




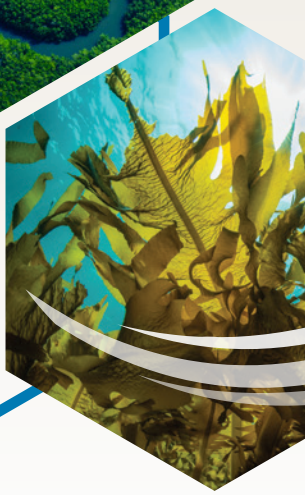

WORLD BANK GROUP

UNLOCKING NATURE-SMART DEVELOPMENT

An Approach Paper on Biodiversity and Ecosystem Services

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UNLOCKING NATURE-SMART DEVELOPMENT

An Approach Paper on Biodiversity and Ecosystem Services

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PREFACE

The objective of this approach paper is to outline, for the benefit of policy makers, the development challenges and opportunities associated with blue and green biodiversity and ecosystem services. The paper frames the management of biodiversity and ecosystem services as a development issue, from both the risk and opportunity perspectives. It proposes six global response areas aimed at rebalancing nature and economic prosperity, which are intended to guide governments and inform broader discussions on the integration of nature into development agendas. In support of these efforts, the paper also outlines contributions of the World Bank Group (WBG) – referring to the World Bank, International Finance Corporation, and Multilateral Investment Guarantee Agency – to these response areas. As the examples throughout the paper show, the WBG actively engages with client countries not only on core biodiversity conservation activities, but also by encouraging the mainstreaming of biodiversity and ecosystem services conservation in country development efforts, by closing data gaps, engaging with private sector partners, strengthening institutional capacity to manage natural capital effectively, engaging financial and economic policy makers to bring biodiversity into macroeconomic and financial sector policy, and fostering intersectoral and global cooperation. As nations formulate a set of new biodiversity targets at the landmark fifteenth meeting of the Conference of the Parties (COP-15) to the Convention on Biological Diversity (CBD), this paper offers insights to guide the design and implementation of the post-2020 global biodiversity framework and inform the WBG's ongoing support to this agenda.

The biodiversity and ecosystem services crisis is a development issue. Biodiversity and natural ecosystems, both terrestrial and marine, are being lost at an unprecedented rate and scale in human history, with potentially far-reaching implications for economies and livelihoods. Economies are embedded in nature, depending profoundly on the ecosystem services it provides, such as food and raw materials, pollination, water filtration, and climate regulation. Biodiversity and ecosystem services underpin all 17 Sustainable Development Goals. Yet nearly

one million animal and plant species (of an estimated eight million total) are threatened with extinction, and 14 of the 18 assessed categories of ecosystem services have declined since 1970 (IPBES 2019). Akin to climate change, the risks associated with biodiversity loss are systemic. They threaten communities, value chains, and economies. Severe degradation of nature has the potential to undo the development gains made in recent decades; aggravate fragility, conflict, and violence; and strip some of the poorest economies of the foundations for future growth. Reducing poverty and inequality and protecting the biosphere are closely related tasks. Biodiversity can no longer be considered a niche issue; it must take its rightful place at the center of the development process.

The current economic crisis, the worst since the Second World War, is a case in point, because it may be rooted in the imbalance between natural and man-made capital and unsustainable exploitation and overuse of natural resources. The COVID-19 pandemic is an example of how nonlinearities, uncertain thresholds, and "tail risks" can play out in the complex relationship between planetary and human health. The economic recession that the pandemic has brought about will cause millions more people to fall into extreme poverty, and the existing poor will experience even deeper deprivation. Despite all the challenges, recovery efforts present significant opportunities for countries to reorient toward greener, more resilient and inclusive development – the approach the WBG has adopted to guide its support to the global recovery.

The coming months provide an important window of opportunity to put planetary and human health on the same course. This paper comes as nations prepare for COP-15 of the CBD, during which a new deal on nature is expected. The latest assessment of progress on the 2011–20 Aichi Biodiversity Targets shows that the international community fell short of meeting the targets, with none fully achieved and only six partially achieved, indicating insufficient progress in addressing the global crisis. The new deal, dubbed the post-2020 global biodiversity framework, will provide a unique opportunity to mobilize a diverse set of actors, including policy makers, financial institutions, and companies, and commit them to decisive action to reverse nature loss through conservation, sustainable use, and equitable sharing of the benefits of biodiversity. Moreover, COP-26 of the United Nations Framework Convention on Climate Change will provide further impetus to the nature agenda because healthy ecosystems increase the resilience of society to climate change and are a powerful carbon sink, and addressing climate change is crucial to curb nature loss. Action on addressing biodiversity loss also tends to be pro-poor and can support an inclusive post-COVID-19 recovery.

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ABBREVIATIONS

ASL	Amazon Sustainable Landscapes Program
CBD	Convention on Biological Diversity
CBI	Climate Bonds Initiative
COP-15	fifteenth meeting of the Conference of the Parties
ESF	Environmental and Social Framework
ESG	environmental, social, and governance
ESS	Environmental and Social Standard
FAO	Food and Agriculture Organization
FCPF	Forest Carbon Partnership Facility
FY	fiscal year
GDP	gross domestic product
GEF	Global Environment Facility
GHG	greenhouse gas
GPMB	Global Preparedness Monitoring Board
GRID	greener, more resilient and inclusive development
GVA	gross value added
IBRD	International Bank for Reconstruction and Development
ICMA	International Capital Market Association
IDA	International Development Association
IEA	International Energy Agency
IFC	International Finance Corporation
IHA	International Hydropower Association
IMF	International Monetary Fund
INPE	Instituto Nacional de Pesquisas Espaciais
IPBES	Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services
IPCC	Intergovernmental Panel on Climate Change
IRENA	International Renewable Energy Agency
IUCN	International Union for Conservation of Nature
MIGA	Multilateral Investment Guarantee Agency
NBSAPs	National Biodiversity Strategies and Action Plans
NDCs	Nationally Determined Contributions
OECD	Organisation for Economic Co-operation and Development
OIE	World Organisation for Animal Health
REDD+	Reducing Emissions from Deforestation and Forest Degradation, plus conservation, sustainable management of forests, and enhancement of forest carbon stocks
RETF	recipient-executed trust fund
SBN	Sustainable Banking Network
SDGs	Sustainable Development Goals
TNFD	Taskforce on Nature-related Financial Disclosures
UN DESA	United Nations Department of Economic and Social Affairs, Population Division
UN FCCC	United Nations Framework Convention on Climate Change
UN WWAP	United Nations World Water Assessment Programme
UNEP	United Nations Environment Programme
UNESCO	United Nations Educational, Scientific and Cultural Organization
UNFCCC	United Nations Framework Convention on Climate Change
UNODC	United Nations Office on Drugs and Crime
WBG	World Bank Group
WCMC	World Conservation Monitoring Centre
WEF	World Economic Forum
WHO	World Health Organization
WRI	World Resources Institute

EXECUTIVE SUMMARY

Blue and green biodiversity and ecosystem services are being lost at an unprecedented rate and scale in human history, with potentially far-reaching implications for economies and livelihoods. The root causes are the pace at which economies produce, consume, and build and the ways that they do so, which are often inefficient not only from an environmental perspective, but also from an economic and inclusion standpoint. Akin to climate change, the economic and financial risks associated with biodiversity loss are systemic. Severe degradation of nature has the potential to undermine achievement of the Sustainable Development Goals (SDGs),[1] depleting the natural asset base that some of the poorest economies need to support future growth. A transformed approach to biodiversity and ecosystem services is needed to move beyond an approach mainly focused on area-based conservation to one that also recognizes how economies and development outcomes rely on nature for services and that addresses the underlying drivers of biodiversity loss in client countries systematically.

ECONOMIC CASE FOR NATURE

The global decline in biodiversity and ecosystem services gives rise to risks that are material and systemic. Biodiversity and ecosystem services, which for the purposes of this paper are also referred to as "nature," for short, underpin economies in tangible, measurable ways. It is estimated that US$44 trillion of global value added (more than half of the world's gross domestic product (GDP)) is generated in industries that highly or moderately depend on nature and its services (WEF 2020a). Key sectors such as agriculture, fisheries, and water utilities rely on ecosystem services.[2] Dependencies in turn give rise to risks associated with environmental degradation. For these sectors, biodiversity loss is material, affecting their performance and financial position. Already, 14 of the 18 assessed categories of ecosystem services have declined since 1970 (IPBES 2019). This means smaller fish catches, pollinator decline, poorer freshwater quality, and reduced ability of nature to control pathogens and protect economic assets from extreme weather. As the physical risks of biodiversity loss materialize, they can affect the relative productivity of value chains and geographic areas. Biodiversity loss also interacts with climate change; the two environmental crises are

1. Conservation and sustainable use of biodiversity contribute directly to or support achievement of 12 of the 17 SDGs (1, 2, 3, 6, 7, 8, 9, 11, 12, 13, 14, and 15); the five remaining SDGs are linked to biodiversity to some degree (CBD Secretariat et al. 2016).
2. Ecosystem services are the benefits people obtain from nature and are organized into four types: provisioning, regulating, cultural, and supporting services (Millennium Ecosystem Assessment 2005).

capable of compounding and giving rise to ecological and financial losses that can pervade the global economy.

Of critical importance to the SDGs is that loss and degradation of nature are likely to affect the poorest economies the most. Although renewable natural capital, including land assets (such as agricultural land, protected forests, and productive forests) and blue assets (such as fisheries and mangroves), accounts for 5 percent of wealth globally, it makes up 23 percent of the wealth in low-income countries (World Bank forthcoming a). In addition, their most vulnerable populations may be most at risk; 79 percent of the global population living below the poverty line resides in rural areas (World Bank 2018a), and they tend to depend greatly on biodiversity and ecosystem services for their livelihoods. Ecosystem dynamics are also characterized by uncertain degradation thresholds and "tipping points" beyond which ecological regime shifts can occur and lead to drastic changes in an ecosystem's capacity to provide services (for example, a tropical forest dying back into savanna). Recent World Bank modeling estimates (Johnson et al. 2021) show that collapse of even a limited range of ecosystem services – a 90 percent reduction in pollination of crops by wild pollinators, provision of timber from tropical forests, and food from marine fisheries – could jeopardize the prospects of some of the poorest economies to grow out of poverty:

- Sub-Saharan Africa could see a 26 percent drop in real GDP growth (equivalent to US$359 billion) and South Asia an 18 percent drop (equivalent to US$316 billion) from 2021 to 2030 compared with the "no tipping point scenario." Some countries could see their GDP growth drop by more than 45 percent.
- Low-income countries may experience a 31 percent reduction in real GDP growth (equivalent to a cumulative US$82 billion between 2021 and 2030), and lower-middle-income countries may forgo 20 percent of growth (US$730 billion) over the next decade.

Present efforts to preserve biodiversity and ecosystem services are insufficient. The latest assessment of progress on the 2011–20 Aichi Biodiversity Targets shows that none of the 20 targets has been fully achieved, and only six have been partially achieved (CBD Secretariat 2020a). This comes at a time when accelerating changes in the socioeconomic sphere are dramatically decreasing the extent and condition of natural habitats. For example, 75 percent of the Earth's ice-free land surface has been significantly altered, and more than 85 percent of the area of wetlands has been lost since the 1970s (IPBES 2019). Some regions, such as South America, saw a 94 percent decline in the average abundance of mammals, birds, fish, reptiles, and amphibians over the same period (WWF 2020) (appendix A).

COVID-19 is a powerful reminder of the close link between human and planetary health. The emergence of many infectious diseases, including COVID-19, is attributed to deforestation and biodiversity and habitat loss that contribute to a growing risk of pathogen spillover from wildlife species (box 1 and appendix A). When it comes to biodiversity and ecosystem collapse, the cost of prevention is less than that of the cure; the rising risk of zoonoses is a striking example of this. According to new analysis (Dobson et al. 2020), the financial damage from the economic and health crisis linked to the COVID-19 pandemic dwarfs, by an order of magnitude, the cost to mitigate and prevent the risks of the pandemic emerging in the first place. Risk mitigation alone does not make the economic case for action; investments in biodiversity have

tangible development benefits. Policies and investments in nature can be effective strategies to create jobs, reduce poverty, and increase shared prosperity (Oldekop et al. 2019; Sims and Alix-Garcia 2017). They can also support COVID-19 recovery interventions that seek *short-term* efficacy in job creation, pro-poor targeting, and fast-disbursing actions and *long-term* investments. The World Economic Forum identified 15 transitions in the three key socioeconomic systems – food, land use, and ocean use; infrastructure and the built environment; and energy and extractives – that could deliver US$10.1 trillion in annual business opportunities and 395 million jobs by 2030 (WEF 2020b) (appendix A).

Countries will need to overcome a series of binding constraints to be able to pursue development outcomes in a way that is compatible with sustainable management of nature. The direct drivers of biodiversity and ecosystem services loss are changes in land and sea use for agriculture, infrastructure and urban development, overexploitation of resources, climate change, pollution, and spread of invasive species (IPBES 2019). The pace with which economies produce, consume, and build and the ways in which they do so are often inefficient not only from an environmental perspective, but also from an economic and inclusion standpoint. The paper identifies five key binding constraints or barriers that perpetuate market and policy failures, keeping sectors and economies locked in unsustainable pathways: short- and long-term trade-offs, lack of data and knowledge, capacity constraints, domestic political economy factors, and the global public good nature of many ecosystem services.

ENABLING NATURE-SMART[3] DEVELOPMENT

To be effective, the global response to the biodiversity crisis needs to be systemic. The approach proposed in this paper builds on the dialogue taking place in the run-up to the fifteenth meeting of the Conference of the Parties (COP-15) to the Convention on Biological Diversity (CBD), as well as the draft of the post-2020 global biodiversity framework, which recognize that policy action and investment at the global, regional, and national levels are required to transform economic, social, and financial models so that the trends that are driving biodiversity loss stabilize over the next 10 years. This means planning for and implementing development differently, taking into account future risks associated with biodiversity loss and systematically accounting for its value in decisions at all levels and across all sectors.

The core building blocks of an effective response include:

1

A whole-of-economy approach to addressing the drivers of biodiversity and ecosystem services loss.

That engages policy makers and financial institutions and provides policy incentives for sectors to look for ways to produce food, build infrastructure, and design cities in ways that maintain provision of ecosystem services.

3. In this paper, the term "nature-smart" is used to describe approaches to policy, investments, and practices that integrate biodiversity and ecosystem service considerations from the perspectives of mitigating risks arising from the loss of nature and harnessing the benefits and opportunities that ecosystem services provide.

2

A solid scientific and economic base for action.

With more advanced methodologies to assess biodiversity risks, dependencies, trade-offs, and opportunities.

3

Measures to support an equitable and inclusive transition.

To ensure that investments and policies designed to address the biodiversity crisis are pro-poor. The transition should maximize local benefits, to ensure that what works for nature also works for people, and include targeted measures to address the social costs of the transition (including any trade-offs and unintended distributional effects on the most vulnerable).

At the same time, investments in biodiversity must be made in a way that exploits synergies with climate change mitigation and adaptation.

Six global response areas could unlock nature-smart development, helping governments move beyond a piecemeal response, focusing on conservation toward systematic integration of nature into development, while removing the barriers to sustainability that countries face worldwide:

1

Engage economic and financial decision makers.

Given the systemic risks arising from nature loss, it is important to integrate nature considerations into national strategies and action plans and use economic policy to address the drivers of nature loss, for example by addressing underpricing of biodiversity and ecosystem services. Integrated economic and ecosystem service modeling could be harnessed to inform such policy. There is also a need to integrate biodiversity criteria into financial decisions, for example through taxonomies, supervisory and regulatory risk assessment, and greater disclosure, and to reconcile trade policy with sustainable management of nature.

2

Integrate nature and nature-based solutions into sector investments.

Solutions to the global biodiversity crisis inevitably lie in the economic sectors that exert the greatest pressure on nature – food, land use, and ocean use; infrastructure and the built environment; and energy and extractives (WEF 2020b). Many of these sectors find themselves at a crossroads – they are central to achieving the SDGs and satisfying the needs of a growing population, but their expanding footprint is also unsustainable.

Ex-ante and ex-post biodiversity impact assessments need to be mainstreamed into sectors at the levels of policy, planning, investment, and supply chain management. It is also important to close knowledge gaps in the application of the One Health approach in relevant sectors and to expand efforts in identification, design, and implementation of nature-based solutions that bring about synergetic achievement of economic development, climate change mitigation and adaptation, and conservation and restoration of ecosystems.

3

Enhance local benefits of conserving and sustainably managing nature.

