficient processes to monitor their biodiversity impacts nor adequate policies to prevent harm.[25] Similarly, nature-related risks could emerge for Indian banks as they finance companies that negatively impact biodiversity and ecosystem services.

As companies face increased regulatory or reputational pressures pushing for a transition to conserving and restoring biodiversity, banks financing laggards with weak, inadequate biodiversity-related controls will increasingly face disruptions and shocks. Furthermore, regulatory and reputational issues could emerge for entire sectors, posing sectoral transition risks for financial institutions involved with these sectors. For instance, there have been increasing public calls for financial institutions—banks and investors (including asset managers, pension funds, and insurance companies)—to address deforestation,

climate change, and human rights violations perpetrated by their clients and investee companies. In 2019, Norway's US$1 trillion Government Pension Fund Global revealed that it had since 2012 divested from 33 palm oil companies over deforestation risks. The Fund also announced that it was asking banks in Indonesia, Malaysia, and Brazil to adopt a 'no deforestation' criteria for their loans to the agricultural sector.

Globally, the operations of four major value chains—food, energy, infrastructure, and fashion[26]—currently drive over 90 percent of human-made pressures on biodiversity. According to the UN Environment Programme, our global food system is the primary driver of biodiversity loss and threatens 86 percent of the species at risk of extinction.[27] With over 45 percent of the lending portfolio of SCBs in India directed towards the agricultural and energy sectors, their exposure to value chains and industries that contribute to the depletion of natural capital via terrestrial ecosystem use, GHG emissions, and water use is substantial. Thus, regulatory interventions supporting India's endeavour to meet its Paris Climate commitments, which include biodiversity conservation targets, could expose this credit to various sectoral transition risks. India has committed in its NDCs to create an additional carbon sink of about 3 billion tonnes of CO2 equivalent through additional forest and tree cover by 2030.[28] Further, India is also a signatory to the GBF, which is expected to drive additional policy and regulatory efforts to halt and reverse biodiversity loss.

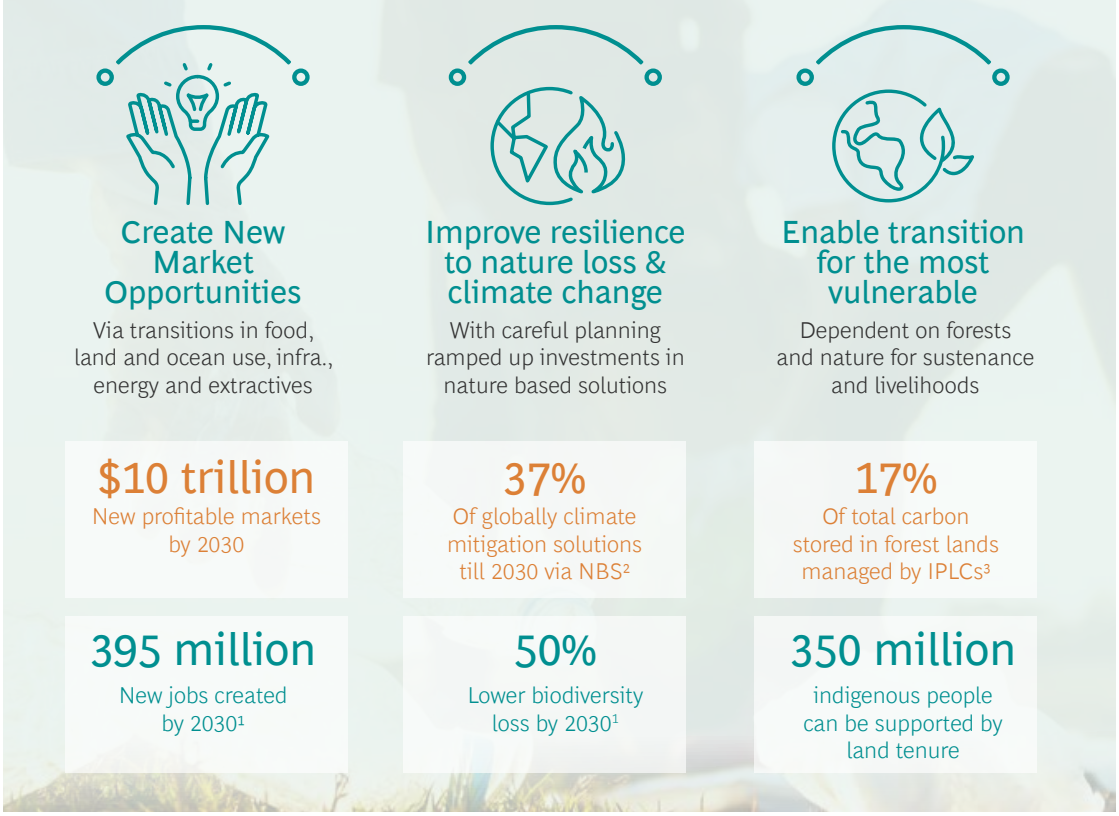
FINANCING NATURE-BASED SOLUTIONS: AN EMERGING OPPORTUNITY

Nature-based solutions have multiple benefits for both the nature and climate transition in terms of new markets, improved resilience, and support for the most vulnerable communities (see Figure 7).

In its 2014 World Investment Report, the UN Conference on Trade and Development estimated that the Sustainable Development Goals (SDGs) would globally require investments of between US$5 trillion and US$7 trillion annually, with US$2.5 trillion of this funding gap allocated for emerging economies like India. In fact, for India to meet the targets of three SDGs—SDG-6 (clean water and sanitation), SDG-7 (affordable and clean energy), and SDG-9 (industry, innovation, and infrastructure)—cumulative investments worth US$2.64 trillion (INR 196 lakh crore) will likely be needed by 2030. Of the total investment, the estimated investment opportunity for the private sector is over US$1.12 trillion. Further, to accomplish the national biodiversity targets alone, the Biodiversity Finance Plan 10 for India estimates an annual funding need of US$15 billion (INR 115,970 crore) with a funding gap of 39.5 percent, or US$6 billion (INR 45,849 crore).

Nature-based solutions and bankable nature-positive business options provide a unique opportunity to act and gain a competitive advantage. The WWF has been working extensively on building bankable nature

Figure 7: Benefits of nature-based solutions



Source: 1. IISD, 2021; 2. Griscom et. al., 2017; 3. IPLC = Indigenous Peoples and Local Communities

solutions that generate a positive financial return for investors and communities across four major themes:

- Climate-smart agriculture that could reorient the agricultural systems while also promoting sustainability.
- Environment protection aimed at restoring key ecosystems that could restore the biodiversity native to those ecosystems and the regulating services provided by those ecosystems.
- Forestry-focused initiatives that target restoring forests and, by extension, the services provided by the forests.
- Water and sanitation related initiatives to mitigate and adapt to the changes caused by climate change.

By building nature conservation into bankable projects, the WWF estimates that private investors could close more than half the global nature conservation funding gap (approximately US$200 billion or INR 15 lakh crore) by profitably funding enterprises with a positive impact. Globally, nature-based solutions are increasingly proving to be successful, as showcased by the following examples:

- Singapore achieved a low water leakage rate of less than 5 percent (which is significantly lower than that of other major cities) by installing smart sensors across the city.
- Smart farming solutions have been helping Indonesian farmers improve yields by 60 percent, with a 50 percent reduction

in farming inputs by giving data-driven insights.

- In the Philippines, insurance companies have agreed to pay an annual fee for the disturbance protection offered by mangroves.
- Namibia's conservation efforts have led to the country having the largest quotient of free-roaming animals in the world, thus growing the ecotourism sector in the country, which generates approximately 3.5 percent of its GDP.

In the same way, India has also started witnessing growth in new nature-based markets. Some of the sectors experiencing this growth include:

1

Limted availablity of Data, measurement and standards to value nature and nature risk

While there has been global progress in measureing climate risk scenario and oppurtnities, measuring both the risks associated with nature and the benefits of nature protection and conservation remain a challange due to the multi-dimensional and interconnected goals for nature conservations versus the more linear relationship between reducing GHG emissions and limiting climate change. This is further compounded by the lack of by the lacks of standard metrics and risk reporting frameworks for nature. Infact, a landscape assesment undertaken by the TNFD found that there are more than 3000, different nature related metrics refered in major scientific reference reports or or standards used by policy makers and regulatory bodies.

2

Limited scale and localized nature of biodiversity projects limits funding potential; compounded by limited cash-flows and/or below market-rate returns

Biodiversity projects by their very nature are localized and small in scale. Given the nature of the solutions which can often be location specific, identifying a scalable and replicable market for private investors is challenging. This highlights the key challenge with biodiversity finance which most often is not the lack of capital, but rather the lack of bankable pipelines of investment opportunities as many projects do not generate the requisite revenue or a cash flow desired by investors. Even where projects do generate a cash flow, the financial returns are often low and below market level returns, thereby limiting private sector investments.

3

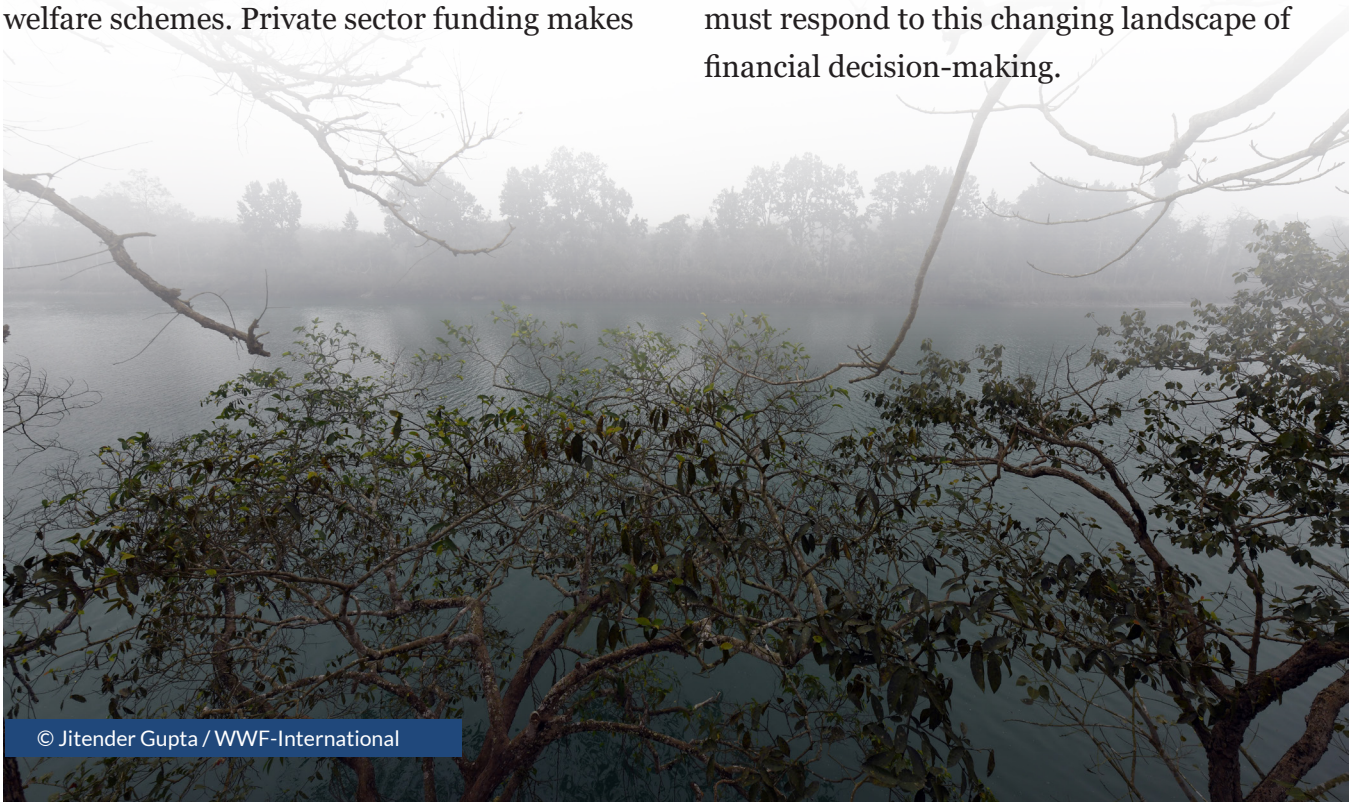
Biodiversity pressure due to incentives favouring economic growth

Under status quo, economic incentives generally favor the expansion of economic activity (e.g., fertilizer subsidies), and don't often account for environmental harm and potential alternatives for the sustainable use of nature in support of economic activity. Globally, as per Organisation for Economic Co-operation and Development (OECD), governments today spend around USD 500 billion (INR 37 lakh crores) per year in economic support that is potentially harmful to biodiversity—5 to 6 times more than the estimated global spending on biodiversity.

- Nature-based tourism saw a growth rate of 17 percent annually between 2009 and 2015, and with the recent eco-awaking among the consumer base, the growth rate is only expected to increase.
- The organic foods market has witnessed a sudden surge growing from a value of US$200 million (INR 1483 crore) in 2018 to US$820 million (INR 6079 crore) in 2020. This space is a huge opportunity for India to pioneer the growth towards nature-positive models that tackle the conservation aspect while also growing businesses.
- A crop-residue management programme launched in the Haryana-Punjab region in 2021 to eliminate stubble burning has generated and forward sold 20,0000 carbon credits already and aims to generate one million credits by 2023.

Funding for nature conservation finance in India is provided primarily by the central and state governments via budgetary allocation and welfare schemes. Private sector funding makes up approximately 1 percent of the pool, driven by small-scale allocations in corporate social responsibility budgets. There is a significant opportunity for the private sector to scale-up funding for nature conservation and climate action. However, there exist three unique barriers to mobilising nature finance flows. These include:

As India embarks on this growth journey, it is critical to look at nature conservation and climate action not just as an obligation but also as an opportunity. This decade presents an opportunity for India to move ahead of the curve and set a benchmark for other countries to follow. As its developmental aspirations converge with the need for sustainable growth, India can establish itself as a centre of global innovation for sustainable businesses, leading the global endeavour to tackle the incredible challenge that lies ahead. However, to achieve these goals, the Indian financial sector, including regulators and financial institutions, must respond to this changing landscape of financial decision-making.



CHAPTER III

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EVALUATING INDIA'S SUSTAINABLE FINANCE REGULATION LANDSCAPE

"The importance of sustainable finance cannot be overstated. We are living in an era where climate change, social inequalities, and governance issues pose significant threats to the stability of economies and societies."

- Speech by Shri Swaminathan J, Deputy Governor, Reserve Bank of India - October 12, 2023.

Sustainable Finance refers to the frame of financial decision-making that goes beyond the traditional 'return on investment' risk factors to include environmental, social and governance factors, with the aim to encourage increased investments towards sustainable climate and nature-positive economic activities. Sustainable finance is a broad label, that includes both financing environment-friendly projects (financing green), as well as investing in transition towards environment-friendly business practices (transition finance). Finance for nature, that is, investments towards nature-based solutions (NbS) and nature-positive economic activities is needed to maximise efforts to combat the climate, biodiversity and degradation challenges. The UNEP's latest report on "The State of Finance for Nature"

(2023), estimated the current financial flows to NbS at around USD 200 billion, which is only a third of the investments required to achieve the climate and biodiversity targets by 2030. In addition to this, a majority of these investments are from government sources, while the private finance is still lagging. There is an irrefutable need for encouraging private finance, enabling policy environment along with developing innovative financial instruments such as SDG bonds and tradable SDG credits can potentially help in closing the finance gap.[i]

Building on the understanding of the global sustainable finance landscape, we have defined four parameters based on which India's current financial landscape has been evaluated to ascertain the policy interventions that will be required to enhance the nature-based financial flows in the country.

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i Think20 India Communique, available at: https://t20ind.org/wp-content/uploads/2023/07/Think-20-G20-ORF-Digital.pdf

PARAMETER 1

Availability of an Appropriate Financial Sector Toolkit to Encourage Finance for Nature

Under this parameter we have evaluated economic instruments put in place by the government (taxes, market-based mechanisms, and so on), the use of sustainable finance taxonomies, corporate disclosure and green regulatory landscapes (such as green labelling), showcasing the various financial tools that can be used to encourage nature finance flows in an economy.

SUSTAINABLE FINANCE TAXONOMY: Clear definition of sustainable activities tailored to local context, supported by regulation and policy

Sustainable finance taxonomies help identify activities that contribute to nature- and climate-positive developments for a particular region/nation based on its development goals. Such taxonomies provide a way for governments to identify target areas for investment, align financial flows with climate and nature goals, and identify risks. Taxonomies can also help financial institutions and regulators to measure the alignment of financial flows with biodiversity goals, and to assess and identify risks.

The EU green taxonomy and the China taxonomy are the two largest and most well-known classification systems. These taxonomies offer examples of the different approaches in taxonomy development. Notably, both governments are working together to standardise the global landscape with the China–EU Common Classification Standard for Green Finance. A comparative analysis of the taxonomies of the EU and China is detailed in Appendix 3 .

The 4 parameters in question are

India's sustainable finance taxonomy is currently under development. A positive step in this direction is the release of India's sovereign green bond framework, which is aligned with the International Capital Market Association (ICMA) Green Bond Principles 2021. This framework has also been reviewed externally by a second-party opinion provider with a 'medium green' rating that provides a positive view, indicating that the framework lays out significant steps towards the long-term vision of a low-carbon and climate-resilient future.

While the framework classifies in detail the principles for selecting green projects for some sectors, others are more generic in nature. This necessitates the requirement of a national taxonomy that will significantly reduce the risk of financing projects that are not completely green or create adverse climate- or environment-related impacts.

Based on an analysis of two of the EU green taxonomy and China Green Bond Catalogue, seven recommendations for India's proposed taxonomy emerge:

- The taxonomy should address India's key environmental problems, including the big five impact drivers (GHG emissions, water scarcity and use, pollutants, waste, and biodiversity loss);
- The taxonomy be tailored to align with international standards while balancing India's development and sustainability goals (e.g., energy security and inclusion of natural gas in the taxonomy, a balance of social vs. environmental action);
- The screening criteria should be tied to the performance on at least one environmental problem, without causing significant harm to any other (criteria measurable via existing standards such as EIA , Pollution standards by CPCB , and water usage norms);
- Targets must be aligned with India's NDC commitments and national biodiversity targets, present and future; the timeline for the availability of technologies and sustainable practices; and the economic feasibility in the Indian context;
- It should enable greater ease in compliance (including a reduction in associated costs), especially for micro, small, and medium enterprises (MSMEs) and small players (such as those in the agricultural sector) to drive widespread adoption and ensure financial inclusion;
- It should establish and implement the right enablers for the success of a green taxonomy (such as a sectoral GHG emission roadmap and targets in line with India's NDC commitments, clear guidance on disclosure; reporting of impact on the environment by government, financial institutions, and corporates; and creating a national measurement, reporting and verification system for emissions and nature metrics);
- Ensure the taxonomy is supported by appropriate regulations and incentives to encourage adoption. This is particularly important for the financial sector, as the biggest owners of financial assets in India—banks and asset managers—will be at the forefront of implementing effective taxonomy in the country.