Effective conservation of natural habitats remains the core of any strategy to protect species and ecosystems, but this can work only if Indigenous Peoples and local communities, who depend on nature and play a crucial role in conserving it, are at the center. Efforts to conserve local biodiversity and ecosystem services, such as protected area management, need to be underpinned by effective benefit-sharing mechanisms and integrated with livelihoods development to ensure that area-based conservation effectively supports environmental and development objectives. Spatially explicit planning at the local level that considers the trade-offs and synergies between economic inclusion and environmental sustainability and brings together multiple stakeholders is crucial. Empowerment and engagement of communities, along with equitable sharing of the economic benefits of conservation, are pivotal to arrest local threats to biodiversity, including overexploitation, illegal logging, and wildlife poaching, and thus improve effectiveness of conservation efforts. The drastic decline in nature-based tourism due to COVID-19 has highlighted the need for sustainable tourism recovery, as well as a broader range of financing options – including sustainable value chains, payments for ecosystem

services schemes, or market-based mechanisms such as forest and blue carbon mitigation offsets – to unlock more financing for nature and create resilient, diversified livelihoods.

4

Mobilize finance.

The biodiversity financing gap is estimated at more than US$711 billion per year. Going forward, in addition to more efficient use of public sector finance, the real and financial sector (the private sector) will play a pivotal role in financing biodiversity and ecosystem services, and there are encouraging signs that the market for biodiversity finance is developing. There are two complementary approaches to mobilizing private finance for biodiversity: *greening finance and financing green*.[4] Concerted action from governments and regulators, the private sector, and development partners is needed to achieve this. Policies and regulations are key to leveling the playing field for sustainable investment and incubating a pipeline of bankable projects, as well as integrating nature considerations into financial decisions and business strategies. A phased approach that blends concessional and commercial capital, progressively increasing the share of the latter, with financial innovation is also needed.

5

Produce metrics and decision support tools.

The decisions of public and private actors involving biodiversity often entail material trade-offs, yet they are supported by incomplete information on nature's value and the risks associated with its loss. Improved spatial data and metrics are essential for better informing planning, policy, and financial decisions. Advances in economic valuation should also be complemented with technical assistance, to help integrate sustainability metrics into decision making. Tracking of public and private investments that have biodiversity and ecosystem services co-benefits also needs to improve.

4. Similar efforts, applied to the development of oceanic sectors, are sometimes referred to as "blueing finance" and "financing blue."

6

Leverage partnerships.

Biodiversity and ecosystem services have not just a local dimension, but also regional and global public goods dimensions. An ambitious, effective post-2020 global biodiversity framework is critical for a swift response to the biodiversity crisis and requires broad stakeholder engagement. Consensus needs to be built around ambitious yet realistic targets, a systemic response, and appropriate support mechanisms that harness sufficient technical and financial resources for implementation. Active engagement of the UN system, the Global Environment Facility, multilateral development banks, and bilateral donors is needed for an effective and coordinated response. There are also opportunities to strengthen dialogue with financial institutions and regulators on biodiversity and the role of trade policy as a means to curb environmental degradation.

Multilateral development banks and other development partners have a role to play in helping to bring nature into development policy and bridging financial gaps. Despite the profound ways in which biodiversity and ecosystem services underpin the SDGs, biodiversity continues to be perceived as a niche issue within a much broader development portfolio. Mainstreaming of nature into the development process will need to gain scale and speed. The World Bank Group (WBG) supports the global response by working with client countries on reconciling development and environmental objectives. The long-standing engagement of the WBG in biodiversity and natural resource management spans investments in conservation, institution and capacity building, development of livelihoods, financial innovation, and comprehensive risk management through the World Bank Environmental and Social Framework, the International Finance Corporation (IFC), and Multilateral Investment Guarantee Agency (MIGA) Performance Standards on Environmental and Social Sustainability.

The breadth of the WBG's portfolio and the ability of the World Bank, IFC, and MIGA to join forces to develop integrated financing solutions could be leveraged to unlock nature-smart approaches in client countries. Capitalizing on its core role as a development bank and its focus on resilience and inclusion while harnessing existing areas of support, including forests, watersheds, and sustainable landscapes; marine, coastal, and aquatic resources; and pollution management and environmental health, the WBG can help clients inform their national and sector-level policy and investments. The World Bank country engagement model provides a mechanism to carry out policy dialogue and support knowledge creation to advance understanding of the links between economic development, poverty reduction, equity, and sustainable management of blue and green ecosystems. Accounting for natural capital in decision making and using emerging models to study ecosystem-economy interactions are key. In particular, the WBG could support country-level efforts to close biodiversity and ecosystem service data gaps, increase institutional capacity to manage natural capital effectively and in a way that supports poverty reduction and shared prosperity, and engage financial and economic policy makers to bring biodiversity into macroeconomic, financial sector, and trade policy. The WBG is also well placed to promote global knowledge creation, build partnerships, and foster global cooperation.

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1

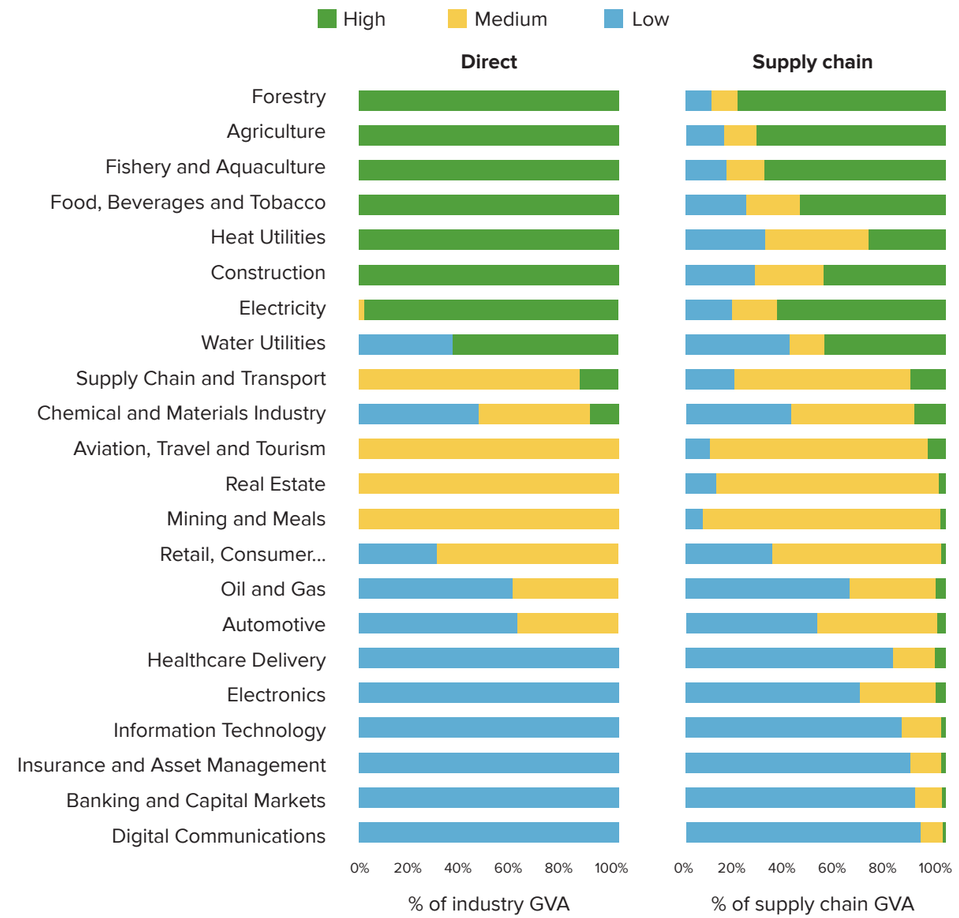
DEVELOPMENT CHALLENGE

1.1. ECONOMIC CASE FOR NATURE

Biodiversity and ecosystem services underpin economies in tangible, measurable ways. It is estimated that US$44 trillion of global value added – corresponding to more than half of the world's gross domestic product (GDP) – is generated in industries that depend highly (US$13 trillion) or moderately (US$31 trillion) on nature and its services (WEF 2020a) (figure 1 and appendix A). Key economic sectors such as construction, agriculture, and food and beverages depend on direct extraction of resources from forests and oceans and the regulating and supporting ecosystem services they provide. These dependencies in turn give rise to risks. For these sectors, biodiversity loss is material,[5] affecting their performance and financial position. For example, the disappearance of pollinators[6] would have immediate knock-on effects on 75 percent of food crops that rely, at least in part, on animal pollination and US$235 billion to US$577 billion of annual crop output that is directly attributable to animal pollination (IPBES 2019; 2016). Likewise, it is likely that loss of critical marine ecosystems such as mangroves, seagrass beds, and coral reefs would affect global marine fisheries that underpin important value chains.[7] As the physical risks of biodiversity loss materialize, they affect the relative productivity of economic activities, sectors, and geographic areas.

5. Materiality refers to the significance of a matter in relation to a set of financial or performance information. If a matter is material to the set of information, then it is likely to be of significance to a user of that information (OECD 2013). Materiality is rarely determinable by a bare quantitative equation; rather, it requires an assessment of whether a reasonable investor would consider the information relevant to their decision whether or not to invest in a company (Staker, Garton, and Barker 2017).
6. The International Union for the Conservation of Nature Red List indicates that 16.5 percent of vertebrate pollinators are threatened with extinction globally. Although there are no global assessments specifically for insect populations, national and regional assessments indicate high levels of threat. Where national Red List assessments are available, they show that more than 40 percent of bee species are threatened (IPBES 2016).
7. The value of global fish exports in 2017, including fish from aquaculture, was estimated at US$152 billion. Approximately 54 percent of this value and 59 percent of the total quantity (in live weight equivalent) of exports of fish and fish products originated from developing countries during the same year (FAO 2018).

FIGURE 1 Percentage of Direct and Supply Chain Gross Value Added (GVA) with High, Medium, and Low Nature Dependency, According to Industry



Source: WEF 2020a.

Of critical importance to the Sustainable Development Goals (SDGs) is the fact that loss and degradation of nature will likely affect the poorest economies the most. Whereas renewable natural capital, including land assets (such as agricultural land, protected forests, and productive forests) and blue assets (such as fisheries and mangroves), accounts for 5 percent of wealth globally, it makes up 23 percent of wealth in low-income countries (World Bank forthcoming a) (appendix A). At the country level, this percentage can be even higher. For example, renewable natural capital accounts for 39 percent of total wealth in Sierra Leone (where 43 percent of the value of natural capital is attributable to forests)

and 35 percent in Suriname (where 47 percent of the value of natural capital is attributable to mangroves) (World Bank forthcoming a). Current trends in the degradation of nature have the potential to undo development gains; aggravate fragility, conflict, and violence[8]; and strip these countries of the foundations for future growth.

Economic models show that in scenarios where certain ecosystem services collapse, low- and lower-middle-income countries stand to lose the most in relative terms. Ecosystem dynamics are characterized by uncertain degradation thresholds and "tipping points" beyond which ecological regime shifts can occur and lead to a drastic change in the ecosystem's capacity to provide services (for example, a tropical forest dying back into savanna). Recent results from World Bank modeling[9] show that a 90 percent reduction in pollination of crops by wild pollinators, provision of timber from tropical forests, and food from marine fisheries could result in 10 percent lower global real GDP growth from 2021 to 2030 (US$2.7 trillion) compared with a no tipping point scenario. The geographic distribution of these effects reveals staggering losses in some of the poorest countries and regions (figure 2):

- Sub-Saharan Africa could see a 26 percent drop in real GDP growth (equivalent to US$359 billion) and South Asia an 18 percent drop (equivalent to US$316 billion) from 2021 to 2030 compared with the "no tipping point scenario." These regions are especially vulnerable in this analysis because of their reliance on forestry production and pollinated crops along with limited ability to switch to other production and consumption options.

- Low-income countries may experience one-third lower real GDP growth (equivalent to US$82 billion), whereas lower-middle-income countries may forgo 20 percent of growth (equivalent to US$730 billion) over the next decade. These two country income groups account for nearly half of the world's population.

- Seven countries – Madagascar, Bangladesh, Pakistan, Ethiopia, Angola, the Democratic Republic of Congo, and Indonesia – could see their GDP growth drop by more than 45 percent.

This analysis may reveal only the tip of the iceberg when it comes to the risks associated with biodiversity loss, because it examines the near term and only a limited set of ecosystem services. Moreover, the model does not account for possible societal conflict that may be triggered by some of the losses in GDP growth – for example, 12 percent of the global population may experience a drop in GDP growth of more

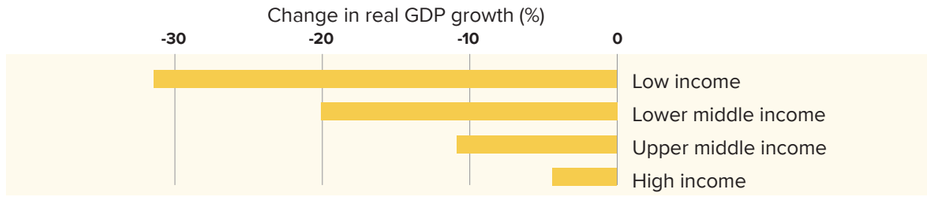
8. The World Bank Group Strategy for Fragility, Conflict, and Violence 2020–2025 (WBG 2020a) acknowledges that fragility can be exacerbated by increasing competition over diminishing renewable resources, such as land and water, which are further aggravated by environmental degradation and depletion. It is estimated that 65 percent of conflicts have a significant land dimension, and conflicts around water are increasing. For example, in parts of Africa, tensions between pastoralists and agriculturists over access to land and water have escalated to violence.
9. The study uses an integrated Global Trade Analysis Project and Integrated Valuation of Ecosystem Services and Tradeoffs model to assess the effect on global GDP of a partial ecosystem collapse, which includes pollinator collapse, widespread conversion of tropical forests into grassland and shrubland, and marine fisheries collapse (~90 percent reduction in extent for each). The model comprehensively accounts for the pathways through which the economic shocks that ecosystem regime shifts induce are transmitted to various sectors of the economy (for example, reduction in fish stocks limits availability of key inputs for the fish industry) and across borders (for example, via commodity trade and movements of factors of production) (Johnson et al. 2021).

than 45 percent. The estimates presented here are the equivalent of a first step toward a stress test of the global economy and point to the materiality of nature risks in some of the poorest regions.

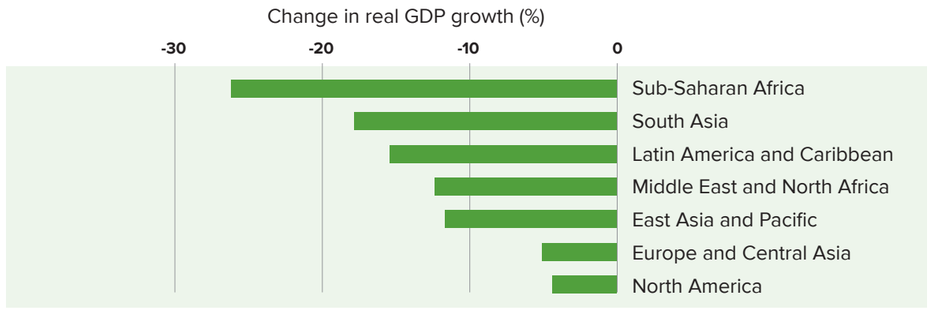
Nature loss can have disproportionate effects on the most vulnerable communities too. Nearly 80 percent of the global population living below the poverty line resides in rural areas (World Bank 2018a), and evidence suggests that they tend to be highly dependent on ecosystem services for livelihoods and well-being. For example, environmental income accounts for 28 percent of the total income of forest adjacent communities (Angelsen et al. 2014), and estimates suggest that without income from natural resources, poverty among smallholders in Latin America, South Asia, East Asia, and Sub-Saharan Africa would be higher (Hickey et al. 2016; Noack et al. 2015). Such socioeconomic groups are also likely to experience environmental degradation and be exposed to environmental hazards. For example, in Ethiopia, land degradation has been a major cause of the country's low and declining natural resource and agricultural productivity, persistent food insecurity, and poverty. Driven primarily by deforestation and poor cropland and livestock management practices, land degradation has resulted in lower crop yields, leading to food insecurity and higher poverty rates among rural households (Gebreselassie, Kirui, and Mirzabaev 2016).