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REPORTING AND DISCLOSURE STANDARDS: Providing relevant information for investors, aligned with global standards

Globally, for climate-related risks, most reporting and disclosure frameworks such as IFRS and CDP , and regulatory mandates from Hong Kong, the EU, France, the UK and Canada are aligned with the recommendations of the Taskforce on Climate-Related Financial Disclosures (TCFD), which are structured around four thematic areas that represent core elements of how organisations operate: governance, strategy, risk management, and metrics and targets. To incorporate nature risk, in the same vein as TCFD for climate risk, the Taskforce on Nature-Related Financial Disclosures (TNFD) was published in September 2023. The TNFD is already supported by multiple financial institutions such as AXA, BNP Paribas, and DBS Bank, and the governments of the UK, France, the Netherlands, and Switzerland.

The Securities and Exchange Board of India (SEBI) has been encouraging ESG reporting—the disclosure of environmental, social, and governance data—since 2012. The mandate of business responsibility and sustainability reporting (BRSR) for listed companies since 2022 has taken this one step further with respect to the quality and comparability of information available. Since FY 2022-23, BRSR has been made mandatory for the top

1000 listed companies in India. The BRSR seeks disclosures from listed entities on their performance against the nine principles of the 'National Guidelines on Responsible Business Conduct' and reporting under each principle is divided into essential and leadership (i.e., voluntary) indicators. Sustainable production, waste disposal, recycling, water, energy, and emissions are recognised challenges in India and have been covered under the BRSR principles.

Aligning the BRSR to TCFD and TNFD will enable India to unlock foreign capital flows as investors worldwide look for more sustainable investments in emerging economies. While BRSR is already a step in the right direction toward capital reallocation to greener projects and effective environmental risk management, the following key learnings can be considered for a more robust framework:

- Enhance climate and nature governance and strategy disclosures in BRSR, including the governance processes, controls, and procedures the entity uses to monitor and manage sustainability-related risks and opportunities through a double-materiality approach, and the entity's strategy for addressing these significant sustainability-related risks and opportunities;
- Incorporate overall risk-management strategy disclosures. While this is partially covered under BRSR, which encourages organisations to report along the identification, assessment, and mitigation of climate- and environment-related risks; in addition, TCFD/TNFD also requires disclosures on how climate- and nature-related risks are integrated into the overall risk management strategy, looking at the impacts of both risks from an internal, operational, and external portfolio management perspective;
- While metrics disclosures are relatively well laid out in the BRSR, to enable holistic action in line with TCFD/TNFD, target-setting can be incorporated in addition to metric disclosure to encourage organisations to set ambitious, publicly declared targets, and transparently disclose progress towards the same in line with international standards such as SBTi ;
- Broaden the audience for sustainability disclosures. Currently, BRSR only applies to the top 1000 listed companies; there is a potential to create a simplified version for inclusion in financial reporting (under the Companies Act) for all corporates.

However, while the global alignment of disclosures is desirable, it needs to be acknowledged that for a developing country like India, necessary actions must be taken to ensure provisions that address the challenges of a heavy compliance cost, the low capability and availability of tools, and alignment to India's net-zero pathway.

RECOMMENDATIONS TO THE GOVERNMENT

India has been a leader in climate change action by being amongst the countries which are in line to meet their Nationally Determined Contributions (NDCs). India met two of its initial NDCs submitted in 2015 (to reduce the emissions intensity of its GDP by 33 to 35 percent by 2030 from 2005 level; and to achieve about 40 percent cumulative electric power installed capacity from non-fossil fuel-based energy resources by 2030) submitted in 2015. India being a biodiversity hotspot and a key signatory to the Global Kunming-Montreal Global Biodiversity Framework (GBF) in 2022, it becomes pertinent to develop policy and regulatory environment focusing on addressing nature and biodiversity loss.

Our key recommendations to the government include:

- Developing policy incentives and enabling conditions, in-line with National Biodiversity Strategy and Action Plan (NBSAP) aligning with the Global Biodiversity Framework and the India's Net-zero 2070 goals that catalyse public and private sector investment for nature conservation by actions such as:
    - A balanced approach between climate mitigation and climate adaptation in India's upcoming climate-finance taxonomy- should be adopted, incorporating aspects such as biodiversity loss, water- pollution, and waste generation are a part of minimum safeguards criteria. For example, the adaptation criteria in the EU taxonomy is guided by 'do-no-significant-harm' rules.
    - Integrated approach for better development planning and management for major public infrastructure to account for nature-related risks and impacts.

- Government can provide appropriate tools to foster a nature positive financial ecosystem. This may include:
    - Exploring potential economic instruments, beyond taxes to promote investments in nature (like deposit refund systems, Payment for Ecosystem services, impact bonds, biodiversity bonds etc.).
- Catalysing strategic capital infusion for nature conservation through actions such as:
    - Promotion of blended finance models to infuse capital for nature positive outcomes through mechanisms such as viability gap funding, frst loss guarantees and targeted budgetary allocations for critical sectors for reversing biodiversity loss.
    - Enhanced budgetary allocation for National Adaptation Fund for Climate Change (NAFCC) to provide grants or low-risk capital for pilot projects and scale-up bankable models on climate adaptation, nature protection and conservation.
- Foster the enhancement of human capital and data infrastructure to have a multiplier effect of its actions. This may include:
    - Developing human capital through enhanced capacity and awareness building mechanisms by engaging leading research and academic institutions.
    - Developing data intelligence and analytics platform with granular ecosystem-level data, along with an effective Measurement, Reporting & Verification (MRV) framework.
    - Developing and implementing national natural capital accounting or reporting standards based on global best practices and aligned to national circumstances.

GREEN LABELLING AND CLASSIFICATION OF FINANCIAL INSTRUMENTS: To promote capital flow for sustainable projects regulation and policy

To promote and channelise capital to sustainable projects, it is important that financial instruments are developed in accordance with the right set of standards and appropriately labelled for transparency. Standards for labelling help create credibility and ensure market integrity by preventing greenwashing. Several voluntary green labelling standards, such as the green bond/ green loan principles by ICMA and the climate bond initiative guidelines, are used globally to label financial instruments.

In India, the over 80 green bonds issued by corporates in the past few years have majorly been certified by these bodies. While voluntary adoption is encouraged, these standards are most effective when endorsed by regulators and governments. In 2017, SEBI issued a circular on the 'Disclosure Requirements for Issuance and Listing of Green Debt Securities'. The primary objective of this circular was to introduce a regulatory framework for the issuance of green debt securities in India and enhance investor confidence in these instruments. The circular was a supplement to the SEBI (Issue and Listing of Debt Securities) Regulation, 2008, and specified a list of disclosures that issuers were mandated to make in their offer document before and following the commencement of a project financed through green debt. The additional disclosure requirements laid out in the circular were intended to attract financing for ESG-compliant projects that promote sustainable practices, including renewable and sustainable energy, clean transportation, sustainable water management, climate change adaptation, energy efficiency, sustainable waste management, sustainable land use, and biodiversity conservation.

While several nature protection and conservation activities, i.e. those that tackle natural resources depletion, loss of biodiversity, and air, water, and soil pollution, are eligible for blue/green bond issuance and are in line with sustainable finance taxonomies, the labelling frameworks also need to impose a “do not cause significant harm principle” for biodiversity and other objectives on issuance. Mature green labelling frameworks such as the


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EU Ecolabel for financial products (including retail products) and voluntary global standards such as the IUCN framework for verification, design and scale-up of nature-based solutions offer robust blueprints that India can follow when adopting internationally aligned green labelling requirements to reinforce the upcoming Indian sustainable finance taxonomy.

PARAMETER 2

Central Bank's Economic and Policy Incentives to Improve Nature Finance Flows

With respect to the role of central banks, the Network for Greening the Financial System (NGFS) is of the view that given the macroeconomic, macro-prudential, and micro-prudential materiality of nature-related financial risks, they are relevant for central banks and supervisors and, therefore such risks should be adequately considered for the fulfilment of their mandates.

The RBI, an NGFS member since 2021, has already taken proactive policy measures to promote and support green finance initiatives. For instance, it included the renewable energy sector under its priority sector lending scheme in 2015. Learning from the recommendations of the NGFS, it has also evaluated the impact of climate risk on inflation and GDP and published broad guidelines for the financial sector on climate-related risks and sustainable finance. As the RBI continues on its journey to incorporate climate risks, it can consider measures for incorporating nature-related risks in financial stability monitoring, and the micro-supervision and management of its own portfolio, learning from the experience of other central banks.

INTEGRATING CLIMATE AND NATURE RELATED RISKS INTO FINANCIAL STABILITY MONITORING

Central banks can review operational frameworks to ensure they remain resilient to emerging climate- and nature-related risks and to safeguard the continued smooth conduct of monetary policy. They can create (dis)incentives by including these risks in their commercial interest rates, collateral requirements, and other policies. The RBI can take inspiration from other central banks, such as the People's Bank of China, the European Central Bank (ECB), and the Bangladesh Bank. (Refer to Appendix 4)

LEADING BY EXAMPLE BY PUBLISHING OWN TRANSITION PLANS AND INTEGRATING SUSTAINABILITY FACTORS INTO OWN PORTFOLIO MANAGEMENT

Central banks can send strong signals to the financial institutions they supervise through their actions. Some central banks have already started factoring in climate- and nature-related risks in their own portfolio management. For instance,

Riksbank (Sweden's central bank) applies a norm-based negative screening criteria to its purchases of corporate bonds issued by non-financial companies;

The ECB aims to gradually decarbonise its corporate bond holdings and is on a path aligned with the goals of the Paris Agreement, starting 2022.

RECOMMENDATIONS TO THE RESERVE BANK OF INDIA (RBI)

As the finance sector regulator RBI has a key role to play in ensuring a prudent management of climate and nature-related systemic risks and providing guidance to the finance sectors players for effectively address these risks.

The following recommendations are aimed to support RBI to further integrate climate and nature related risks into financial stability monitoring, macro & micro-supervision, own-portfolio management and to incentivize sustainable finance flows in the economy:

- Integration of nature related risks in micro-prudential supervision and supervisory guidance for regulated entities by:
    - Providing detailed guidance to the banking sector, which aims to incorporates both the expected impact of nature-related issues on the bank's risks and value creation, and the impacts of the bank's activities on nature (double materiality assessment).
    - Development of nature related scenarios for stress testing exercises, based on national context and drawing learnings from similar exercises undertaken for climate related scenarios such as those provided by the Network for Greening Financial System (NGFS).
    - To further factor-in the following in REs internal policies, i.e.:
        - conducting regular training on relevant nature-related financial issues for the board, senior management, business lines and functions.
        - factoring nature-related performance criteria in appraisal and remuneration policies
        - adoption of internal governance controls (three lines of defence) aimed at mitigating nature-related financial risks

        - guidance to banks for development of sector-specific policies for higher environmental risk sectors (especially hard-to-abate sectors)
- Incorporating E&S considerations in the calculation of minimum capital requirements (capital add-ons for banks and liquidity ratios) through a differentiated risk-based approach that incorporates penalizing factors in capital and liquidity requirements for higher E&S risks.
- Aligning the REs portfolio with the objectives of the country's NDCs and NBSAP.
    - Strengthen the non-financial disclosures of the regulated entities:
        - On the lines of the recently issued Draft Guidelines on 'Disclosure Framework on Climate-related Financial Disclosures', the central bank can also consider issuing guidelines on disclosure framework on nature and biodiversity-related disclosures.
- Integration of nature related risks in macro-prudential supervision and monetary policy through actions such as:
    - Conducting an analysis of the dependencies and impacts of nature and biodiversity on domestic financial institutions, and gauging system-wide vulnerabilities. In this context, RBI can bring in a discussion paper on Nature and Biodiversity-related risks.
    - Considering integrating climate and nature-related (e.g., deforestation and conversion risk) metrics and social considerations in its collateral framework.
    - Integration of E&S issues in its asset management practices (for its own portfolio) and assess (and disclose) its portfolio exposure to E&S risks.
    - On the lines of the proposed repository for climate risks, RBI may consider developing a similar platform for nature-related financial risks.

CLIMATE AND NATURE RELATED RISKS IN MICROPRUDENTIAL SUPERVISION

Biodiversity and nature-related risks can result in systemic risks that impact macroeconomic stability. Along with taking lessons from climate-related risks, the central banks can utilise the current tools (such as ENCORE) available for assessing dependencies and impacts of ecosystem services on the economy, and identify critical sectors to develop sectoral scenarios to assess the resilience of the financial system against these risks.

Central banks can also include nature-related factors in climate assessments as a part of their supervisory frameworks. The publication of detailed guidelines (with a timeline for compliance) of supervisory expectations on climate- and nature-related risks, supported by self-assessment, helps drive action, as has been observed with banks across Europe via the ECB's 13 supervisory expectations of compliance by 2024.

Here, an important consideration that emerges is that smaller and less complex financial institutions may not be able to comply with stringent supervisory expectations. In line with the principle of proportionality, some supervisors have also provided (or are considering) specific guidance to smaller and less complex institutions. For instance, Banco de Portugal's supervisory expectations for smaller banks under its direct supervision. Further, some central banks have requested sector-specific action. For instance, the Monetary Authority of Singapore's environmental risk management guidelines (2020).

ALIGNING FINANCIAL SECTOR RESPONSE WITH INTERNATIONAL BEST PRACTICES

Central banks can take the lead in aligning financial sector response with international best practices by enabling coordination with international platforms (e.g., NGFS), building awareness and intellectual capacity, and encouraging knowledge sharing for the financial sector. Central banks can also consider the phase-wise implementation of additional disclosures by the banking sector on nature-related risks based on global best practice standards such as the IFRS Foundation's International Sustainability Standard Board's global baseline of standards and TNFD.

PARAMETER 3

Inclusion of Nature Risks Across Banking and Financial Services (Strategy, Governance, and Decision- Making Process)

The RBI has released multiple publications and studies, including a survey report, showcasing that climate and nature risks are currently inadequately represented within the operational frameworks of Indian banks. As they commence their journey, Indian financial institutions can learn significantly from global exemplars on managing both climate and nature risks, and leverage opportunities in the nature solutions space. Three key learnings are elaborated below:

HOLISTIC RISK MANAGEMENT

A holistic climate- and nature-related risk management framework influences all parts of a financial institution's operations, including business model and strategy, governance, risk appetite frameworks, enterprise risk management, stress testing, and scenario analysis. Indian financial institutions can learn from global exemplars on how to incorporate climate and nature risks in governance and risk management practices. While the tools, methodologies, and scenario analysis to assess biodiversity risks are still nascent and evolving, there is a pressing need for action.

Financial institutions globally are adopting an iterative approach to managing biodiversity risk where action is based on available data and to evolve nature risk management as the quality of data and methodologies evolve.

For instance, UBS performs an annual sustainability and climate risk materiality assessment of its products, services, and supply chain. The services and activities deemed as having high risk include:

- Risk identification and measurement of the most material sustainability and climate risks for UBS;
- Risk monitoring and appetite setting based on exposure to high- and medium-risk sectors;
- Risk management and control in client onboarding, transaction due diligence, product development, and supply chain management; and
- Risk reporting and disclosures.

Another example is ING and its ESG-linked key performance indicators and incentives process. ING has tied a part of the board's variable remuneration to the company's non-financial performance. ING board members' remuneration is partly based on whether the bank achieves climate alignment in select target sectors. Another part is tied to sustainability and environmental performance indicators. The board remuneration targets are cascaded accordingly through the governance and departmental structures at ING.

SEIZING THE NATURE FINANCE OPPORTUNITY

Beyond risk measurement and monitoring, nature finance is an opportunity for banks to develop new markets, instruments, and structures, enabling them to access new sources of revenue. Globally, banks increasingly tap into these revenue sources by leveraging innovative financing mechanisms that drive nature-based solutions/projects.

- Rabobank and the WWF have teamed up with a dairy company in the Netherlands to develop a Biodiversity Monitor that provides dairy farmers insights into the benefits provided by the environment that helps them reduce operating costs through sustainable management while at the same time benefiting from lower interest rates, a better market price, or more advantageous lease conditions.
- Project Carbon was launched by financial institutions CIBC, Itaú Unibanco, National Australia Bank, and the NatWest Group will develop a new technological platform that will enable the trading of voluntary carbon credits through blockchain technology,

which aims to reduce barriers to carbon trading and help scale high-quality nature-based solutions.

- Swiss Re and the Nature Conservancy teamed up with the regional government of Mexico to tackle the issue of delayed public funding for coral reef protection following a natural disaster by devising a new insurance solution that would ensure rapid disbursement of funds to enable trained community members to deal with reef damage following a severe storm.

LEARNING FROM GLOBAL INITIATIVES SUCH AS THE FINANCE FOR BIODIVERSITY PLEDGE

Over 103 financial institutions globally with over US$14 trillion (over INR 1038 lakh crore) AUM have signed the Finance for Biodiversity pledge and have already committed to collaborating, engaging, and assessing their own biodiversity impact, setting targets and reporting on biodiversity matters by 2024. While many of these institutions are in Europe, there is potential for Indian banks to lead action in Asia.