FIGURE 2 Forgone Real Gross Domestic Product (GDP) Growth, 2021-2030, Under Select Ecosystem Service Collapse Scenarios Compared with No Tipping Point Scenario, According to (A) Income Group, (B) Geographic Region, and (C) Global Trade Analysis Project Country Unit

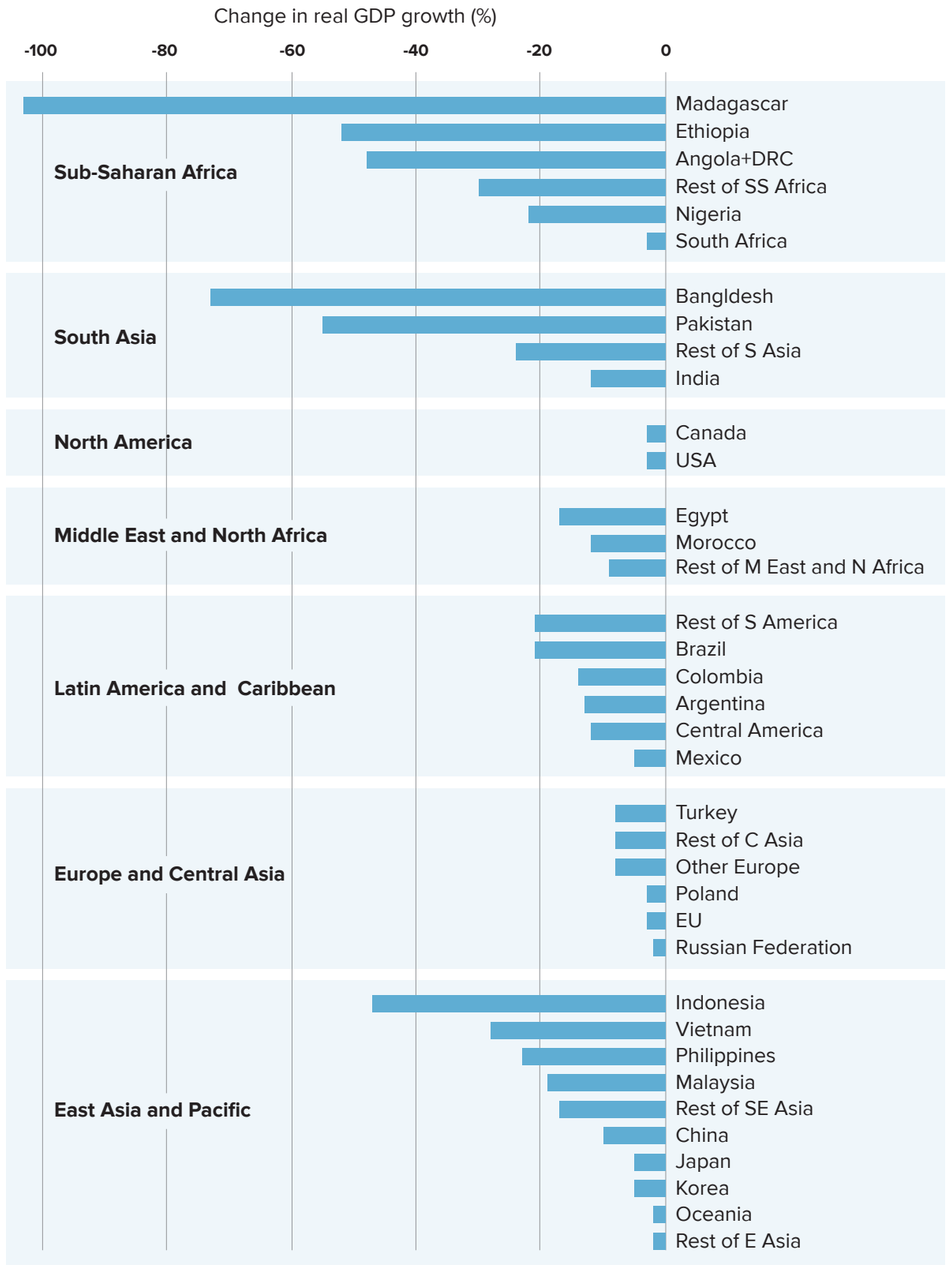
A. Income group



B. Geographic region



C. Global Trade Analysis Project country unit



Source: Johnson et al. 2021.

Biodiversity loss and climate change reinforce one another. Climate change is a direct driver of biodiversity loss; even under a 1.5°C to 2°C global warming scenario, the majority of terrestrial species ranges are projected to shrink dramatically (IPBES 2019). Conversely, the loss of nature contributes to climate change. Terrestrial and marine ecosystems are the sole carbon sinks, sequestering 60 percent of gross annual anthropogenic carbon emissions (IPBES 2019); their degradation releases carbon and reduces their capacity to sequester carbon. Nature loss and climate reinforce each other, pushing the planet toward dangerous tipping points, from the collapse of ice sheets, which can trigger self-reinforcing global warming,[10] to the disappearance of coral reefs. For example, a World Bank study on the effects of climate change on African fisheries estimated that even under the most optimistic climate change scenario, the maximum catch potential will decrease by 30 percent or more as soon as 2050 in many tropical West African countries (World Bank 2019b). The key takeaway for policy makers is that environmental degradation follows a nonlinear pattern; it can compound and engender catastrophic ecological losses that can pervade the global economy.

Present efforts to preserve biodiversity and ecosystem services are insufficient, and the window to act is closing, calling for urgent action at the global and national levels. Biodiversity is being lost at an unprecedented rate, with one million animal and plant species of a global inventory of eight million threatened with extinction (appendix A). The cost of preventing biodiversity and ecosystem collapse is cheaper than curing it (box 1). The coming months offer a critical window of opportunity to take transformative action on this agenda. The landmark fifteenth meeting of the Conference of the Parties (COP-15) to the Convention on Biological Diversity (CBD) will adopt a new global biodiversity framework and targets committing the world to ambitious policy action and investments in nature. The latest estimates suggest that between US$600 billion and US$820 billion per year is needed to finance the transformation that could reverse biodiversity loss (Deutz et al. 2020). The COVID-19 pandemic has also served as a powerful reminder of the close link between human and planetary health. The emergence of many infectious diseases, including COVID-19,[11] is attributed to deforestation and loss of biodiversity, and natural habitats represent a growing risk of pathogen spillover from wildlife species (appendix A). As the world weathers its deepest crisis since the Second World War, the substantial stimulus packages designed to foster economic recovery offer a unique opportunity for countries to transition to green, resilient, and inclusive development.

Risk mitigation alone does not make the economic case for action; investments in biodiversity have tangible development benefits and can be leveraged for a green, resilient, and inclusive COVID-19 recovery. At the macroeconomic level, investments to reverse nature loss are welfare enhancing because they reduce negative environmental externalities and help maintain the natural assets that support economic prosperity. More efficient long-term management of natural resources is crucial for unlocking sustainable development opportunities and building resilient infrastructure and human capital. A first-of-its-kind integrated ecosystem-economy model developed by the World Bank demonstrates that nature-smart

10. One scenario of self-reinforcing global warming is rising global temperatures triggering large-scale melting of the ice sheets, which in turn reduces the reflective surface of the Earth (albedo effect). With less sunlight reflected into space, the Earth's surface absorbs more heat, amplifying global warming and the melting of the ice sheets (Steffen et al. 2018).
11. Although the origin of the COVID-19 outbreak and its transmission pathway have yet to be ascertained, multiple studies have shown a link between deforestation and increased risk of zoonoses (Patz et al. 2004; Olivero et al. 2017).

BOX 1 Investing in Risk Reduction: Lessons from the Health Cost of Ecosystem Alteration

Wildlife- and environment-linked diseases are often externalities of changing land use and agricultural and food system production transitions without adequate biosecurity measures. Although these activities can yield significant economic benefits to communities and countries in the form of job creation, tax revenue, and provision of food or other goods, certain types of development and associated practices increase the risk of disease.

There is growing scientific evidence that habitat loss and degradation trigger the spillover of zoonotic diseases to humans. The pathogens behind such outbreaks have wildlife "reservoirs," with natural habitats acting as natural barriers, limiting human exposure to and the effects of many pathogens through a buffering effect (Cunningham, Daszak, and Wood 2017). But habitat destruction, unregulated wildlife trade, and climate change limit nature's ability to act as a shield. Global changes in the mode and intensity of land use are creating expanding hazardous interfaces between people, livestock, and wildlife reservoirs of zoonotic disease (Gibb et al. 2020).

Nevertheless, relatively little is invested in preventing deforestation and poaching and regulating wildlife trade, despite well-researched plans that demonstrate a high return on investment in limiting zoonoses and conferring many other benefits (Dobson et al. 2020). The cost of monitoring and preventing disease spillover would be substantially lower than the economic and mortality costs of responding to these pathogens once they have emerged. The net costs of actions to prevent future zoonotic pandemics have been estimated at US$18 billion to US$27 billion per year (Dobson et al. 2020). In comparison, COVID-19 may have reduced gross domestic product by at least US$5 trillion in 2020, and the willingness to pay for avoided loss of lives constitutes a cost of many additional trillions. These costs exclude the rising tally of deaths, deaths from other causes due to disrupted medical systems, and loss of forgone activities due to social distancing.

Factoring disease cost into the cost of the loss of ecosystem services can improve the understanding of the cost of economic development, environmental, and health trade-offs. For example, mass conversion of forest to palm plantations was correlated with marked increases in malaria in Sabah, Malaysia. The state exceeded the optimal level of conversion of forest to agricultural land, resulting in an added cost of US$21 million annually over the socially optimal level of converted land (EcoHealth Alliance 2019). Because zoonotic and vector-borne disease risk is not typically built into development project cost-benefit equations or safeguard and impact reviews (Seifman et al. 2015), these effects are easily missed, highlighting the need for integrated approaches that anticipate and reduce risk in the context of sustainable development.

Source: Adapted from World Bank forthcoming b.

policies in agriculture and forestry that promote sustainable land use can be win-win policies, generating economic gains in these sectors and the broader economy while conserving natural ecosystems (Johnson et al. 2021).

Policies and investments that protect biodiversity can be effective strategies to create jobs. Tilting markets and value chains toward nature-smart models creates inclusive, long-term value and greener and higher quality jobs. The World Economic Forum identified 15 transitions in the three critical socioeconomic systems driving nature loss – food, land use, and ocean use; infrastructure and the built environment; and energy and extractives[12] – that could produce US$10.1 trillion in annual business opportunities and 395 million jobs by 2030 (WEF 2020b) (appendix A). Emerging literature suggests that clean industrial activities, adoption of a circular economy approach, and renewable energy often create more positive spillover effects to the economy than conventional brown sectors do.[13] Although not all workers may benefit in the short term, over time, job creation associated with the green transition is expected to outpace "brown" job destruction, with positive net job effects in terms of quality and quantity (World Bank 2021a). This presents an opportunity to invest in development of human capital and cultivate the skills required for the transition to green jobs and eco-entrepreneurship. Crucially, job opportunities can be created in rural areas, where they are often needed the most. For example, investments in land restoration, regenerative agriculture, and sustainable forestry can generate more days of employment while reducing environmental degradation (World Bank 2021a). Recent analysis of the multiplier effect of protected area tourism in Zambia and Fiji showed that nature-based tourism generated jobs for 14 to 30 percent of the working age population living in the vicinity of the studied parks in Zambia and 12 percent in Fiji (World Bank 2021b).

There is also evidence that investments in biodiversity and ecosystem services support poverty alleviation and promote shared prosperity. Community-based forest management contributed to significant net reductions in poverty and deforestation across Nepal (Oldekop et al. 2019). Likewise, payments for ecosystem services helped conserve forest while also achieving small poverty alleviation gains in Mexico (Sims and Alix-Garcia 2017).[14] Analysis of protected area tourism in Fiji, Brazil, and Nepal also shows that the returns on public investment in protected areas and promotion of sustainable tourism are significant, and that the benefits are broad and help the poor.[15] Ecosystems also hold a formidable library of genetic material that Indigenous Peoples and local communities rely upon and that can be used to increase food security (IPBES 2019).

12. The World Economic Forum estimates that, together with climate change, the threats emerging from these three socioeconomic systems endanger 80 percent of the threatened or near-threatened species (WEF 2020b). See also figure 3.
13. For example, in the United States, the clean energy sector (renewable energy and energy efficiency) employed three times as many workers as the traditional energy sector (fossil fuels) in 2019 (E2 2020).
14. Causal links between good natural resource management and poverty reduction are hard to demonstrate. Miller, Mansourian, and Wildburger (2020) point at how different social, economic, political, and environmental factors intersect to shape forest-poverty dynamics (see also Busch and Ferretti-Gallon 2017; Ferraro, Sanchirico, and Smith 2019). These relationships depend strongly on context, varying with geography and social, economic, and political context. Future research should place greater emphasis on more spatially disaggregated poverty data, longitudinal approaches, causal chains, and comparative analyses for better understanding the role of socioeconomic, political, and biophysical contexts.
15. Analysis showed that returns on government investments in protected areas ranged from US$6 to US$28 per dollar of government spending. In Zambia, each dollar spent by tourists in two studied parks raised the incomes of the poor by US$0.99 and US$1.34, compared with a raise of US$0.83 and US$0.19 for non-poor households (World Bank 2021b).

1.2. TRADE-OFFS AND OPPORTUNITIES

Effective action to address the drivers of biodiversity loss involves confronting market, policy, and institutional failures that facilitate unsustainable practices. A 2019 landmark report by the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services (IPBES) identified five key man-made drivers of biodiversity and ecosystem services loss: land and sea use change, overexploitation, climate change, pollution, and invasive species. Facilitating these direct drivers are market and policy failures that promote unsustainable production and consumption patterns. Public goods, positive and negative externalities, and information asymmetries are some of the market failures that misalign the private and social costs and benefits of the use of nature, encouraging loss and depletion beyond the level that is socially optimal. Recent estimates show that 1.6 Earths would be required to maintain the world's current living standards with the current economic systems (Dasgupta 2021). The private sector can shift to nature-smart practices, but if the value of the services of nature is not adequately accounted for and monetized, conservation efforts will face challenges in generating cashflows, and sustainable practices may not become commercially viable. As such, conservation and sustainable management of nature will continue to be associated with trade-offs, particularly at the local level.[16]

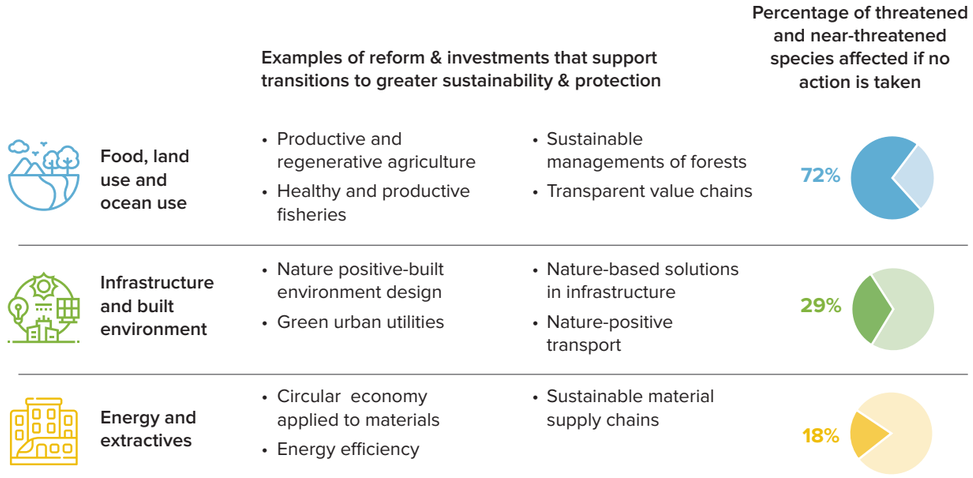
Policy intervention is essential, yet fiscal, economic, and trade policy have moved slowly to incorporate biodiversity values. Conservative estimates suggest that every year, governments spend at least US$500 billion in support of agriculture, forestry and fisheries, and fossil fuels that are potentially harmful to biodiversity (OECD 2020a). For example, more than half of global subsidies to fisheries, estimated at US$35 billion per year, results in overfishing (Sumaila et al. 2016). Experiences from Mexico, Indonesia, India, and Brazil demonstrate that agricultural support can encourage unsustainable production practices, such as excess use of artificial fertilizers (OECD 2020b). Policies such as these amplify market distortions, further encouraging underpricing of biodiversity risks and the value of ecosystem services in private sector decisions. A recent survey of the relative performance of 25 major fiscal recovery programs implemented in response to COVID-19 has also shown that these stimulus programs are more "brown" than "green," and they are likely not doing enough to decouple economic growth from fossil fuel use and degradation of natural capital (Hepburn et al. 2020).