PARAMETER 4

Unlocking Private Finance Via Strategic Infusion of Catalytic Capital to Demonstrate Commercial Viability and De-Risk Nature Conservation Projects

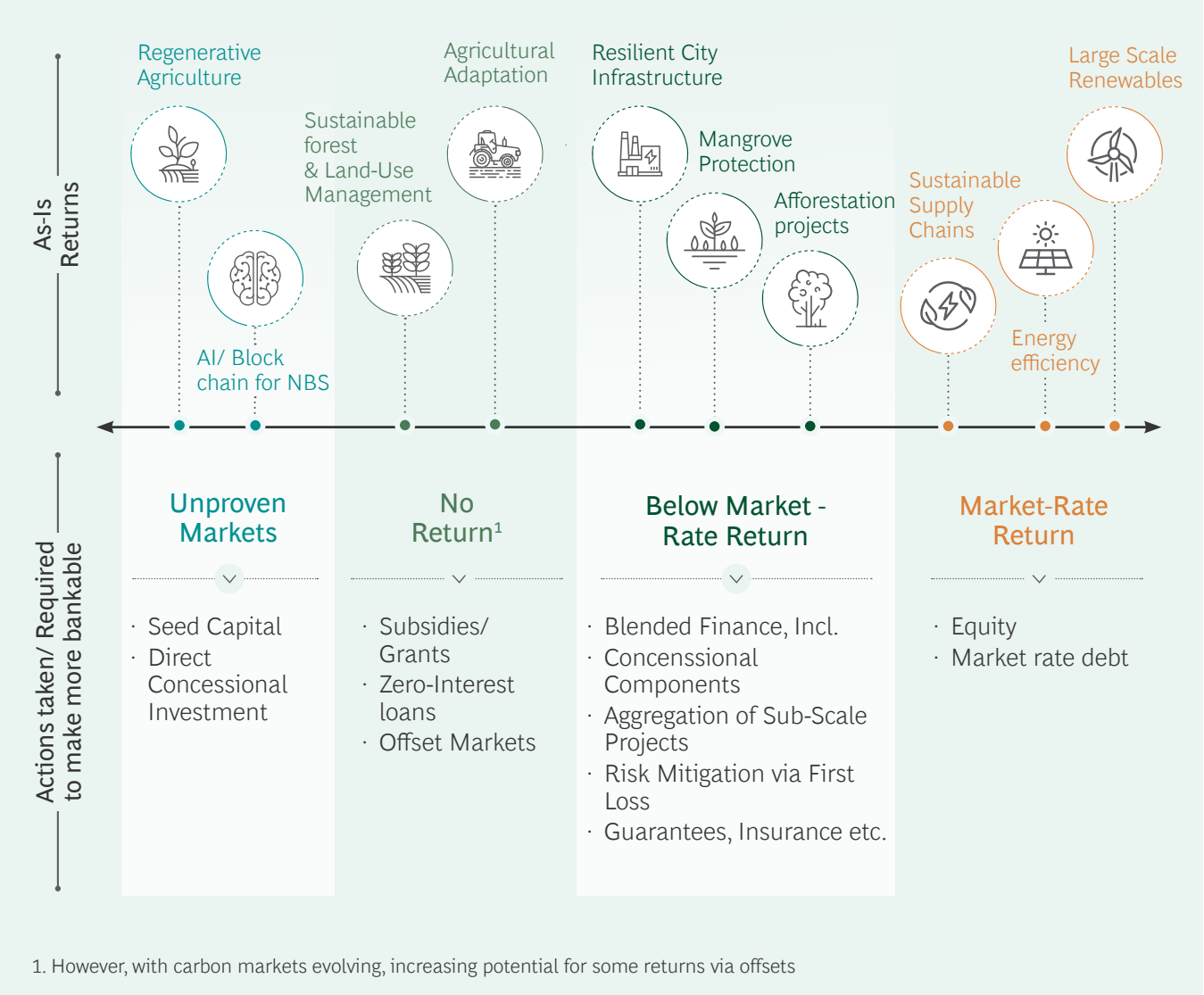
Nature finance faces a huge financing deficit that can potentially be met by private-sector investment. However, to catalyse private finance at scale, there are a few mobilisation challenges that need to be overcome, for example, project unattractiveness due to limited large-scale opportunities, limited liquid investment opportunities, non-transparent risks, relatively low returns, and longtime horizons.

As can be seen from Figure 8, the bankability of a nature-based project can be translated onto a scale, varying from projects that currently are part of an unproven or nascent market, projects that have little to no returns, to mature sectors with proven returns and strong, robust markets. Blended finance can play an important role in helping alleviate several challenges faced by nature-based projects, particularly from a risk and return perspective, by mixing concessional and commercial sources of financing.

Creating an efficient blended structure, and allocating risk and return to various investors, however, it is more complex for biodiversity than it is for climate change (e.g. clean energy or decarbonisation) space. For example, in the renewables sector, the key challenge is to support the development and deployment of new technologies at lower costs where new clean energy businesses can compete with fossil fuel-based businesses. In the case of biodiversity and ecosystem services, however, given the lack of any direct form of comparable competing technology or business model and the risky and untested character of the investment, new sources of concessional finance and different approaches to 'blending' are needed that can improve the returns of businesses from conserving biodiversity as opposed to the same businesses degrading it.

Three important interventions are required to scale blended finance:

Figure 8: Bankability of nature climate and nature business opportunities



1. However, with carbon markets evolving, increasing potential for some returns via offsets

Source: Expert interviews, BCG analysis

CREATING A PIPELINE OF BANKABLE PROJECTS VIA A SOUND FRAMEWORK AIMED AT REPLICATING AND EXPANDING SUCCESSFUL INVESTMENTS IN NATURE

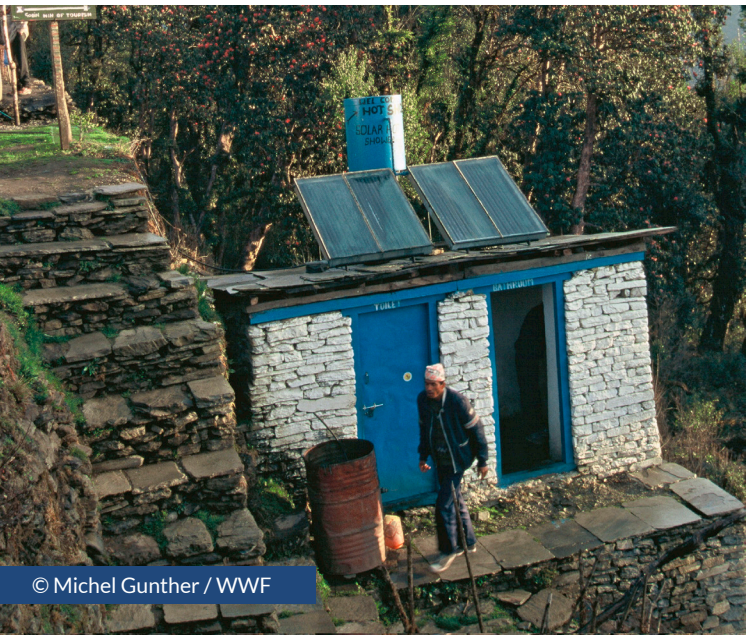
With respect to nature protection and conservation projects, it is particularly challenging that the technology in question is often nascent and is required to prove bankability before it can attract private capital. To mobilise capital at scale, it is often necessary to create a pipeline of bankable projects via project standardisation and replication. The scaling of nature finance is limited by the number of bankable, at-scale projects available to investors. Most nature projects are small-scale and highly localised and are thereby unattractive to large investors.

Given these circumstances, project standardisation and the replication via a sound framework aimed at replicating and expanding successful investments in nature is key to creating bankable business models. One such example is that of the Coalition for Private Investment in Conservation (CPIC), which launched a series of blueprints with

the objective of providing companies and conservation agencies with business-plan templates, risk management tools, and conservation impact strategies focusing on key sectors including sustainable cocoa, forestry, coastal resilience and marine protection.

FUNDING FOR NASCENT TECHNOLOGIES TO DEVELOP AND TEST NEW BUSINESS MODELS

Governments, multilateral development banks, and development finance institutions offer concessional financing (and grants, zero interest rate loans, and seed money) that can be effectively leveraged to develop and test new, unproven business models during the initial stages of a nature-based project. Once the business model is structured and defined, and can showcase a definitive return, private capital can then be mobilised to fill in the viability gap required for the project. Furthermore, concessional finance can also be used to reduce the risk profile of a project by blending it with private finance and helping the project meet a private investor's risk-return profile expectations.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There exist several institutions that offer and utilise blended finance to drive climate- and nature-based innovations and projects such as the Green Growth Equity Fund, the Green Climate Fund, and the GEF- supported CPIC Conservation Finance Initiative.

DEVELOPING INNOVATIVE INSTRUMENTS TO SCALE BLENDED FINANCE

The climate finance landscape has witnessed the rise of multiple innovative financial tools and approaches that allow investors to take advantage of the opportunities with social and environmental impacts. These instruments aim to reduce risk, blend public and private finance, and facilitate investment across a project's lifecycle, and include a range of offerings like concessionary finance, guarantees, viability gap funding, innovative policy insurance, green bonds, and foreign exchange liquidity facilities.

While these new tools and blending approaches have been geared mostly towards mobilising climate finance, many could be similarly applied to nature-based investments and can help direct capital to new areas. The challenge, however, remains to mobilise these instruments effectively and at a large enough scale, in combination with policy mechanisms, to enable large-scale investments in nature-based projects in the country.

Some of the innovative, nature-based financial instruments that are currently being deployed in India and globally have been illustrated below:

POOLING SUBSCALE PROJECTS: For localised and small-scale projects, aggregation of projects at an industry or geographic level

can help mobilise capital:

- **Water & Sanitation Pool Fund, Tamil Nadu:** Pooled bond issuance facilitated access to long-term capital for 13 small urban local bodies. It helped overcome high transaction costs and enabled multilayered credit enhancement to extend bond maturity & boost investor confidence.
- **Microfinance Initiative for Asia:** It is a US$175M public-private fund to refinance Asian microfinance institutions that operate sustainably. The blended finance structure allows for pooling of capital from investors with varied risk-return profiles.

MANAGING UNATTRACTIVE RISK-RETURN PROFILES: Moving beyond the 'use of proceeds' model, sharing of risk across stakeholders can mobilise capital for long-tenure, high-risk projects:

- **Environment Impact Bond, DC Water (US):** An Innovative Environment Bond, whereby the costs of constructing the green infrastructure are paid for by DC Water, but the performance risks of managing stormwater runoff are shared amongst DC Water & the investors.
- **Sustainable Supply Chain Finance MSMEs:** The Asian Development Bank signed a deal with Axis Bank Limited, worth US$150 million, to enable preferential supply chain finance for Indian MSMEs that meet defined sustainability criteria.

DEVELOPING NEW REVENUE STREAMS: Innovative financing instruments can create new revenue streams, and the sale of nature-based credits:

- **Mitigation Banking Credits:** Ecosystem Investment Partners, a private equity firm that works on ecological restoration and conservation projects, sells the mitigation credits they acquire via these activities to corporates to help reduce their unavoidable environmental impact.
- **Payment for Ecosystem Services:** Under the payment for ecosystem services, Vittel (Nestle Waters) is financing the transition of farmers in the catchment area towards more sustainable farming practices.
- **Debt for Nature Swaps:** US$22 million of Seychelles' national debt was written off in exchange for creating 13 new marine protected areas.

BUILDING NEW SECURITIES FINANCING MARKET: Enhancing secondary market liquidity, price discovery, and market discipline can accelerate the pace of private investment

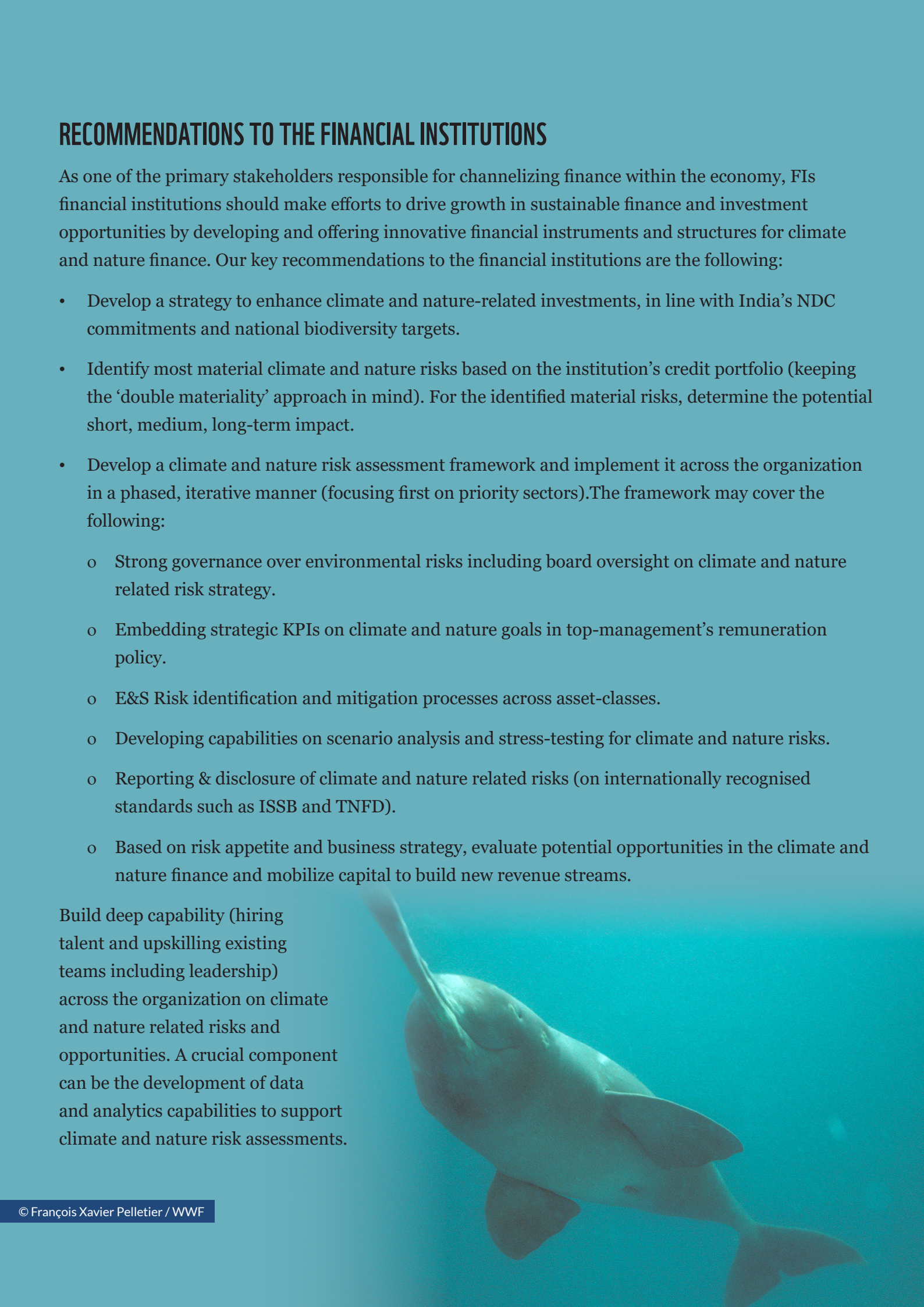
- **Carbon as a financial instrument:** The EU classified its emission trading scheme allowances and their derivatives as financial instruments, helping safeguard carbon markets via financial market rules and encouraged the development of investment products that leverage carbon instruments as an asset class (for example, exchange traded products that track carbon indices).
- **Water Derivatives, US:** Chicago Mercantile Exchange water futures market allows farmers, hedge funds, and municipalities to hedge bets on the future price of water and water availability to help manage risk from draughts and water scarcity.

RECOMMENDATIONS TO THE FINANCIAL INSTITUTIONS

As one of the primary stakeholders responsible for channelizing finance within the economy, FIs financial institutions should make efforts to drive growth in sustainable finance and investment opportunities by developing and offering innovative financial instruments and structures for climate and nature finance. Our key recommendations to the financial institutions are the following:

- Develop a strategy to enhance climate and nature-related investments, in line with India's NDC commitments and national biodiversity targets.
- Identify most material climate and nature risks based on the institution's credit portfolio (keeping the 'double materiality' approach in mind). For the identified material risks, determine the potential short, medium, long-term impact.
- Develop a climate and nature risk assessment framework and implement it across the organization in a phased, iterative manner (focusing first on priority sectors).The framework may cover the following:
    - Strong governance over environmental risks including board oversight on climate and nature related risk strategy.
    - Embedding strategic KPIs on climate and nature goals in top-management's remuneration policy.
    - E&S Risk identification and mitigation processes across asset-classes.
    - Developing capabilities on scenario analysis and stress-testing for climate and nature risks.
    - Reporting & disclosure of climate and nature related risks (on internationally recognised standards such as ISSB and TNFD).
    - Based on risk appetite and business strategy, evaluate potential opportunities in the climate and nature finance and mobilize capital to build new revenue streams.

Build deep capability (hiring talent and upskilling existing teams including leadership) across the organization on climate and nature related risks and opportunities. A crucial component can be the development of data and analytics capabilities to support climate and nature risk assessments.



LOOKING AHEAD

In line with scientific consensus, the upcoming decades are critical for both climate and nature action. It is imperative that global stakeholders collaborate to address both challenges in parallel—and not in a sequential manner—to enable a sustainable future. Further, the authors of this report argue that although the issue of loss of biodiversity may be a governmental mandate, the actors within the financial sector are uniquely placed to engage with it. As evidenced in this report, biodiversity loss poses significant risks to the overall financial stability and more context-specific challenges across various critical sectors. In this context, loss of biodiversity should be as pertinent a risk factor for the financial sector as any other economic factor. Biodiversity loss can potentially trigger systemic disruptions within the Indian and global financial sectors.

While the toolkit for measuring and addressing climate and, in particular, nature risks is still evolving, we need to assume an inverted burden of proof—i.e., assume that environmental degradation, including biodiversity loss, poses an economic and financial risk, and begin incorporating preventive measures in action plans. Here, although there is increased attention being accorded to the interlinkages of loss of biodiversity and the challenges that the financial sector may potentially face as consequence, the availability of pertinent data tools and policy frameworks for the same are

still at a nascent stage. As a consequence, the task for the finance sector supervisors and regulators is even more significant. There is a need to evolve guidance tools for the financial institutions on the lines of contextually constructed green taxonomies, innovative financial instruments, and regulatory measures aimed at redirecting global and domestic financial flows towards nature-positive business models and projects.

The scientific and economic research communities have claimed that developing economies are particularly vulnerable to climate change and biodiversity loss. This vulnerability is a function of their geographical characteristics (biodiversity and climate hotspots) and their economic and financial limitations. This decade presents an opportunity for India to move ahead of the curve and set a benchmark for other countries to follow. India is on its way to developing a green taxonomy, a forward-looking framework that can act as a preventive tool to preempt the nature-related risks from triggering systemic financial instability. As its developmental aspirations converge with the need for sustainable growth, India can establish itself as a centre of global innovation for sustainable businesses, leading the global endeavour to tackle the incredible challenge that lies ahead.

APPENDIX

1. ECOSYSTEM SERVICE VALUATION FOR INDIA

An ecosystem valuation is a process through which a monetary value is assigned to an ecosystem and/ or its services, which can act as a tool for potential decision-makers to evaluate the financial impacts of their policies and decisions on various biodiverse ecosystems.

The estimation of India's annual value of ecosystem services has been carried out using the approach defined by the Ecosystems Service Value Database. T his a pproach w as d eveloped by r esearch teams led by Robert Costanza and Rudolf de Groot for the international "The Economics of Ecosystems and Biodiversity" (TEEB) initiative developed between 2007 and 201418 .

Our analysis utilizes a mix of India specific values, where such values are available (e.g., value of agricultural output in India), and values from the Ecosystem Service Value Database adapted for the Indian context. Finally, the valuation has been performed for the year 2021.