1.2.1. TRENDS IN KEY ECONOMIC SECTORS

Solutions to reverse biodiversity and ecosystem services loss lie in key economic sectors. The World Economic Forum estimates that together with climate change, three socioeconomic systems – food, land use, and ocean use; infrastructure and the built environment; and energy and extractives – endanger 80 percent of threatened or near-threatened species (WEF 2020b) (figure 3). In other words, they are

16. For example, trade-offs may exist among alternative land uses in terms of the ecosystem services and financial returns they generate. To illustrate, conversion of natural forest into cropland or pasture may boost provisioning services (food production) but do so at the cost of biodiversity and regulating ecosystem services such as water purification, water retention, and climate regulation at the local level (Rodríguez et al. 2006; Power 2010; IPBES 2019). Unlike provisioning services that tend to have market prices, regulating services are often public goods that cannot be monetized in the absence of functioning environmental markets, making forest land use less attractive financially at the local level. Temporal trade-offs also exist (see table 1 and appendix A). Win-win scenarios at the local level are possible, however, with appropriate spatial planning, payments for ecosystem services, and other ecological compensation mechanisms that promote sustainable production practices (Johnson et al. 2021) (see also section 2 and appendix A).

FIGURE 3 Solutions to the Global Biodiversity Crisis lie in Three Socioeconomic Systems



Source: Adapted from WEF 2020b.

Note: All three systems, together with climate change, affect ~79 percent of threatened and near-threatened species according to analysis that the World Economic Forum conducted based on data from the International Union for the Conservation of Nature Red List.

driving much of the biodiversity and ecosystem services loss. Across all categories, the negative impact on biodiversity can essentially be traced to the five direct drivers of biodiversity loss that are happening at a scale and rate that exceeds the ability of ecosystems to replenish, recover, and maintain balance. At the same time, these socioeconomic systems are the backbone of economies, accounting for one-third of global GDP and providing two-thirds of all jobs (WEF 2020b). How these sectors plan, invest, and produce matters for development and for the environment.

The practices that the food, land use, and ocean use; infrastructure and built environment; and energy and extractive sectors adopt over the next decade will determine whether they can meet growing development needs and do so within planetary boundaries.[17] Of the three socioeconomic systems, the food, land use, and ocean use system puts the greatest strain on nature and is at a crossroads. This system contributes to more than 70 percent of biodiversity loss, 80 percent of tropical deforestation, 70 percent of water withdrawals, and 30 percent of global greenhouse gas (GHG)

17. The goal of the planetary boundaries approach is to define a "safe operating space" in which human societies can develop and thrive based on evolving understanding of the functioning and resilience of the Earth system (Rockström et al. 2009; Steffen et al. 2015). Planetary boundaries are defined as a "safe" distance from a dangerous level (for processes without known thresholds at the continental to global scale) or a global threshold. The nine planetary boundaries are climate change, novel entities, ozone depletion, atmospheric aerosol loading, ocean acidification, biochemical flows (nitrogen and phosphorus), freshwater use, land system change, and biosphere integrity (functional and genetic diversity). Transgressing one or more planetary boundaries, which has already happened with respect to biodiversity, may trigger nonlinear, abrupt, irreversible environmental change, pushing the Earth into a new state.

emissions (WEF 2020b; IPCC 2019; GEF 2019). It encompasses key sectors such as agriculture, livestock, fisheries, and forestry, which depend profoundly on ecosystem services but are often characterized by high resource intensity, high reliance on pesticides and chemical fertilizers, and overextraction. By adjusting production practices in the food sector, it is possible to generate new sources of revenue while maintaining the natural resource asset base for sustained production. For example, World Bank (2017a) found that by reducing overfishing and overcapacity by 40 percent, more fish could be caught, helping to recover more than US$80 billion in "sunken billions" (loss of potential economic rents in global fisheries) while rebuilding the global fish biomass (see also section 1.1). The expanding footprint of these sectors on the climate system and biodiversity is unsustainable, threatening to impair the provision of the critical ecosystem services on which they depend, yet their output is critical to satisfying the needs and projected demand of the nearly 10 billion people expected to live on Earth in 2050.

There are also opportunities to reduce the environmental impact of infrastructure and urban development (in terms of GHG emissions, land use change, and waste), including through nature-based solutions. Basic infrastructure gaps – limited access to drinking water, sanitation, and road connections – also persist and must be closed to reduce poverty and increase shared prosperity. As the share of the urban population increases (from 55 percent today to 70 percent by 2050), with most of this growth occurring in developing countries (UN DESA 2019a), planners can harness geospatial data and modeling techniques to inform decisions over where and how to build and produce. In transport, for example, there are opportunities to adopt upstream or "front-of-pipe" solutions to minimize disruptions to nature ex ante. Promising initiatives are emerging, such as Green Roads for Water,[18] which aims to transform the way roads are built and maintained by incorporating water management and regreening into road design and construction. Such examples could also be applied in the context of biodiversity. Many goods and services that are traditionally provided using grey (human engineered) infrastructure, including drinking water, management of sedimentation, coastal erosion, and damage to infrastructure from flooding and storm surges, can be cost-effectively provided using green (nature based) or a combination of green and grey infrastructure. Challenges and opportunities also exist in the energy and extractives sectors.

1.2.2. BINDING CONSTRAINTS ON A TRANSITION TO NATURE-SMART DEVELOPMENT

Despite broad recognition of the need to correct the economic inefficiencies that facilitate nature loss, little progress has been made to date, suggesting that there are factors that may be preventing countries from taking action. This paper identifies five *binding constraints* or *barriers* that perpetuate market and policy failures, keeping sectors and countries locked in unsustainable development pathways. The five constraints are the existence of short- and long-term trade-offs, lack of data and knowledge, capacity constraints, domestic political economy factors, and the global public good nature of many ecosystem services. They are summarized in table 1 and discussed in detail in appendix A. Addressing these constraints is a key step to unlocking nature-smart development.

18. The Green Roads for Water Learning Alliance brings together more than 800 implementers, researchers, trainers, policy makers, funders, and others who make roads work for natural resources management and resilience (https://roadsforwater.org/).

TABLE 1 Key Binding Constraints on Nature-Smart Development

Short- and long-term trade-offs	• Short-term priorities (e.g., maximizing immediate returns from extraction of natural resources) undermine decisions about natural resource management at the community, productive sector, and investor level. Investment in nature is associated with large short-term costs (direct or opportunity costs) for benefits that often materialize only in the long term. Even if financial models suggest that investing in nature pays off, cash flow problems in the absence of well-functioning environmental markets can favor less environmentally friendly choices. These trade-offs are amplified where property rights are weak and markets for environmental services are absent. • Short-term bias also exists in policy, primarily due to political cycles, lack of fiscal space, short-term budget constraints, and large debt service burdens. As a result, fiscal, economic, and trade incentives, by and large, continue to favor expansion of output over conservation.
Lack of data and knowledge	• There are data gaps data related to the economic value of biodiversity, the risks associated with its loss, and measurement of the effect of policies and investments on biodiversity. • In the private sector, traceability of impact of various value chains on nature is limited; global trade allows spatial decoupling of consumption from biodiversity loss; financial markets lack the risk and impact data and measurement standards needed to assess portfolios systematically. • Incorporation of ecosystem accounts into natural capital accounting in policy is in very early stages.
Capacity constraints	• There are biodiversity-relevant capacity gaps at the individual, organizational, and systemic levels. • Governments report technical challenges, including limited understanding of the economic value of biodiversity and its links to development; limited interface between science and policy, as well as lack of capacity to engage a wide range of stakeholders to address biodiversity loss.
Domestic political economy	• Concerns about potential effects of environmental policies on the competitiveness of critical sectors; distributional implications (effects of such policies on incomes of different socioeconomic groups); and the influence of vested interests or the political and social acceptability of reform act as salient barriers to decisive policy action or prevent it from having sustained effect.
Existence and underprovision of global public goods	• Although not all nature is a global public good, many associated costs and benefits transcend borders. This means that the good in question is underprovided as no country has enough incentives to provide it at the socially optimal level. Even if other constraints are eliminated at the country level, success in reversing biodiversity loss at the global level is not guaranteed as long as there is no international cooperation and burden sharing. • The world fell short of meeting the Aichi Biodiversity Targets in 2020 - none have been fully achieved, and only six targets have been partially achieved.

2

ENABLING NATURE-SMART DEVELOPMENT

2.1. BUILDING BLOCKS FOR AN EFFECTIVE GLOBAL RESPONSE

The draft post-2020 global biodiversity framework, which is expected to be adopted at COP-15 of the CBD, calls for urgent, transformative action to address biodiversity loss. The framework recognizes that urgent policy action globally, regionally, and nationally is required to transform economic, social, and financial models so that the trends that have exacerbated biodiversity loss stabilize by 2030 and allow for the recovery of natural ecosystems in the following 20 years, with net improvements by 2050, to achieve the CBD's vision of "living in harmony with nature by 2050" (CBD Secretariat 2020b) (box 2). As the world population and per capita incomes continue to grow, consumption of goods and services that unsustainably draws on nature's services will continue to increase, as will the urgency to act.

Putting economies on more sustainable development paths means ensuring that the world's vital ecosystems are adequately protected, restored, and used sustainably to advance development goals. Because biodiversity and ecosystem services are irreplaceable[19] and their loss is irreversible, a globally concerted effort to enhance conservation is necessary. But there is growing evidence that increases in conservation efforts alone would not suffice to "bend the curve"[20] of biodiversity loss and that a systemic shift to more sustainable production and consumption practices and restoration of nature is required. This means planning for and undertaking development differently, accounting for the future risks associated

19. Biodiversity and many ecosystem services are not fully replaceable, and some are irreplaceable. People have created substitutes for some of nature's services, but many of them are imperfect or financially prohibitive. Moreover, loss of biological diversity, such as phylogenetic and functional diversity, can permanently reduce future options (IPBES 2019).
20. "Bending the curve" refers to reversing the downward-sloping trends in biodiversity indices observed since the 1970s – the declining species abundance over time. Future projections show that these trends will continue unless ambitious, integrated action combining conservation and restoration efforts with transformation of critical economic systems such as food production are made. Considerable uncertainties remain over the effect of land use and other future socioeconomic trends on biodiversity, which reflects gaps in our knowledge (Mace et al. 2018; IPBES 2019; Leclere et al. 2020).

with biodiversity and systematically accounting for its value in decisions at all levels and in all sectors. At the same time, investments in biodiversity must be made in a way that exploits synergies with climate change mitigation and adaptation and creates development opportunities at the local level.

The proposed approach for transformative action is anchored in three building blocks (see also figure 4):

1 Whole-of-economy approach to tackling the drivers of biodiversity and ecosystem services loss

Current efforts to conserve and restore terrestrial, freshwater, and marine habitats constitute a fraction of the amount of global finance supporting activities that degrade natural capital. Finding ways to produce food, build infrastructure, and design cities in ways that maintain the provision of ecosystem services is imperative if biodiversity trends are to be reversed and SDGs met. Interventions should focus on addressing the five direct drivers of nature loss. Achieving this at scale requires tipping the economic policy balance in favor of sustainable investments and practices and away from supporting business as usual. It also requires robust institutions and mechanisms that allow communities and businesses to capture the value of ecosystem services.

2 Solid scientific and economic base for action

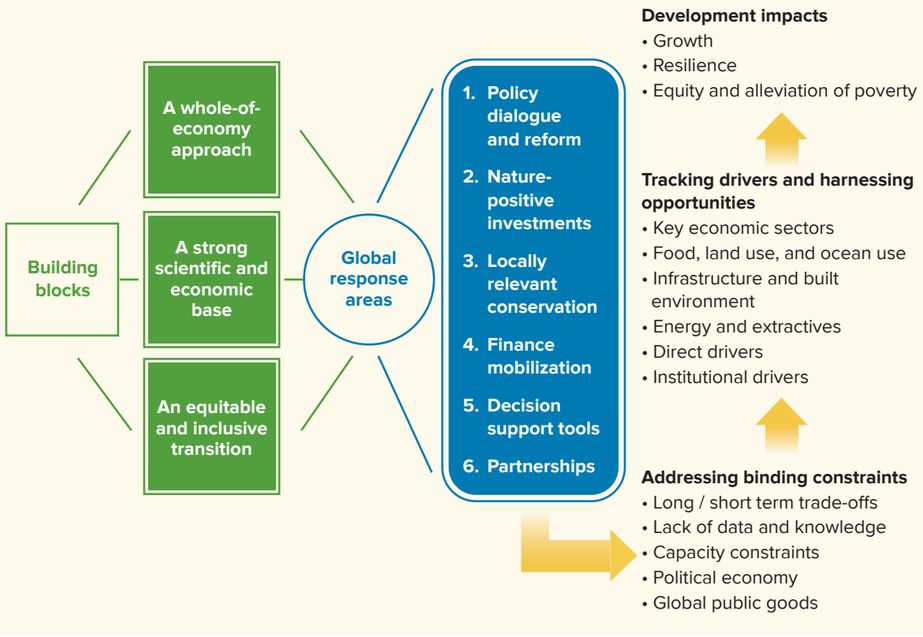
Biodiversity is an irreplaceable global public good, requiring large investments in conservation, sustainable use, and benefit sharing. The trade-offs are real and require careful analysis. Although the value of biodiversity and ecosystem services is often hard to ascertain, emerging evidence shows material risks potentially arising from the loss of services such as pollination, water regulation, coastal resilience, food, and construction materials provision (see section 1.1). At the same time, growing awareness of the cultural and inspirational values of nature, together with awareness of the risks their loss involves, will inevitably shift consumer and investor preferences and may create stranded assets. Economics can be a powerful tool to develop methodologies to assess biodiversity risks, dependencies, opportunities, and forward-looking scenarios. Paired with science and spatially explicit[21] measurement of the impact of various activities and investments on biodiversity, economics can help identify the most cost-effective policies or investment options. Finally, economics can help gauge the distributional implications of green transitions and inform actions to address regressive effects on incomes and well-being.

3 Equitable and inclusive transition

Biodiversity outcomes and poverty reduction goals are inextricably linked (see section 1); environmental degradation and the systemic risks associated with biodiversity loss threaten to undo development progress. By contrast, investments in biodiversity can support local development, because Indigenous Peoples and local communities, inland and along the coasts, are often the stewards of natural resources and depend heavily on them for food, fuel, and livelihoods. Thus, the policy response to the global biodiversity crisis must be pro-poor, designed in a way that maximizes local benefits, creating value for people. An immediate opportunity to make investments in nature inclusive is to incorporate nature into efforts to rebuild better after the COVID-19 pandemic and the associated economic crisis. In addition, any policy response, particularly in the case of environmental fiscal reform, needs to incorporate targeted measures to address the social costs of the transition, to avoid unintended distributional effects on the most vulnerable segments of the population, and mitigate political economy challenges that often act as salient barriers to successful reform.

21. "Spatially explicit" refers to the ability to associate data or direct an intervention to a specific geographic location.

FIGURE 4 Global Response Areas for Nature-Smart Development



BOX 2 Post-2020 Global Biodiversity Framework

The Convention on Biological Diversity outlines an ambitious vision of "Living in Harmony with Nature": "by 2050, biodiversity is valued, conserved, restored and wisely used, maintaining ecosystem services, sustaining a healthy planet and delivering benefits essential for all people." A decade ago, 194 countries adopted the 20 Aichi Biodiversity Targets (CBD Secretariat 2020c) for 2010 to 2020. The latest assessment shows that none of the 20 targets has been fully achieved; six have been partially achieved (CBD Secretariat 2020a). The overall picture is one of progress at the country level but progress that is insufficient to address the global crisis.

The draft of the post-2020 global biodiversity framework (CBD Secretariat 2020b) calls for transformative action. It assumes that a whole-of-government and -society approach is necessary to implement the systematic changes needed over the next 10 years as a stepping-stone toward the achievement of the 2050 Vision. Countries need to internalize the value of nature in decisions at all levels and recognize the cost of inaction. The transformative actions that are required include putting in place tools and solutions for implementation and mainstreaming, reducing threats to biodiversity, and ensuring that biodiversity is used sustainably to meet people's needs. Enabling conditions and adequate means of implementation, including financial resources, capacity, and technology, are needed to support these actions (CBD Secretariat 2020b).

Investments in biodiversity and ecosystem services need to take full advantage of the synergies and manage the trade-offs between climate change mitigation, adaptation, and nature-smart development. A nature- or climate-only approach would be less impactful and fiscally inefficient and would likely overstate alignment with the SDGs. Nature and climate are interrelated; neither can be successfully resolved unless both are tackled together (Pörtner et al. 2021). Nature-based solutions,[22] including those that involve restoration of forests or conservation of mangroves, play an important role in climate change mitigation and adaptation and can help countries reach the targets of the Paris Agreement cost-effectively (Griscom et al. 2017). Ecosystem services also underpin renewable energy, including hydropower and geothermal, whose share in the energy mix is set to grow. (Renewables represented two-thirds of newly added global capacity in 2018 (IRENA 2019).) At the same time, strategies and investments supporting climate change mitigation and adaptation should also aim to maximize biodiversity co-benefits and minimize trade-offs. If designed right, nature-based solutions generate significant biodiversity co-benefits. In contrast, certain land-based climate mitigation and even land restoration approaches such as intensive bioenergy crop production are detrimental to biodiversity and ecosystem services.[23] A common agenda between climate change and biodiversity provides multiple entry points for designing and financing policies and programs that support conservation and restoration. The World Bank Group's (WBG's) new Climate Change Action Plan 2021–2025 (WBG 2021) recognizes the role of nature and nature-based solutions as a cross-cutting theme, as part of its efforts to fully integrate climate and development.