Our valuation takes in consider 4 ecosystem services across 11 distinct ecosystems as illustrated in Exhibit 10.

Direct values for the ecosystem function were substituted wherever available. For instance, in the case of food provision from oceans, the gross value of output from marine fisheries in India (publicly available information published by the Govt. of India) was used.

The rationales dictating the valuation of each of the four individual ecosystem services have been detailed below:

Provisioning

Accounts from the net market value of the benefit provided by each ecosystem

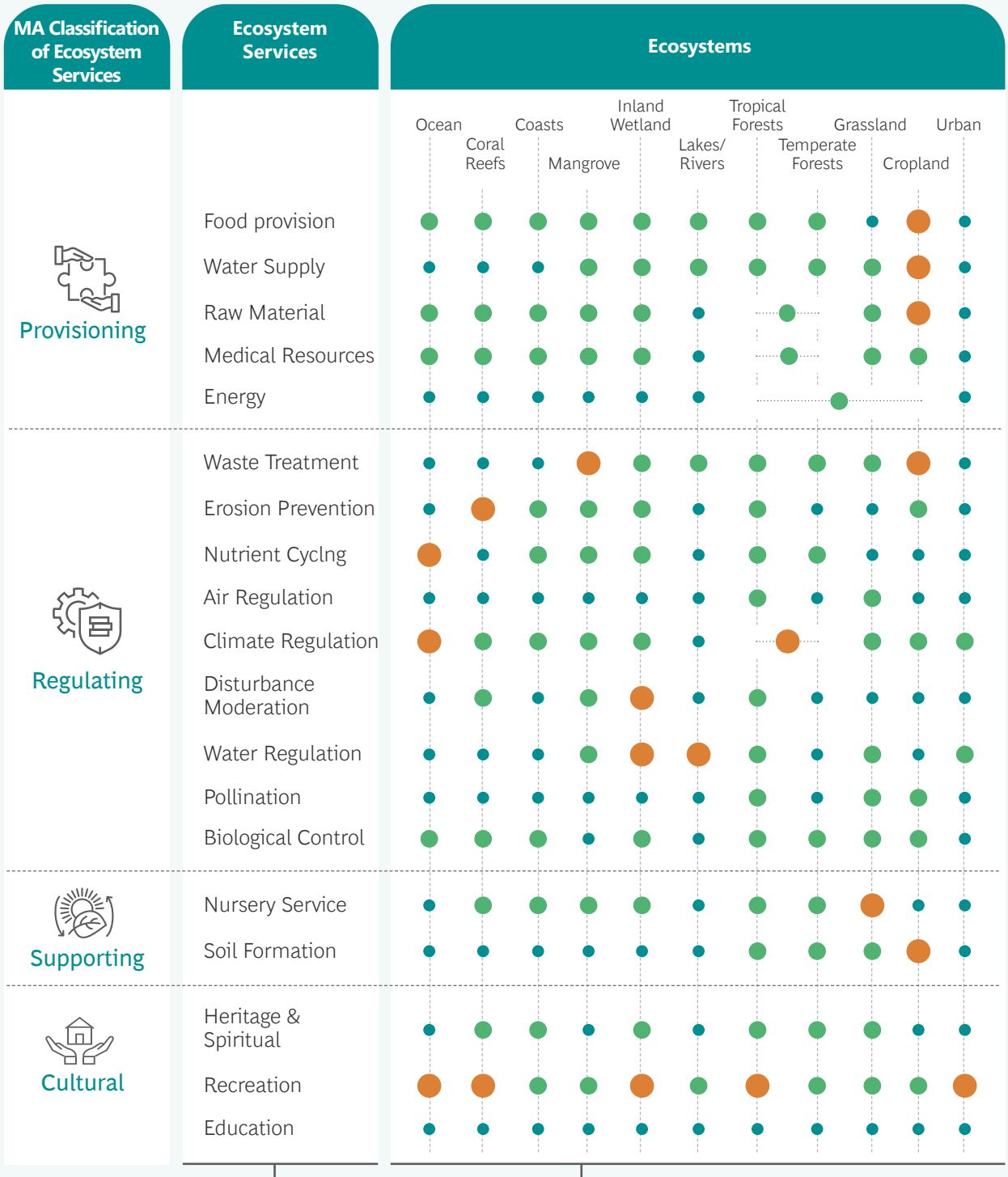
- For e.g. in the case of food provision from croplands, the value of output from agriculture in India (in INR) was taken as the proxy.

Regulating

Accounts for the avoided cost of replacing an ecological function

- For e.g. in the case of waste treatment by wetlands, the value was calculated by estimating the cost of artificially treating the same volume of waste treated by wetlands per year.

Exhibit 10: Relative value of ecosystem services



Ecosystem Service Value = **$/ ha/ a** Derived from ecosystem functions *(where available for each point element)* X **ha** Derived from Indian ecosystem area X **CC** Contextual Constant *(where required for each point element)*

Each touchpoint on the above exhibit represents a value, and the summation of such values gives the whole value of ecosystem services.

Supporting

Accounts for the market prices at which services are offered by an ecosystem

- For e.g. in the case of soil formation by croplands, the value was estimated by evaluating the amount of carbon retained in the soil, and valuing it as per the current social cost of carbon for India. The values for supporting services are excluded from the total aggregate of ecosystem services, this is so because the supporting services provide "intermediate services" that enable the "final services" (provisioning, regulating and cultural services); therefore, if we add these intermediate services, it will lead to the error of double counting.[j]

Cultural

Accounts for the mone*tar*y value of the earning potential of a service

- The value of cultural services is mainly driven by the value of nature-based tourism in India (while cultural services comprise spiritual, heritage, educational, and recreational functions - spiritual, cultural heritage, and educational benefits have been excluded from current calculations given the difficulty of assigning objective monetary figures to these functions).

To ensure comparability between each ecosystem services and their respective economic outputs (both externally amongst each other as well as internally across each function), the following steps were undertaken:

- All ecosystem values were adjusted to 2021 $ values, accounting for inflation both at an Indian and global level, using average Indian and global inflation rates as stated by the World Bank.
- Wherever possible, estimates were updated to India specific values while global values were contextualized to Indian circumstance by making India specific adjustments. For example, in the case of food provisioning services for oceans, lakes, rivers and croplands, global values were substituted with India specific values but for pharmaceutical resources, given the unavailability of India specific values, global values were adjusted using India specific EBITDA margins to estimate the value of pharmaceutical resources that each ecosystem provides to India.

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j "…. of the four categories of ecosystem services identified, namely, provisioning, regulating, cultural and supporting services, one needs to be extremely careful to not include supporting services in the additive framework of valuation. If need be, it is better to value them separately and present two sets of use-values, one as an aggregate of provisioning, regulating and cultural, and the other as supporting services on its own. This is mostly because supporting services (e.g., soil formation, gene-pool protection, pollination, etc.) notionally also provide 'intermediate services' that enable the 'final services' (that are provisioning, regulating, and cultural in nature). Adding such 'intermediate services' to 'final services' will lead to double counting, which should be avoided. Therefore, the simple formula to arrive at the sum of all the ecosystem service values of an ecosystem for a year (be it defined in the form of a microecosystem like a tree or at a bigger scale like a landscape) should be:

V = Vp + VR + VC

Where:
V is the sum total of the values of ecosystem services
Vp is the sum of the values of all provisioning services.
VR is the sum of the values of all regulating services.
VC is the sum of the values of all cultural services."
See, Expert committee (2022). Compensatory Conservation in India: An Analysis of the Science, Policy and Practice, Report submitted to the Hon'ble Supreme Court by the 7-Member Expert Committee pursuant to the directions dated 25th March, 2021 in Special Leave Petition (Civil) No. 25047 Of 2018, New Delhi, India. (Pg. 59)

Assigning monetary values to ecosystem services involve limitations that are an intrinsic part of our assessment as well, as showcased below:

Given that our current methodology only considers the anthropogenic benefits offered by biodiversity, the economic valuation provided should be considered to be a lower bound estimate of the true value provided by ecosystems.

Furthermore, a lack of quantifiable signposts for a number ecosystem services such as spiritual and mental wellbeing, habitat provision, etc. prevents the assessment from providing an all-encompassing, concrete valuation covering every single function.

Finally, given the mix of data sets and parameters utilized, there is a degree of uncertainty inherent to the assumptions and outputs offered by the analysis, which can be sharpened over subsequent iterations (as the quality of data improves over time).

Despite growing awareness and understanding of ecosystems benefits, given the rapidly evolving research landscape, ecosystem valuation is currently open to a wide number of approaches each beset with their individual assumptions bringing with them their inherent uncertainties. When one then considers the subject of Loss and Damage (L&D) on top of these assumptions, owing to the extremely nascent nature of the subject today, these uncertainties are further magnified.

Hence for the purpose of simplicity and clarity, we have not included specifics regarding loss and damage in our ecosystem valuation presented in this document. However, while the valuation presented today might not clearly delineate L&D costs, as methodologies and approaches coalesce and standardize, backed by increasingly robust data sets, the evaluation can be further revised to accurately include L&D implications.

2. SCHEDULED COMMERCIAL BANK'S CREDIT EXPOSURE TO NATURAL CAPITAL RISK IN INDIA

Our analysis detailing the credit exposure of Indian scheduled commercial banks to natural capital risks was carried out through an assessment of the banks' portfolio sectors' dependencies on various ecosystem services. In this regard, the analysis utilizes data from the ENCORE Biodiversity Tool, a database that utilizes the Global Industry Classification Standard (GICS) to map the dependency and impacts of economic activities to ecosystem services, designating very high to very low dependency/ impact for each individual economic activity.[29]

Our assessment involves a detailed analysis of the interactions between each economic sector and its dependencies on ecosystem services covering 86 business processes, 21 ecosystem services (breaking down the 4 ecosystem services into various constituent parts) and 11 impact drivers.

In order to adapt the available ENCORE data to India's context, each ENCORE sector was mapped against RBI's sectoral classification. This was conducted via an exhaustive line by line mapping of RBI's sectors to GICS sectors using the RBI Industry Classification definitions[30] and Basic Statistical Returns (BSR[31]) sector codes as key.

Data on the sectoral lending portfolio of scheduled commercial banks was obtained from RBI's latest (May 2022) sectoral deployment of bank credit.[32] This data represents about ~93% of the lending portfolio of commercial banks in India. Since the analysis is based on credit deployed directly to each sector, personal loans were removed from the analysis and the credit extended adjusted accordingly.

Following the mapping exercise, each business process within an economic sector was mapped as per its respective dependency to an (or many) ecosystem service(s). It was observed that several business processes depended (highly or very highly) on more than one ecosystem service and hence equal weightage was provided to all ecosystem services. For example, if a business process was dependent on two ecosystem services (e.g., groundwater and surface water) equal weights were assigned to both these dependencies, thereby ascertaining that the business process was equally dependent on both these services with neither assuming greater importance or priority.

The assessment focuses on the relationship between economic sectors and their ecosystem dependencies with high or very high dependencies only, as the degree of support provided by ecosystem services with high or very high materiality is critical to the production/operational process of the sector in question. Impact assessment for each sector has been carried out in the same manner. This is the same approach followed by De Nederlandsche Bank and Bank Negara Malaysia, the central banks of Netherlands and Malaysia respectively.

Finally, the credit allocated to each sector was distributed equally (equal weights) across all its ecosystem dependencies (irrespective of degree of dependency). The total credit allocated to high or very high dependencies was then calculated to provide the final sectoral credit value that is exposed to nature- based risks.

As with the ecosystem valuation, our assessment of India's credit exposure to nature-based risks is subject to certain inherent limitations, as showcased below:

- Firstly, ENCORE only considers first order dependencies. For e.g., ENCORE states that agriculture has very high dependency on 15 ecosystem services and high dependency on 11 ecosystem services. Hence any alteration caused in any of these services would affect the output of the agricultural sector
- Finally, depending on how the distribution of credit is carried out across services (equal as adopted in our assessment vs varying weightages) the final result shall vary. In our analysis we have assigned equal weights to all ecosystem dependencies but that may not be the most accurate approach. A sector could allocate more credit to an ecosystem service such as

groundwater as opposed to an ecosystem service such as maintenance of nursery services, which would skew the results of our assessment. However, due to lack of data available providing insights into the distribution of credit across individual services, equal weights have been attributed as part of our current analysis.

3. SUSTAINABLE TAXONOMY - A COMPARATIVE ANALYSIS BETWEEN CHINA AND EU

The EU green taxonomy and the China taxonomy are the two largest and most well-known classification systems. These taxonomies offer examples of different approaches in taxonomy development. In-fact, both these major governments are working together to standardize the global landscape with the China–EU Common Classification Standard for Green Finance. We attempted to compare both taxonomies to learn valuable lessons

Parameter	China	EU
Strategic Goal	Developing a green bond market	To help navigate the transition to a low-carbon, resilient, and resource efficient economy and to serve as the reporting framework for the new EU regulation on climate-related disclosures
Objectives by Taxonomy	1. Energy saving 2. Pollution prevention and control 3. Resource conservation and recycling 4. Clean transportation 5. Clean Energy 6. Ecological protection & climate change adaptation 31 subsectors covered across each of the above objectives	1. Climate change mitigation 2. Climate change adaptation 3. Sustainable use, protection of water & marine res. 4. Transition to a circular economy, waste prevention 5. Pollution prevention and control 6. Protection of healthy ecosystems Priority sectors identified for each objective
Target Users	Green bond issuers and investors	Applies to reporting to regulators and stakeholders by **all investors with staffs of more than 500, all listed corporations, and all banks**

Screening Criteria	The China green taxonomy (2021 Edition) includes six categories. Further elaboration on the definition of green attributes is made available in the second, third, and fourth level directory. Metrics selected for each project activity. Eligibility is determined based on demonstration of greenhouse gas (GHG) emission reduction. Many sub-categories, such as solar photovoltaic power generation, can also be found under the clean energy industry in the China green taxonomy while others such as regional heating/cooling supply distribution are included under the green upgrade of infrastructure in the China green taxonomy.	Technical Screening Criteria (TSC) define the specific requirements and thresholds for an activity to be considered as significantly contributing to a sustainability objective e.g., GHG reduction thresholds gCO2e/unit of product or compliance with standards, labels, or regulations such as Forest management requirements. for reforestation or technologies such as solar PV or regulations For an activity pursuing one or more of the six objectives to qualify as sustainable it cannot cause significant harm to any of the other Taxonomy objectives. For each activity, the TSC lays out thresholds to define compliance with no significant harm.
Application	Green bond issuers required to provide verification reports of underlying assets alignment w. taxonomy	Expected to be mandatory
Supporting Regulation	The PBOC includes green bonds & green loans in collateral frameworks and priority lending to banks holding green bonds. Macro-prudential assessment framework considers ratio of green assets to conv. assets & record of issuing green bonds. Some regional govt. subsidize coupon for green bonds/ loan	The European Commission and the European Parliament are considering a "**green supporting factor**"—that is, a lowering of capital requirements for sustainable financial products.

Source: Adapted from World Bank "How to Develop a National Green Taxonomy for emerging markets"

4. GLOBAL CASE STUDIES OF CENTRAL BANKS' POLICY & INCENTIVES FOR PROMOTING SUSTAINABLE FINANCE

The People's Bank of China (PBOC) provides incentives in monetary policy for green and environmentally friendly activities via multiple initiatives including

- Incentive in commercial bank interest rate: In China, the interest rate that commercial banks get on central bank reserves is a function of a score called Macro Prudential Assessment (MPA) score. The MPA score depends on several dimensions of banks' activities, such as their capital adequacy ratios, their liquidity conditions, the quality of their assets, their competitiveness behavior, etc. The amount that a bank provides in green loans positively impacts its MPA score.

- Incentive in collateral frameworks: In 2018, the People's Bank of China (PBoC) broadened the asset classes accepted as collateral for its Medium Term Lending Facility (MLF) to include financial bonds, in particular, green bonds. It granted these green bonds priority over other financial bonds (a first-among-equals status) and lowered the credit quality requirement on all eligible green bonds from AAA to AA.

The European Commercial bank plans to disincentivize use of assets with a high carbon footprint as collateral for instance

- Starting 2024, the Eurosystem will limit the share of assets issued by entities with a high carbon footprint that can be pledged as collateral by individual counterparties when borrowing from the Eurosystem.
- Effective 2026 the Eurosystem will only accept marketable assets and credit claims from companies and debtors that comply with the Corporate Sustainability Reporting Directive (CSRD) and make appropriate climate-related disclosures

Bangladesh Bank's refinancing scheme for environmentally friendly projects has a ~$50 million (Rs. 371 crore) fund for refinancing 50+ green product lines including renewable energy, energy efficiency, solid waste management, liquid waste management, recycling and others. It also has created a $200 million (Rs. 1483 crore) green transformation fund to provide concessional loans of 5-10 years tenor to promote finance for environment-friendly infrastructure in export-oriented industries. The long tenor of the loans fills an important gap in Bangladesh's financial system, where the corporate bond market is still underdeveloped, and traditional bank lending is usually only provided for maturities of up to 5 or 7 years.

Prioritizing supervisory activities based on most material climate and environment related risks

Banco Central do Brasil (BCB) ranks social-environmental (S&E) risk among its top 5 priorities in its Supervision Area Annual Plan (SAP). The SAP is a cyclical process that results in a detailed set of activities to be performed throughout the year, as well as its monitoring and evaluation rules and targets. The central bank uses a social and environmental residual risk matrix (SERM) which identifies risky credit exposures of all financial institutions from the environmental point of view to support the supervisory planning process and priority topics that should receive greater attention from the supervision. It also evaluates the adequacy of each financial institution's governance and risk management frameworks based on a weighted average of several themes including:

- Governance
- Risk management
- Credit risk
- Specific rural credit procedure
- Operational risk, including legal risk
- Market risk, and
- Reputational risk

Central banks can lead the way for the financial sector by tilting their own portfolio towards climate and nature positive investments

Riksbank (Sweden's central bank) applies a norm-based negative screening criteria to its purchases of corporate bonds issued by non-financial companies. Effective from January 2021, the Riksbank may exclude bonds from issuers that do not comply with universal global standards and norms for environment and sustainability. The principles in the UN Global Compact represent one example of standards and norms that the Riksbank applies in this context.

European Central Bank (ECB) aims to, starting 2022, gradually decarbonise its corporate bond holdings, on a path aligned with the goals of the Paris Agreement. To that end, the Eurosystem will tilt these holdings towards issuers with better climate performance through the reinvestment of the sizable redemptions expected over the coming years. Better climate performance will be measured with reference to lower greenhouse gas emissions, more ambitious carbon reduction targets and better climate-related disclosures. This aims to mitigate climate-related financial risks on the Eurosystem balance sheet. It also provides incentives to issuers to improve their disclosures and reduce their carbon emissions in the future.

ENDNOTES

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