2.2. SIX GLOBAL RESPONSE AREAS

Implementing a nature-smart approach to development requires a harmonized response at the policy, investment planning, financial reform, and knowledge generation levels. Moving beyond a piecemeal approach to conservation toward systematic integration of biodiversity into development and decision making at all levels requires overcoming several barriers. Section 1.2 highlighted short- and long-term trade-offs, lack of data and knowledge, capacity constraints, political economy challenges, and the global public good nature of many ecosystem services. These barriers result in market and policy failures, keeping sectors and countries locked into unsustainable pathways. As institutional barriers are removed, innovation and investment opportunities for nature-smart development can be found in the food, land use, and ocean use system; infrastructure building; and energy and extractives development. Six areas can pave the way for a more effective global response (figure 4):

22. The International Union for the Conservation of Nature (IUCN 2020) defines nature-based solutions as "actions to protect, sustainably manage, and restore natural or modified ecosystems, that address societal challenges effectively and adaptively, simultaneously providing human well-being and biodiversity benefits."

23 Many land-based climate change mitigation activities can be effective and support conservation goals, but some proposed approaches, such as large-scale deployment of bioenergy crops (including trees, perennial grasses, or annual crops) and afforestation of non-forest ecosystems, tend to have negative effects on biodiversity and ecosystem services. Such effects may be on adjacent land or freshwater or marine ecosystems through fertilizer and pesticide use or by increasing agricultural water withdrawals, thus also impacting human capacity to adapt to climate change (Pörtner et al. 2021; IPBES 2019). Such approaches violate an important tenet of nature-based solutions – namely that they should simultaneously provide human well-being and biodiversity benefits (Pörtner et al. 2021). It is also estimated that plantation crops, which tend to provide the greatest economic benefits but have lower climate and biodiversity co-benefits, represent 45 percent of commitments to reforestation under the Bonn Challenge (Lewis et al. 2019). To maximize impact across multiple objectives, nature-based solutions need to be designed in a sustainable way and avoid a narrow focus on carbon sequestration.

1. Engage economic and financial decision makers
2. Integrate nature and nature-based solutions into sector investments
3. Enhance the local benefits of conserving and sustainably managing nature
4. Produce metrics and decision support tools
5. Mobilize finance
6. Leverage partnerships.

Multilateral development banks and other development partners have a role to play in helping to bring nature into development policy and bridging financial gaps. Despite the profound ways in which biodiversity and ecosystem services underpin the SDGs, biodiversity continues to be perceived as a niche issue within a much broader development portfolio. Mainstreaming nature into the development process will need to gain scale and speed. A paradigm shift, including in the way development partners support the biodiversity agenda, is needed to move beyond an approach that is uniquely focused on area-based conservation to one that also recognizes how economies and development outcomes rely on nature for services. The WBG supports the global response by working with client countries on reconciling development and environmental objectives. Its long-standing engagement in biodiversity and natural resource management and the country engagement model that provides a mechanism for policy dialogue and advancing the understanding of the links between development, poverty reduction, and biodiversity could be leveraged to support client countries in closing data gaps; increasing institutional capacity to manage natural capital effectively while reducing poverty and increasing shared prosperity; engaging financial and economic policy makers to bring biodiversity into macroeconomic, financial sector, and trade policies; and fostering intersectoral and global cooperation. The breadth of the WBG's portfolio can also support integration of nature-smart approaches into food production, infrastructure, and value chains. The contributions of the WBG to the global response in each area are discussed in the following subsections.

1. ENGAGE ECONOMIC AND FINANCIAL DECISION MAKERS

Because nature is a development asset, managing it so that opportunities are harnessed and risks mitigated is a task for economic decision makers. Section 1.1 showed that the risks originating in degradation of nature can be large and can jeopardize development efforts in the poorest countries. It is still not well understood when and how ecosystem services may collapse or decline precipitously, but it is known that such collapse or decline may occur sooner than one might think because of the nonlinearities in ecosystem responses. (In some cases, systemic change is already happening, such as in the increase in zoonoses that rapid changes in land use and unregulated poaching in tropical areas make possible.) Cost-effective ways to mitigate such risks could be identified. Complementing this perspective is the fact that prevailing policy regimes do not succeed in pricing many ecosystem services, partly because of the lack of policies and partly because of nonlinearities that are not well understood and signaled in the economic system. Moreover, there is need for dialogue within and between countries to increase appreciation of the public goods nature of certain ecosystem services and promote coordinated action.

The response must involve a combination of planning, policy making (including with respect to the financial sector), and global cooperation.

Integrate Biodiversity into National Strategies

Given the systemic risks involved and the multisectoral nature of biodiversity and ecosystem services loss, it will be important to pursue the integration of nature considerations into national strategies and action plans. Mainstreaming biodiversity into development is a continuous, gradual process of improvement. Priority interventions need to be consistent with national objectives and informed by national biodiversity assessments and identify the risks, opportunities, and relative importance of individual drivers (direct and indirect) of biodiversity, as well as their interactions. In this process, lessons could be drawn from climate change coordination mechanisms and the synergies between the climate change and biodiversity agendas identified. The WBG's country engagement process, notably the Systematic Country Diagnostics,[24] International Finance Corporation (IFC) Country Private Sector Diagnostics, and Country Partnership Frameworks,[25] offers a mechanism to support integration of biodiversity and ecosystem services into green, resilient, and inclusive development processes in client countries. The country engagement framework and the business model of the International Bank for Reconstruction and Development (IBRD), International Development Association (IDA), IFC, and Multilateral Investment Guarantee Agency (MIGA) are designed to help clients achieve development outcomes. Analytical and advisory activities, including Country Environmental Analyses[26] and Environmental Public Expenditure and Institutional Reviews could be used to inform this support.

The revision of National Biodiversity Strategies and Action Plans (NBSAPs) under the auspices of the post-2020 global biodiversity framework and the Nationally Determined Contributions (NDCs) under the Paris Agreement offer an opportunity for comprehensive engagement of countries. NBSAPs, which are national strategies, plans, or programs for conservation and sustainable use of biodiversity and ecosystem services, are the primary implementation mechanism for the CBD. One of their objectives is to integrate conservation and sustainable use of nature into relevant sectoral or cross-sectoral plans, programs, and policies. After the CBD COP-15, the existing NBSAPs must be aligned with the post-2020 global diversity framework, which (in its draft version) calls for enhanced efforts to mainstream biodiversity and address direct and indirect drivers of biodiversity loss. NDCs are also an opportunity, because few countries currently report on their alignment with the Aichi Targets[27] or consider biodiversity and nature-

24. The Systematic Country Diagnostic is intended to become a reference point for client consultations on priorities for WBG country engagement and to help governments, the WBG, and other development partners establish a dialogue to focus their efforts on effective goals and activities aligned with the global goals of ending extreme poverty and boosting shared prosperity in a sustainable manner.
25. The Country Partnership Framework is a four- to six-year strategy that the WBG develops for a country to guide its operational activities. It is focused on the WBG's added value in that country and produced in close coordination with the WBG's counterpart in government (usually the ministry of planning, international cooperation, or finance). All projects and programs that the WBG finances within the time frame of this strategy must be aligned with it.
26. The Country Environmental Analysis is a tool the World Bank developed to help inform dialogue with countries, raise awareness of environmental problems affecting the poor, and increase understanding of the linkages between the environment and growth sectors.
27. The Aichi Biodiversity Targets, an integral part of the CBD Strategic Plan 2011–2020, are organized under five strategic goals and comprise aspirations for achievement at the global level and a flexible framework for establishment of national or regional targets.

based solutions in their climate change action plans, many of which are being updated (Climate Action Tracker 2020). This would help maximize synergies and minimize trade-offs between the two agendas.

The WBG is supporting at least 15 IDA countries in implementing or updating their NBSAPs or similar national action plans. This policy commitment, made as part of the 19th replenishment of IDA (fiscal years (FYs) 2021–23), is supporting renewed WBG engagement in nature and sustainability in Africa, Asia, and Latin America and the development of necessary analytical tools. To ensure that these plans are effective, their revision should include preparation of financing and investment plans that consider ways to mobilize private sector finance, which is essential to overcome the lack of public finance available for biodiversity. The World Bank's Global Program on Sustainability has been designed, in part, to support the integrated and coordinated planning process and identify tools for private sector resource mobilization.

Improving the governance of biodiversity and ecosystem services will require increased efforts to implement integrated, sustainable management approaches in landscapes and seascapes. Seeing critical ecosystems as integral parts of the broader landscape and seascape allows for systematic, integrated, holistic management of critical natural assets. It also increases opportunities to simultaneously meet multiple objectives, such as job creation, productivity improvements, local development, climate change mitigation, and conservation of biodiversity and ecosystem services, while managing potential trade-offs. It is important to move toward a results-oriented approach to biodiversity and ecosystem services that promotes systematic monitoring of effective indicators at the country level. Building on the achievements of the 2016–2020 Forest Action Plan and the ongoing engagement in the Blue Economy, the WBG offers support to its clients through technical assistance (box 3). The IFC has also been expanding its reach beyond risk mitigation of impacts at the project level to develop upstream approaches for better integration of biodiversity into the renewable energy and agriculture sectors. The IFC is also working on initiatives focused on marine ecosystems. For example, it is developing a taxonomy for blue bonds for application by its financial intermediary clients seeking to issue blue bonds and identifying investment opportunities to reduce marine plastic pollution.

Address the Underlying Drivers of Biodiversity Loss through Economic Policy

Another priority is to address the problem of underpricing of biodiversity and ecosystem services, particularly the regulating, supporting, and cultural ones. Markets generally do not capture the values of services such as animal pollination, water purification, and carbon sequestration, which accrue to the broader economy as positive externalities. These services also tend to be free and accessible to all; in contrast, private actors see their preservation as a cost (direct or opportunity cost) in the absence of compensation mechanisms (appendix A). Although not all ecosystem services can be priced, there is much scope for bringing the economic value of many ecosystem services into markets. Pricing policies, including taxes, user fees, access fees, subsidies, and marketable permits, are key to aligning the social and private benefits of decisions affecting natural resources. Without appropriate policies, loss of biodiversity and ecosystem services will continue unabated.

BOX 3 World Bank Group Approaches to Integrating Biodiversity and Ecosystem Services into Landscape and Seascape Management

The response areas identified in this paper are fully aligned with the World Bank Group's (WBG's) support to the blue economy and terrestrial forest landscapes, as captured in the PROBLUE and PROGREEN programs.

Covering 90 percent of the habitable space on the planet (UNESCO 2017), oceans play a critical part in any biodiversity conservation strategy. The WBG's blue economy approach seeks to address the challenges facing oceans, such as marine pollution, climate change, and overexploitation of marine living resources. The underlying objective is to allocate resources and natural capital to develop a country's ocean economy as efficiently and sustainably as possible. The work builds on the World Bank's long history of engagement in managing the oceans and its comparative advantage to promote an integrated approach to management of ocean activities and increase blue financing. It fosters application of a blue economy lens at all levels of the World Bank's programming and project cycle.

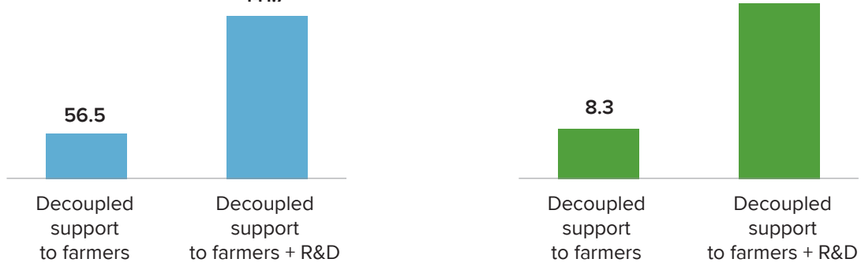
Forest ecosystems are another critical component of the world's biodiversity. They provide livelihoods and mitigate climate change and are essential for sustainable food production, but deforestation and degradation undermine the potential of forests and contribute to biodiversity loss. The 2016–2020 Forest Action Plan was designed to strengthen the role of forests in achieving the WBG's goals of ending extreme poverty and increasing shared prosperity by 2030. Going forward, an outcome-oriented approach is sought, with four pathways to maintaining and improving ecosystem services in resilient production and conservation landscapes: production management, protected areas and nature-based tourism, nature-based solutions and management of trade-offs and synergies across land uses, and ecosystem restoration. The World Bank envisages a programmatic landscape approach that engages multiple sectors and institutions over a period long enough to effect change at all levels.

An immediate opportunity for countries to align policy with sustainable management of biodiversity and ecosystem services is to repurpose perverse economic incentives in a way that encourages conservation and sustainable use of natural capital. It is estimated that governments spend at least US$500 billion annually in fiscal support to agricultural producers, forestry and fisheries, and fossil fuels that is potentially harmful to biodiversity (OECD 2020a). For example, in 2017, 76 predominantly Organisation for Economic Co-operation and Development (OECD) and Group of Twenty economies spent US$340 billion in fossil fuel support (OECD and IEA 2019). In the same year, OECD countries provided US$228 billion of support to farmers, of which US$116 billion could be considered harmful to biodiversity (OECD 2020b). More than half of global subsidies to fisheries, estimated at US$35 billion per year, is for fuel support and results in overfishing (Sumaila et al. 2016). The experiences of countries such as Mexico, Indonesia, India, and Brazil demonstrate that such policies encourage unsustainable production practices

(OECD 2020b) because they amplify market failures, further encouraging underpricing of biodiversity risks and value in private investment, production, and consumption decisions.

World Bank analysis demonstrates that decoupling agricultural subsidies from production inputs and output could decrease the conversion of natural ecosystems by 8 percent while increasing global real GDP by US$57 billion by 2030. Decoupling support to farmers and channeling some of the agricultural subsidy savings toward public investment in agricultural research and development could halve losses of natural land while raising economic benefits to US$142 billion at the global level by 2030 (Johnson et al. 2021) (figure 5). Building on the Sunken Billions Report (World Bank 2017a; World Bank and FAO 2009), the World Bank is also undertaking a study to assess the extent of fisheries subsidies, excess fishing capacity and effort, and economic losses in global capture fisheries and to explore how public expenditures could be redirected from those that distort trade patterns and fishing capacity levels toward others that support needed reforms of fisheries governance.

FIGURE 5 Effect of Agricultural Policies on Avoided Natural Land Conversion and GDP



Source: World Bank Johnson et al. 2021.

Note: GDP = gross domestic product; R&D = agricultural research and development.

Environmental fiscal reform can reconcile the need for domestic resource mobilization and improve environmental outcomes. Fiscal instruments in sectors that depend on the provisioning services of nature (for example, timber and fisheries) could be better aligned with the objectives of sustainably using the asset base and ecosystems. Fiscal policy in the forestry sector is usually implemented with the goal of capturing a fair share of rents and promoting industry development rather than promoting sustainable forest management. Incentives for sustainable forest practices may be lacking entirely. Environmental taxes, when they exist, may be too low and signal that policy makers may be putting low priority on environmental issues. Another area of potential support is ecological fiscal transfers, which allow intergovernmental budget transfers to be harnessed to combine welfare and environmental objectives.[28]

28. For a thorough analysis of current knowledge on and opportunities in environmental fiscal reform for the forestry sector, see World Bank (2021c).

Examples of implementation of green fiscal reform and other policies to support sector-wide transformation exist in several World Bank client countries. The World Bank's Morocco Inclusive Green Growth Development Policy Loan series helped the Government of Morocco improve management of natural capital and green physical capital and strengthen and diversify the rural economy through regulatory reforms. The reforms included phasing out fossil fuel subsidies, adopting a national water plan and national coastal zones management plan, and establishing a new legal and institutional framework for sustainable management of fisheries. The project helped align strategies in multiple sectors around common sustainability objectives. Other examples include the World Bank Vietnam Climate Change and Green Growth development policy operation, which promoted climate-smart landscape planning and strengthened coastal forest management standards to provide environmental services such as protection from storm surge, hydrological regulation, and biodiversity conservation. The Mato Grosso Fiscal Adjustment and Environmental Sustainability development policy operation promotes economic growth in agriculture in the Brazilian state of Mato Grosso that is environmentally sustainable by improving the monitoring of illegal deforestation and forest fires and strengthening the rural cadaster registry and regularization program. This is expected to encourage private investment in environmentally sustainable, inclusive agricultural systems. Building on such experiences, there is much room to expand support for adoption of whole-of-economy approaches in countries that improve the enabling environment for biodiversity and to do more on policy reform that addresses the drivers of nature loss.

The use of integrated economic and ecosystem service modeling could help ministries of finance and planning in the ex-ante analysis of economic policy reforms. Natural capital, including forests, mangroves along the coastline, and water bodies, is a production factor along with labor and produced capital. Ecosystem services are rarely incorporated into macroeconomic modeling, which results in suboptimal policy decisions. To overcome this, the World Bank has piloted an integrated ecosystem-economy model that is spatially explicit and, for the first time, combines on a global scale ecosystem service models (Integrated Valuation of Ecosystem Services and Tradeoffs) and a computable general equilibrium model (the Global Trade Analysis Project). Some of the results, which are presented in figure 5, illustrate possible applications of such tools, which include comparing alternative policies and identifying win-win pathways in terms of environmental and economic outcomes.

Modeling tools could also be harnessed to assess the distributional effects and political economy aspects of policy reform proposals. Fiscal policy reform tends to have winners and losers. Analysis of the distributional effects of reforms is key for governments to ensure an inclusive and equitable transition and manage the political economy considerations that often undermine reform efforts. The integrated ecosystem-economic model work (Johnson et al. 2021) finds that none of the policy reform scenarios analyzed resulted in landowners and labor both being better off in most countries (appendix A). Any reform agenda therefore needs to incorporate targeted compensation and transition measures. In addition to avoiding unintended distributional effects, this helps to ensure that reforms can be sustained over time and withstand potential policy reversals or shifts in political priorities.

Integrate Biodiversity Criteria into Financial Decisions

For the financial sector to fulfill its role of effectively managing and distributing risks and allocating resources to productive uses, central banks, financial sector regulators, and supervisors will need to take steps to enable the integration of biodiversity criteria into financial decisions, including supporting biodiversity risk assessments, greater transparency, and adoption of standards and impact reporting in financial markets. These are critical for achieving closer alignment of financial flows with the SDGs and ensuring market integrity and financial stability. Action in the following four areas would be transformative (adapted from WBG 2020b):

- *Taxonomies and labeling:* (i) develop taxonomies that identify economic activities that contribute to sustainable biodiversity use and ecosystem services provision, and (ii) promote standardization and broad use of biodiversity metrics for impact reporting across sustainable financing mechanisms (for example, from capital markets through green or other bonds and from bank financing through green or other loans).

- *Supervisory and regulatory risk assessment:* (i) develop tools and methodologies to integrate biodiversity risks[29] into the financial stability monitoring and supervisory approaches of central banks and supervisors, and (ii) encourage or require the inclusion of biodiversity criteria in risk assessments and investment processes in the financial sector.[30]

- *Disclosure:* promote disclosure of nature-related information by leveraging other countries' experiences and initiatives, such as through an eventual Taskforce on Nature-related Financial Disclosures (TNFD), building on the approaches that the Taskforce on Climate-related Financial Disclosures developed.

- *International networks:* support networks, such as the Network for Greening the Financial System, the Coalition of Finance Ministers for Climate Action, and the Sustainable Banking Network, to facilitate standardization of nature and biodiversity risk assessment in supervisory tools and approaches, and help regulators adopt them.

29. As the Bank for International Settlements' "Green Swan" report (Bolton et al. 2020) indicates, risk assessment techniques have been largely backward looking. Since risks arising from climate change and nature loss are unlike those experienced in the past, it is necessary for financial regulators and governments to develop forward-looking, scenario-based analyses (WBG 2020b).

30. For example, in the context of the WBG's work, this could be done by piloting inclusion of nature-related risks in Financial System Stability Assessments prepared under the Financial Sector Assessment Program.

Reconcile Trade Policy with Sustainable Management of Nature

Because trade and global value chains play a major role in driving land use change and overexploitation of renewable natural resources, exporting and importing countries need to align their trade policies with nature-smart domestic fiscal and sector policies. Global trade has the potential to allocate production efficiently across countries by allowing them to capitalize on their comparative advantage, but because markets do not account for externalities, trade also has the potential to lead to environmental degradation, allowing importing countries to decouple their growth in consumption from environmental impact and shift the environmental costs to exporting countries. Potential solutions exist on both sides. Importing countries in the European Union are starting to implement actions to limit or avoid imported deforestation.[31] A range of policy options is available to exporting countries, particularly in tropical areas, for simultaneously addressing the risks of trade barriers based on biodiversity and ecosystem services loss and sustainable management of their natural assets. For example, taxation-and-rebate mechanisms, known as feebates, combined with third-party sustainability certification, have the potential to deliver a "triple dividend" (reduce environmental degradation, generate and fund development co-benefits and public goods, and raise economic activity (Pigato 2019)), including in countries where administrative capacity is limited.[32] By aligning trade, fiscal, and sector policies, feebates can provide strong incentives for enhanced environmental performance within supply chains, especially if variable tax rates are linked to certifications in production methods. Another advantage of feebates is that they can provide new revenue sources to fiscally stressed countries, which may be recycled for general or sustainability-specific expenditure purposes, for example to establish systematic financing of domestic payments for ecosystem services mechanisms or international mechanisms such as Reducing Emissions from Deforestation and Forest Degradation, plus conservation, sustainable management of forests, and enhancement of forest carbon stocks (REDD+).

2. INTEGRATE NATURE AND NATURE-BASED SOLUTIONS INTO SECTOR INVESTMENTS

A few economic sectors are at the core of unlocking a nature-smart agenda. Solutions to the global biodiversity crisis inevitably have to come from the economic sectors that put the greatest pressure on biodiversity and ecosystem services; these can be categorized as land and ocean use, infrastructure and the built environment, and energy and extractives (WEF 2020b). Many of these sectors are central to achieving the SDGs and satisfying the needs of a growing population, but their expanding footprint is also unsustainable. To minimize the trade-offs between development objectives and the need to bend the

31. For example, France and the Netherlands have adopted national strategies against imported deforestation. During the 2021 One Planet Summit, the European Commission and Parliament announced a timetable to agree on next steps to fight imported deforestation in the European Union in 2021 (Ministry for Europe and Foreign Affairs of France 2021).

32. For a more detailed treatment of environmental certification (the potential for fiscal instruments, revenues, and expenditures to play a more effective role in sustainable forest management and reduce incentives for land use changes), see World Bank (2021c).

curve on biodiversity loss, sector-level investment and planning need to incorporate robust biodiversity risk management and harness nature-based solutions as much as possible. Figure 6 provides examples of approaches that could help achieve this in several key sectors.

FIGURE 6 Examples of Integrating Nature into Key Economic Sectors

Manage Biodiversity Risks

The greater are the dependencies on nature, the greater is the exposure of key economic sectors to the risks related to ecosystem degradation. Biodiversity risks could be classified as physical, transitional, or systemic risks (WBG 2020b), encompassing the threat of disruption that loss of ecosystem services poses to economic activities and communities, as well as risks related to the transition to the nature-smart economy. Incorporation of ex-ante and ex-post biodiversity impact assessments into sectors

needs to happen at the levels of policy, planning, investment, and supply-chain management to bring about synergetic achievement of economic development, climate change resilience, conservation, and restoration of the planet's vital ecosystems.

Infrastructure is a case in point – getting infrastructure planning "right" plays a pivotal role in biodiversity outcomes, given the long-lived, often irreversible effect that investments in new roads, dams, and urban expansion can have on ecosystems. Infrastructure decisions influence the type and location of economic activities in a given area and imply a change in the assets, including the irreversible loss of natural capital. For example, road building can have a transformative effect on land use decisions in the vicinity (Damania et al. 2019). In areas of high biodiversity and ecosystem service value, this may mean adverse effects on biodiversity that extend far beyond the immediate project area. Good economics associated with good planning that accounts for such risks can go a long way in striking the right balance. An example of a sector-driven initiative that seeks to achieve this is the global Hydropower Sustainability Assessment Protocol, which was developed between 2007 and 2010 to foster good sustainability practices for the hydropower sector. The protocol is an outcome of a multistakeholder effort, incorporating a review of the World Commission on Dams' recommendations, the Equator Principles, the World Bank Safeguard Policies and IFC Performance Standards, and the sustainability tools of the International Hydropower Association, as well as inputs from multiple nongovernmental organizations (IHA 2021). Public consultation is also underway to develop a new global sustainability standard (and certification) for hydropower. Building on initiatives such as this, there is substantial room for development and dissemination of good practices in other sectors, as well as for expanding technical and financial assistance to countries for their implementation.[33]

Through application of rigorous environmental and social safeguard policies and standards, the WBG has the mandate and is well placed to identify opportunities for integrating biodiversity and nature-based solutions early on in projects that its clients undertake. The WBG's engagement inevitably spans sectors associated with a large environmental footprint. For example, roughly 30 percent of IBRD and 44 percent of IDA commitments in FY2019 were in sectors that may have a high (positive or negative) impact on biodiversity and ecosystem services.[34] Through the Environmental and Social Framework (ESF), the World Bank holistically and systematically screens the investment project pipeline and portfolio for potential environmental and social risks and impacts and guides clients in the development of appropriate mitigation measures. Application of the risk mitigation hierarchy promotes positive environmental and social outcomes of projects. Building on the experience of implementing the ESF, the World Bank advises clients and partners on solutions on the ground, including how to gauge and manage the impacts of large

33. The ability of project developers (particularly those developing large, complex infrastructure projects) to embrace best sustainability practices hinges on a substantial increase in financial and technical support. Integration of nature-relevant considerations into project design is a major challenge for several reasons, including: (i) absence of robust ex-ante national, regional, and subregional environmental strategy; (ii) lack of biodiversity data; (iii) lack of adequate regulation; (iv) lack of technical capacity in the public and private sectors; and (v) a disconnect between the measures recommended in (strategic, regional, and project level) environmental impact assessments and allocation of responsibilities for implementation of such measures. An example of the latter is that efforts to ensure implementation of conservation measures – as well as oversight and monitoring – are rarely supported with explicit funding. This challenge is due, in part, to a lack of understanding of the value of ecosystem services, the economic cost of biodiversity loss, and which actors should absorb which costs.

34. These sectors include agriculture, fishing, and forestry; transportation and urban development; water, sanitation, and waste management; and energy and extractives. Estimates are based on data from World Bank (2019a).

infrastructure projects from the perspectives of decarbonization and potential environmental impact. One recent example of such support is the establishment of a biodiversity corridor under the Itaipu hydropower project (with financial support from the Global Environment Facility (GEF)) (World Bank 2017b). Similarly, the IFC can harness its valuable experience in managing biodiversity risk and impacts and promoting investments with nature co-benefits, built through extensive engagement with a wide range of private sector actors and activities across different sectors. The IFC's Performance Standard 6 has served as a robust framework for biodiversity risk and impact management in its investments. Appendix B provides more detail on the ESF and the IFC's performance standards.[35]

There is also a strong rationale for promoting interdisciplinary approaches, such as the One Health approach, to reduce the risk of emerging infectious diseases that stem from the rapid loss of natural habitats. The One Health approach acknowledges the direct and indirect connections between the health of humans, animals, and the environment and the need to integrate expertise from multiple sectors to guide optimal, cost-effective approaches to address zoonotic and other disease threats (World Bank forthcoming b). Whereas the human and domestic animal health fields are developed and receive extensive resources, attention to the role of wildlife in the emergence of new infectious diseases has been limited to date (box 1). The WBG can support the capacity building required to operationalize the One Health approach in client countries. This entails expanding wildlife health capacity and operations, including by improving multisectoral information-sharing channels in ways that reinforce overall public, animal, and environmental health (World Bank forthcoming b).

Invest in Nature-Based Solutions

Seeing nature as a solution can also help countries tackle multiple challenges simultaneously. Nature-based solutions harness natural capital to deliver ecosystem services, along with a range of development benefits, and can address key societal challenges, including food and water security, disaster risk, human health, and climate change, by focusing on preserving or restoring ecosystems. For instance, restoring, maintaining, and expanding green infrastructure, such as mangroves, wetlands, and watersheds, can enhance the performance of (or substitute for) traditional gray infrastructure in areas such as flood protection, water resource management, and protection of built assets from geohazard risks (for example, through bioengineering solutions), often at lower cost – particularly when factoring in spillover benefits for biodiversity and ecosystem services. As such, nature-based solutions are often a cost-effective approach to water resource management, disaster risk reduction, and climate change mitigation (Browder et al. 2019). It is estimated that nature-based solutions could deliver 37 percent of the cost-effective climate mitigation needed through 2030 (Griscom et al. 2017).

The World Bank supports greater adoption of nature-based solutions across its portfolio through institutional capacity building, knowledge products, and technical assistance. Between 2012 and 2017, 81 World Bank projects supported green infrastructure and urban biodiversity solutions (Browder et al.

35. MIGA's Performance Standards on Environmental and Social Sustainability are completely consistent with those used by the IFC (see https://www.miga.org/environmental-social-sustainability).

2019). Green and blue urban infrastructure assets[36] help cities mitigate climate extremes and decrease biodiversity loss. Projects have included the Metro Colombo Urban Development Project, which supported urban wetland management and strategic planning for urban resilience at the municipal level and invested in flood protection through preservation of wetlands. During the COVID-19 pandemic, urban biodiversity has become even more vital because it is linked to better quality of life and public health. The Mekong Delta Integrated Climate Resilience and Sustainable Livelihoods Project is supporting restoration of mangrove forests to prevent coastal flooding and erosion in Vietnam. The World Bank builds on this by supporting institutional capacity building for the identification and planning of nature-based solutions; filling knowledge and technical gaps, including by improving the tools available to prepare nature-based solutions, developing best practice approaches, showcasing global examples, training local communities in sustainable resource management, and providing guidance for adequate quantification of the benefits and costs of nature-based solutions; and implementing support to client countries.

To implement nature-smart approaches at scale, biodiversity considerations need to be incorporated into upstream sectoral planning and investments in strategic sectors. This applies to climate-smart agricultural and forestry practices, pollution management and circular economy[37] approaches, green and innovative logistics solutions, compact urban development, adoption of green technology for construction and maintenance of roads, and promotion of sustainable sectors such as ecotourism. As with risk mitigation, there are substantial institutional and technical capacity gaps to overcome. The WBG has been actively supporting its clients in this area (appendix B). Table 2 provides more examples of WBG projects supporting nature-smart sector approaches.

36. "Green" and "blue" infrastructure assets include grasslands, parks, greenways, rivers, lakes, canals, coastal water systems, and wetlands. These ecological urban assets can support physical and social resilience by reducing the effects of extreme weather events, increasing food and water security, reducing air and noise pollution, improving microclimates, enhancing well-being, and sequestering carbon, thus reducing GHG emissions.

37. A circular economy is based on the principles of designing out waste and pollution, keeping products and materials in use, and regenerating natural systems (Ellen McArthur Foundation 2017). The forthcoming PROCLEAN umbrella program is an example of an initiative that can support such efforts. The program is expected to integrate pollution management into upstream Systematic Country Diagnostic and Country Partnership Frameworks, identifying programmatic opportunities to address pollution in strategic sectors such as energy, agriculture, water, transport, and urban development and thus to address multiple sources of pollution-related drivers of biodiversity loss while improving public health and offering economic opportunities. The program is also expected to support wider adoption of circular economy approaches, with the goal of gradually decoupling growth from consumption of finite resources.

TABLE 2 Examples of World Bank Group Projects Supporting Integration of Nature into Different Sectors

Project	Sector(s)	The challenge and solution harnessing biodiversity and ecosystems
World Bank Brazil Integrated Landscape Management in the Cerrado Biome Project, recipient-executed trust fund (RETF) (project page)	Agriculture, forestry	**The challenge**: The Cerrado is an important biome for economic and environmental reasons and for food security in Brazil, it is also facing pressure from expanding mechanized agriculture. The total area of the Cerrado deforested amounts to more than 1 million km^2 (INPE 2021). **The solution:** The project is supporting adoption of an integrated landscape management approach in the Cerrado through, among other activities, helping 4,000 landholders and agricultural producers adopt low-carbon-emission agricultural practices and land-restoration practices through technical assistance related to habitat restoration and low carbon emissions agriculture.
World Bank Malawi Shire River Basin Management Program, IDA (project page)	Water, sanitation, waste manage-ment	**The challenge:** The project was facing the challenge of upgrading infrastructure and land and water management practices in the Lake Malawi-Shire River system — the country's most important natural resource system, with rich natural habitat. **The solution:** The project rehabilitated the Kamuzu Barrage and upgraded the river flood mitigation infrastructure while protecting forests, wetlands, and biodiversity; rehabilitating degraded parts of the river catchment; and increasing the management effectiveness of local protected areas. By adopting an integrated planning approach, the project has delivered "win-win" infrastructure and conservation outcomes.
IFC financing of Mediterranean Shipping Company to retrofit ships with filters to treat ballast water (webpage)	Transport	**The challenge:** Large ships often carry millions of gallons of ballast water that contains organisms that are transported to and discharged in places where they can become alien invasive species, causing severe ecological and economic damages. Mediterranean Shipping Company, one of the largest shipping companies in the world, recognizes the importance of managing these risks in compliance with the Ballast Water Management Convention. **The solution**: Mediterranean Shipping Company is installing ballast water treatment equipment on 150 vessels using IFC financing.
IFC investment in Nespresso's sustainable coffee in East Africa (webpage)	Agriculture	**The challenge:** The coffee company Nespresso seeks to source coffee from producers that meet the AAA Sustainable Quality program standard that the Rainforest Alliance developed. This standard "protects biodiversity, delivers financial benefits to farmers, and fosters a culture of respect for workers and local communities." In addition, coffee farmers need financial support to adapt to climate change. **The solution:** The IFC project with Nespresso helps farmers scale up agroforestry involving native shade tree plantings on coffee plantations, by providing training, delivering tree seedlings, and supporting monitoring. Additionally, the project supported reforestation at the landscape level, rejuvenating degraded terrain, reducing likelihood of erosion, increasing potential for biodiversity, and fortifying farming ecosystems and farmer communities.
IFC Wind Energy Sector in Jordan (webpage)	Energy	**The challenge:** The wind energy sector in Jordan faced considerable pushback from conservation organizations concerned about effects on birds. The effects of this sector were largely unknown in the country, and there was no mechanism in the regulatory framework to account for, manage, and monitor potential cumulative effects on iconic bird species. **The solution:** To develop a more sustainable wind energy market in Jordan, IFC engaged wind energy developers, conservation organizations, and the government in developing an approach to assessing and managing cumulative effects that involved the use of impact thresholds defined to ensure that healthy populations of priority birds are maintained. This multistakeholder effort developed a sustainable way to scale up wind energy through partnership with international and national stakeholders. The management and monitoring framework has been implemented on wind energy projects countrywide.

Project	Sector(s)	The challenge and solution harnessing biodiversity and ecosystems
MIGA Hydropower Project in Solomon Islands (webpage)	Energy	**The challenge:** Hydropower projects often alter the downstream hydrology of a river, obstruct fish migration, and convert or degrade natural habitats. **The solution:** In accordance with the requirements of MIGA Performance Standards, the project is adopting a mitigation hierarchy to avoid and reduce potential impacts on biodiversity, including environmental flow release and a trap-and-haul system at the dam to facilitate fish migration, monitoring of fish presence and movements, and adaptive management as deemed necessary to achieve net gain/no net loss of biodiversity within the project area. The operator will also develop a biodiversity action plan to achieve a net gain in biodiversity in designated critical habitats.

3. ENHANCE LOCAL BENEFITS OF CONSERVING AND SUSTAINABLY MANAGING NATURE

Effective area-based conservation remains the foundation for protecting species and maintaining ecosystem services. Short of an unprecedented technological leap, there is to date only one broadly accepted strategy for protecting the remaining population and diversity of species (including genetic diversity), as well as ecosystem functions: effective conservation of natural habitats through protected areas and other effective area-based conservation measures, including in transboundary landscapes. Several direct drivers of biodiversity loss, such as habitat loss and overexploitation, can be managed through locally beneficial area-based conservation if it is planned appropriately using science-based approaches and accompanied by effective governance and management. For example, marine protected areas have been shown to increase fish stocks and are estimated to have twice as many large fish species as fished areas (Edgar et al. 2014).

The proportion of the planet's land and oceans under protection has increased in recent decades, yet much work remains. Governments have committed to meeting terrestrial and marine protected area targets under CBD Aichi Target 11, which seeks to protect at least 17 percent of terrestrial and inland water and 10 percent of coastal and marine areas by 2020 through protected areas and other effective area-based conservation measures.[38] The goal has been only partially achieved. Approximately 15 percent of terrestrial and 7.5 percent of marine areas were designated as protected as of August 2020. Progress has been limited in ensuring that they safeguard the most important areas for biodiversity, are

38. Aichi Target 11 has six components: "By 2020, at least 17 per cent of terrestrial and inland water areas (1) and 10 per cent of coastal and marine areas (2), especially areas of particular importance for biodiversity and ecosystem services (3), are conserved through effectively and equitably managed (4), ecologically representative (5) and well-connected systems of protected areas and other effective area-based conservation measures, and integrated into the wider landscape and seascape (6)."

ecologically representative, are connected to one another and to the wider landscape and seascape, and are equitably and effectively managed (CBD Secretariat 2020a). The problem of "paper parks" remains a troubling trend, particularly with marine protected areas that are gazetted but not managed. Pressures from overexploitation and competing land uses also persist, undermining these efforts. In light of the rapid decline of biodiversity globally, the post-2020 global biodiversity framework is expected to raise the global targets on protected areas substantially.[39]

There is a development case for effective area-based conservation because it supports many of the SDGs. Livelihoods, well-being, and safety nets for rural poor populations are inextricably linked to and depend on natural ecosystems. Healthy ecosystems make up 50 to 90 percent of the total source of livelihoods among the rural poor (CBD 2018), and low-income countries depend on renewable natural capital, which includes agricultural land, protected and productive forests, mangroves, and fisheries, for 23 percent of their wealth (World Bank forthcoming a), yet in several of these countries, natural capital is being depleted owing to insecure land tenure, low institutional capacity, and exposure to climate shocks that deepen vicious poverty traps, and the risks associated with biodiversity and ecosystem services loss pose a significant challenge to food security, sustainable development, and poverty reduction. Although it may not always be possible, marine and terrestrial protected areas *can* generate multiple economic, social, and cultural benefits at the local level and, with sufficient investment, can be engines for development. Conservation and restoration of natural habitats can also help address climate change by adding carbon sinks and can help communities, including in IDA countries, fragile countries, and small island developing states, adapt to climate change. Such initiatives can also provide other valuable ecosystem services, such as control of pathogens – the ability of protected areas to act as a buffer, decreasing the risk of spillover of pathogens from wildlife to humans, which has become all the more relevant with COVID-19 and the emergence of other zoonotic diseases in recent years (appendix A). Much work remains for better leveraging the environmental and development benefits of conservation efforts, however, and this response area outlines several key approaches to achieve that.

Increase the Effectiveness of Protected Areas and Maximize the Local Benefits They Generate

Efforts to protect local biodiversity and ecosystem services, such as protected areas management, need to be underpinned by effective benefit-sharing mechanisms and integrated with development of livelihoods, to ensure that area-based conservation effectively supports environmental and development objectives. Greater support to local development activities and benefit sharing involving Indigenous Peoples and local communities is needed. Another priority area is the creation of incentives for conservation, for example by leveraging innovative co-financing models and financing mechanisms, to reduce the funding gaps that protected areas face. Approaches that could be scaled up include nature-based tourism (although the dramatic decline in nature-based tourism due to COVID-19 has highlighted the need for a sustainable tourism recovery), endowment funds, sustainable value chains, and payment for

39. In addition to protected areas, global conservation targets are expected to encompass other effective area-based conservation measures, as well as territories and areas conserved by Indigenous Peoples and local communities.

ecosystem services schemes that connect the stewards of forest, marine, and freshwater ecosystems with markets for environmental services. In doing so, these mechanisms help create sustainable and resilient livelihoods at the local level. In support of this, the World Bank harnesses its ability to work across sectors and create innovative financing instruments, for example by continuing to pilot thematic bonds, such as green and blue bonds, and by continuing to support the implementation of the REDD+ mechanism under the Forest Carbon Partnership Facility Readiness Fund and the Carbon Fund,[40] which mobilize finance to support conservation and development outcomes. Table 3 provides examples of World Bank support in these areas.

Sustainable tourism around natural landscapes has the potential to deliver triple bottom-line benefits. Tourism in protected areas was a fast-growing segment and the largest market-based contributor to the financing of protected areas prior to the economic fallout from the COVID-19 pandemic.[41] A recent World Bank study (World Bank 2021b) piloted the local economywide impact evaluation method to estimate the impact of tourism in protected areas on the local economy in four countries: Brazil, Fiji, Nepal, and Zambia. The study makes the case to governments in developing countries that investing in protected areas not only conserves biodiversity, but also provides net positive economic returns, creates income multipliers, and provides practical green recovery options in times of COVID-19. For instance, in Chitwan National Park, Nepal, the economic return per dollar of public spending in the park is US$7.6. In South Luangwa National Park, Zambia, the economic return per dollar of public spending is even higher (US$28.2). Similarly, tourist expenditures in the park are significant income multipliers for households in the local economy. In Abrolhos Marine Reserve, Brazil, the estimated real income multiplier per dollar spent by tourists is 1.74. In Fiji, the study estimated that each additional tourist adds US$2,400 to inflation-adjusted household total real income in the study area, and tourism has created 8,304 jobs through direct and indirect channels. The results in each of these countries show that tourism contributes significantly to local economies.

A recovery and expansion of the sustainable tourism sector would contribute to both development and conservation objectives. The COVID-19 pandemic has exposed just how deeply connected protected area tourism is to the success of conservation, community engagement, and poverty reduction. The impact on the tourism sector left communities – many of which were already in extreme poverty – without jobs, income, and conservation-based livelihoods. Beyond the need for recovery of this sector after the pandemic, there are also opportunities to promote the sector's growth and increase its sustainability and resilience by ensuring that the natural asset itself is protected, and through enabling policy and regulations that promote concessions, and appropriate benefit-sharing mechanisms with local communities. There is also an opportunity to strengthen other sectors along the tourism value chain, including agriculture, fisheries, trade, and rural development.

40. As of June 30, 2020, 47 countries were in the REDD+ Readiness Fund (of which 36 have programs implemented by the World Bank and 10 by other development partners) and 18 countries in the Carbon Fund (FCPF 2020).
41. Pandemic-related travel restrictions and national lockdowns resulted in many protected areas losing their primary source of revenue, which further led to budget cuts, layoffs, and impaired conservation efforts.

TABLE 3 Examples of World Bank Programs Supporting Management of Biodiversity and Ecosystem Services

Project	Country	The challenge and innovative solutions for biodiversity and ecosystem conservation
Amazon Sustainable Landscapes Program, RETF (project page)	Brazil, Colombia, Peru (Phases I & II) Bolivia, Ecuador, Suriname, foreign territory of French Guyana (Phase II)	**The challenge:** The Amazon contains 40 percent of the planet's rainforest and a critical reservoir of biodiversity, but it is facing immense pressure from deforestation, land degradation, fragmentation, and overexploitation of forest and freshwater ecosystems (ASL 2020). **The solution:** Under Phase II, the GEF-funded Amazon Sustainable Landscapes program has mobilized regional cooperation and US$113 million in GEF funding and US$683 million in co-funding to protect biodiversity and the integrity and resilience of the Amazon. The program is strengthening management effectiveness of 65 million hectares of protected areas, facilitating creation of 4.3 million hectares of new protected areas and promoting sustainable productive practices in 11 million hectares (ASL 2020). It is also implementing conservation agreements with Indigenous Peoples and local communities to build capacity and support local governance of natural resource management.
Madagascar Environmental Program, IDA/RETF (project page)	Madagascar	**The challenge:** Madagascar is referred to as the "eighth continent" for its unparalleled biodiversity, but high levels of poverty, especially in rural areas, threaten its unique ecological capital. Slash-and-burn agriculture practices have contributed to the loss of approximately 80 percent of native forests. **The solution:** The three-phase Environmental Program (1990–2015) has created Madagascar's environmental institutions and established the network of protected areas and forestry corridors that cover some 7 million hectares. Combined with extensive community development and creation of sustainable financing mechanisms (ecotourism; endowment funds; and REDD+ pilot projects), the program reduced the rate of deforestation by 75 percent in 20 years.

Project	Country	The challenge and innovative solutions for biodiversity and ecosystem conservation
Seychelles Third South West Indian Ocean Fisheries Governance and Shared Growth Project, IBRD (project page)	Seychelles	**The challenge:** The Seychelles has an exclusive economic zone of 1.4 million km^2 — a globally designated biodiversity hotspot and a critical economic asset employing 17 percent of the local population and generating 8 percent to 20 percent of GDP. Pressures from fisheries and tourism on marine resources are reaching unsustainable levels. **The solution:** The Third South West Indian Ocean Fisheries Governance and Shared Growth Project supports the decision of the government to refocus its development on a blue economy by expanding marine territories under protection (a 15 percent expansion of the exclusive economic zone as medium biodiversity areas and another 15 percent as high biodiversity areas), pooling investment in the fisheries sector, and creating a Blue Grants Fund and Blue Investment Fund that will use the proceeds of the sovereign Blue Bond to support development of sustainable seafood value chains, among other activities.

Note: GEF = Global Environment Facility.

Promote Inclusive and Integrated Management of Biodiversity-Rich Landscapes

To implement the ambitious global conservation targets that are expected to be adopted at the CBD COP-15, countries will need to find ways to exploit synergies between development and sustainable management of nature more effectively. One of the proposed goals of the draft post-2020 global biodiversity framework is to ensure that conservation measures cover "at least 30 percent of land and sea areas, with at least 10 percent under strict protection" by 2030 (CBD Secretariat 2020b). A coalition of more than 50 countries already committed to this goal at the 2021 One Planet Summit (Campaign for Nature 2021), building momentum toward this global ambition. To implement this type of target, countries will also need to introduce conservation measures outside the core protected areas (sometimes referred to as "other effective area-based conservation measures") – to complement protected areas with sustainable use of nature as part of an integrated landscape management approach. Achieving this will require promoting sustainable management of nature in a way that generates local development benefits and, where local development benefits are insufficient, establishing ecological compensation mechanisms and application of market-based instruments to encourage sustainable practices. It will also require greater use of advanced technology for effective monitoring and enforcement (such as geospatial data, remote sensing, and machine learning, as well as drones to detect real-time threats).

Country experience demonstrates that integrated landscape management and restoration not only deliver environmental outcomes, but also promote shared prosperity, because conservation efforts create jobs and income-generation opportunities for communities. For example, in Ethiopia**,** with support from World Bank–financed projects, communities have transformed their degraded environments into green, productive land. Under the World Bank's decade-long Sustainable Land Management Program, some 900,000 hectares of land has been put under sustainable land management practices, benefitting 2.5 million people. This work has led to greater access to water and food security, higher yields, and diversified sources of income – contributing to resilient livelihoods. Another World Bank project in India supported livelihoods through application of integrated coastal zone management approaches in three states, which included restoring and afforesting 19,500 hectares of mangroves and investment in pollution management. In doing so, the projects helped protect coastal populations against pollution, erosion, and sea level rise. Activities to enhance livelihoods benefitted more than 6.74 million people directly (World Bank 2020a). These examples stress the importance of strengthening the skills and technical capacity of the communities involved in the projects, through the establishment of appropriate learning opportunities and training mechanisms. Education is also important for sustainability of investment and to raise environmental awareness and capacity. For example, the Chad Local Development and Adaptation project is developing literacy courses for groups with low levels of education to support their engagement in natural resources management and investing in environmental education programs for schools.

The use of market instruments such as mitigation banking and biodiversity offsets also needs to become more systematic, while adhering to the risk mitigation hierarchy.[42] Lessons from climate change mitigation show that market-based instruments can help unlock private finance and direct it toward investment opportunities that would otherwise remain underfinanced.[43,44] Mitigation banking is a way to facilitate private investments in conservation by generating financial returns through the sale of biodiversity offsets to project developers. Biodiversity offsets are a valuable, underused tool for scaling up biodiversity investment but should be used as a last resort mechanism – when other onsite options to minimize impacts have been exhausted. Projects that have moderate effects on biodiversity in particular overlook this instrument. Landscapes often suffer from "death by a thousand cuts" or compounding pressures from many small to medium-size actors and projects. If all developments were contributing to commonly defined biodiversity objectives, biodiversity offsets could provide much-needed funding for conservation and deliver better biodiversity outcomes. With biodiversity offsets firmly established in the environmental standards of the World Bank (Environmental and Social Standard 6) and IFC and MIGA (Performance

42. The risk mitigation hierarchy is a tool that guides users toward limiting the negative impacts on biodiversity from development projects (Biodiversity Consultancy 2020). It consists of four sequential steps that must be taken throughout the project's life cycle to limit such impacts: "(a) anticipate and avoid risks and impacts; (b) where avoidance is not possible, minimize or reduce risks and impacts to acceptable levels; (c) once risks and impacts have been minimized or reduced, mitigate; and (d) where significant residual impacts remain, compensate for or offset them, where technically and financially feasible" (World Bank 2016).
43. For example, the EU Emissions Trading System has proven to be an effective tool in reducing emissions cost-effectively. Emissions from installations that the Emissions Trading System covers declined by approximately 35 percent between 2005 and 2019.
44. Global trading mechanisms have proven to be more complex. Article 6 of the Paris Agreement (UN FCCC 2015) relates to "voluntary cooperation in the implementation of their NDCs to allow for higher ambition in their mitigation and adaptation actions." In addition to nonmarket mechanisms (for example, taxes on emissions), the article highlights the need for carbon markets. Article 6.2 creates an accounting framework, and Article 6.4 establishes a United Nations mechanism to trade credits. Ongoing efforts to operationalize this article, including at the WBG (for example, through the multilateral Development Bank Working Group on Article 6) are proving to be challenging and offer lessons for biodiversity financing.

Standard 6) and applied in various projects in the past (WBG 2016), the WBG could support greater uptake of biodiversity offsets in client countries. The establishment and strengthening of national frameworks for effective application of biodiversity offsets at the national level could generate positive conservation outcomes by reducing transaction costs and other barriers to more widespread and effective offset use.

Address Illegal Trade and Promote Legal and Sustainable Use of Biodiversity

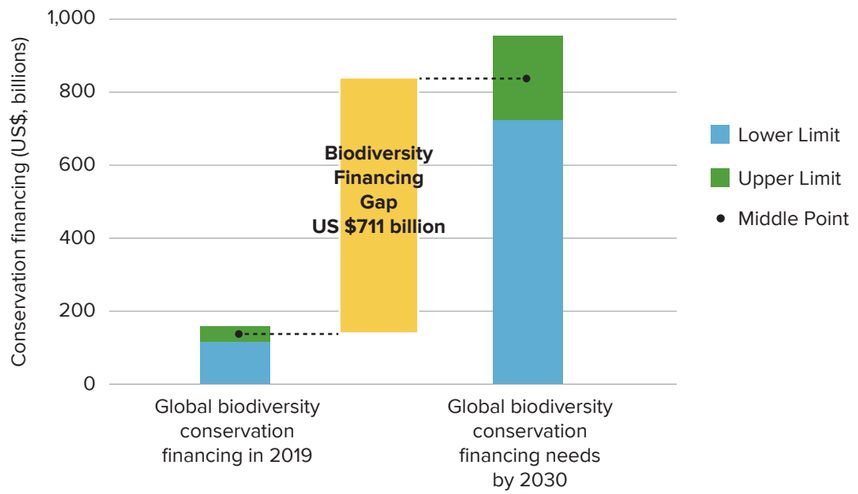
The global response also needs to address overexploitation and incorporate measures to combat illegal wildlife trade and promote legal, sustainable use of renewable resources. Unsustainable and illegal logging, fishing, and wildlife trade exacerbate poverty and result in significant economic losses. For instance, the annual cost of illegal logging, fishing, and wildlife trade is a staggering US$1 trillion to US$2 trillion. Countries lose an estimated US$7 billion to US$12 billion in potential revenues because of illegal trade in wildlife species and timber products (World Bank 2019c). These impacts can disproportionately affect fragile states that can be particularly susceptible to wildlife crime and vulnerable to infiltration by organized criminal networks that are involved in some wildlife crimes (UNODC 2020). In addition, the trade, handling, and consumption of high-risk wildlife species can increase the potential for transmission of zoonotic diseases. The response to these threats needs to be coordinated; tackle illegal supply chains; strengthen governance, policies, and laws; and create mechanisms to share the benefits from biodiversity and ecosystem services in a way that is compatible with the needs of the local population. The WBG is taking advantage of its expertise in anti-money laundering, governance, property rights, trade, natural capital accounting, and interdisciplinary approaches such as One Health to support these efforts. Additionally, the GEF-funded, WBG-led Global Wildlife Program is bringing together 32 countries across Asia, Africa, and Latin America to combat illegal wildlife trade, promote wildlife-based economies, and facilitate knowledge sharing.

4. MOBILIZE FINANCE

It is estimated that the biodiversity financing gap for the next decade will be US$711 billion per year. The Paulson Institute (Deutz et al. 2020) estimates that the financing gap to reverse the decline in biodiversity by 2030 is between US$598 billion and US$824 billion per year (US$711 billion per year on average) (figure 7). This refers primarily to investments in conservation of biodiversity and ecosystem services. The world currently spends between US$124 billion and US$143 billion on conservation, which is a near-tripling in funding since 2012. Domestic public investment is by far the largest source of biodiversity finance; private investment is limited.[45] Financial flows that are harmful to biodiversity, such as fossil fuel and agricultural subsidies, continue to overshadow biodiversity finance. Governments alone spend five to six times as much in economic support that is potentially harmful to biodiversity each year as total spending on biodiversity (OECD 2020a), and the total volume of brown finance (finance that undermines biodiversity goals) is likely to be many times as large.

45. A significant proportion of private finance comes from biodiversity offsets, mainly wetland and stream mitigation banks and conservation banks in the United States (OECD 2020a).

FIGURE 7 Global Biodiversity Conservation Financing Gap



Source: Deutz et al. 2020.

Adopt a Holistic Approach to Mobilizing Private Finance

Going forward, private finance will play a pivotal role in supporting biodiversity and ecosystem services, and there are two complementary approaches to mobilizing it: financing green and greening finance (WBG 2020b). The goal of the first approach, *financing green,* is to unlock private investment in opportunities through financing nature-based solutions and projects that contribute to the conservation, restoration, and sustainable use of biodiversity and ecosystem services. The goal of the second approach, *greening finance*, is to address a broader challenge, that is, directing financial flows away from projects with a negative impact on biodiversity and ecosystems by improving risk management. The same efforts that are applied to the development of oceanic sectors are sometimes referred to as “blueing finance” and “financing blue.”

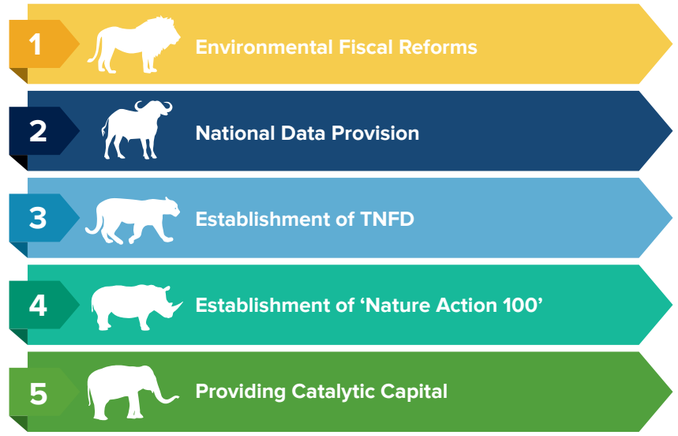
Concerted action of governments and regulators, as well as the real and financial sectors (the private sector) and development partners, is needed to achieve this. The priority areas for action are summarized as follows (and a selection is highlighted in figure 8):

- *Governments and regulators* play a crucial role in establishing the enabling environment for nature-smart development through policies and regulations that level the playing field in the real sector (for example, environmental fiscal reform) and reporting requirements, data provision, standard setting, and supervision that encourage integration of biodiversity criteria into financial decision making and market development (WBG 2020b) (see also Response Area 1, in section 2.2). One recent example of steps that governments have taken to improve data provision and reporting is the Dutch Central Bank's effort to estimate the exposure of the country's financial system to the risks associated with biodiversity loss. The report, which was released in 2020, finds that Dutch financial institutions worldwide have €510 billion in exposure to companies with high or very high dependency on one or more ecosystem services. The report calls for financial regulators to develop consistent, broadly applied standards for measuring and reporting on biodiversity risks (van Toor et al. 2020). Another example is the recently announced TNFD, a multistakeholder effort to develop a framework and guidance for biodiversity reporting and risk assessment by real and financial sector firms. Catalytic capital, provided by governments, with support from development partners, also needs to continue to be deployed strategically to de-risk projects and unlock private investment.

- *The private sector* has a key role to play in developing and adopting biodiversity-relevant risk management tools and financial instruments (see also Response Areas 1 and 5). Businesses are starting to consider biodiversity and ecosystem services in their production and investment practices in response to the risk of nature loss affecting their bottom lines. In turn, awareness of the financial materiality of nature loss is becoming increasingly clear for investors. For example, recent deforestation and related fires in Indonesia have led to significant market pressure to end the use of uncertified palm oil in consumer goods and biofuels (Steinweg Rijk, and Piotrowski 2019). In addition to advancing the use of risk assessment tools, the private sector needs to develop and scale up innovative financing approaches for ecosystem services.

- *Development partners* such as multilateral development banks and bilateral partners, in turn, have a role to play in using blended finance to catalyze new business models and investment vehicles in biodiversity and in supporting governments in implementing recommended policy reforms.

FIGURE 8 "The Big Five" Actions to Mobilize Finance for Biodiversity, by Stakeholder Group



Source: WBG 2020b.

Boost the Supply of Bankable Green Projects

Many of the emerging financing models for nature[46] are replicable but difficult to scale because they tend to apply to small, local projects with below-market returns. One of the main reasons for this is that biodiversity and ecosystem services often have a public goods characteristic. Because markets for environmental services, such as water provision and carbon sequestration, are fairly nascent and their adoption is in the early stages at the global level, it can be difficult for investments in nature to generate monetizable cash flows. Even where such projects generate cash flows, financial returns tend to be low and below market return hurdles (WBG 2020b). Such opportunities also tend to be geographically dispersed. The challenge is lack not only of capital, but also of a pipeline of investable opportunities.

To overcome this challenge, development of markets for ecosystem services, as well as "stacking"[47] and "aggregation"[48] of projects, is required. Payment for ecosystem services mechanisms, carbon offsets, and mitigation banking are some of the mechanisms that could be expanded to create markets for ecosystem services, such as watershed conservation and sequestration of carbon, and thus help monetize them. This is important not only for mobilizing investment, but also for managing (to the extent possible) the

46. Examples include conservation bonds and public-private partnerships that bring in tourism revenues and philanthropic funding, environmental impact bonds and payments for ecosystem services that put a value on green infrastructure and nature's regulating contributions, thematic bonds that connect biodiversity projects with capital markets, and mitigation banking that allows corporations to invest in impact mitigation.
47. "Stacking" refers to the practice of monetizing multiple ecosystem services payments (and therefore generating multiple revenue streams) from a single parcel of land (WBG 2020b).
48. To overcome the challenges associated with the small scale and localized nature of biodiversity projects, individual producers and initiatives can be combined or pooled at the sector or landscape (geographic) level (WBG 2020b).

real, spatial, and temporal trade-offs – the opportunity costs that green project developers, landowners, and local communities may face. There are promising signs that investor interest is growing. For example, demand for voluntary forest-related carbon offsets grew from 0.3 million metric tons of carbon dioxide equivalent in 2008 to 42.8 million metric tons of carbon dioxide equivalent in 2018, and it was valued at US$295.7 million in 2018, according to Forest Trends (Hamrick and Gallant 2018). At the project level, the priority is to capitalize on the multiple revenue streams that nature generates within a landscape (for example, conservation tourism plus sustainable agriculture plus carbon and biodiversity credits), ensuring the steady cash flows and commercial viability that investors seek. Projects could then be combined, using aggregating instruments such as funds and bonds to generate the scale that large investors seek.

A phased approach that blends concessional and commercial capital – progressively increasing the share of the latter – and the use of innovative financial instruments are also needed. Blended finance that uses catalytic capital from public and philanthropic sources to attract private investment has an important role to play in supporting the development of proof-of-concept business models and making their risk-return profiles more competitive, as well as expanding the more commercially viable models to new sectors and locations. Concessional loans, investment guarantees to help de-risk an investment, and technical assistance are examples of approaches that could be applied to blend concessional and commercial finance (box 4).

Support a Shift in Corporate Sector Strategies

It is also important to engage with the private sector to support integration of the consideration of nature into its risk management and business strategies. One of the best ways for investors to address undiversifiable risk, such as biodiversity risk, is to engage directly with companies that contribute to the risk. Global corporations and their supply chains are major contributors to biodiversity and ecosystem loss. Similar to the Climate Action 100+ initiative that a group of investors launched in 2017 to engage systematically with GHG emitters that can encourage the clean energy transition, a "nature action 100" could engage with the 100 firms with the largest negative footprint on biodiversity. The private sector is taking steps to engage in the dialogue leading up to the CBD COP-15 and to promote corporate action in response to the biodiversity crisis through initiatives such as the TNFD, the Natural Capital Coalition,[49] and the Nature Action Agenda.[50] The IFC could support such efforts by building on its breadth of engagements in sustainable investing, including the Sustainable Banking Network and its recent development of a taxonomy of biodiversity-relevant investments (box 5).

49. The Natural Capital Coalition is an international collaboration that unites the global natural capital community (https://naturalcapitalcoalition.org/).
50. The Nature Action Agenda is a multisector movement catalyzing economic action to halt biodiversity loss by 2030 and enable humans to live in harmony with nature (https://www.weforum.org/projects/nature-action-agenda).

BOX 4 Developing Financial Solutions and Blended Finance for Biodiversity Conservation and Climate Change

The World Bank Group's (WBG's) experience in financial innovation and development of blended financing mechanisms for biodiversity conservation and climate change is being leveraged to support resource mobilization for biodiversity and ecosystem services. The use of concessional finance is a key element of this effort. Global programs such as PROBLUE and PROGREEN and the Global Water Security and Sanitation Partnership provide concessional finance to advance knowledge, build capacity, and identify technical solutions for the management of natural resources that can in turn leverage other sources of finance. Further opportunities also exist to help client countries expand proof-of-concept business models related to biodiversity and accelerate the growth of cross-border investments and transactions for purchase and exchange of biodiversity offsets. For example, the Multilateral Investment Guarantee Agency (MIGA) is well placed to support scaling up foreign investment finance toward biodiversity by providing its de-risking products to protect foreign investors and lenders against noncommercial risks. MIGA guarantees could also play a vital role in accelerating the growth of cross-border investments for the purchase and exchange of biodiversity offsets. MIGA is evaluating how its products could be applied in implementing Article 6 of the Paris Climate Accord, which is based on a new global carbon offset trading system. Through this exercise, MIGA is learning valuable lessons that could be applied to countries' efforts to direct foreign investment to biodiversity markets and offset transactions.

Another area for support is the application of financial instruments for conservation such as labeled bonds, transition bonds, sustainability-linked bonds, and insurance products, in the context of biodiversity. Over the past decade, the WBG has created the foundation for what is today more than a US$750 billion green bond market[a] that is connecting environmental projects with capital markets and mainstream investors. Since 2008, the World Bank has raised US$14.3 billion through 168 green bonds issued in 22 currencies. The success of green bonds has inspired the creation of other thematic bonds, such as blue bonds, the green sukuk,[b] sustainable development bonds,[c] and green credit instruments (appendix B). An instrument that is more accessible to many private investors, green loans, is expected to surpass the green bond market in size, as may the rapidly growing sustainability-linked loan market.

a. The World Bank issued the world's first labeled green bond in 2008, creating a new investment category that catalyzed sustainable investment in capital markets that were previously out of reach for most green project developers.
b. In 2016, the WBG supported the Central Bank and the Securities Commission of Malaysia in issuing the first green sukuk, which opened the possibility of accessing the Islamic finance market for green and sustainable investment (Kamil et al. 2019).
c. In 2018, the WBG issued the first in a series of sustainable development bonds with the objective of raising awareness of the critical role that water and ocean resources play in development around the world.

BOX 5 Case in Point: IFC–Wildlife Conservation Society Taxonomy of Biodiversity-Relevant Investments

To guide private sector investment, the International Finance Corporation (IFC), in collaboration with the Wildlife Conservation Society, is preparing a basic taxonomy (an indicative list) of investment activities and investment components related to protecting, maintaining, and enhancing biodiversity and ecosystem services and sustainably managing living natural resources. The taxonomy builds on the Convention on Biological Diversity definition of biodiversity as "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 a part; this includes diversity within species, between species, and of ecosystems." To be considered biodiversity or nature related, investment activities should seek to address at least one of the direct drivers of biodiversity loss. The investment activities reviewed in this taxonomy fall into the following categories:

i. *Investment activities that generate biodiversity co-benefits while supporting established business operations.* Such investment activities include financing sustainable production and operation practices that rely on natural ecosystems and generate biodiversity conservation co-benefits, financing waste prevention and recycling activities, and manufacturing products that reduce pollution that is harmful to biodiversity.

ii. *Investments in biodiversity conservation as the primary objective, directly financing conservation or conservation-related services.*

iii. *Investments in nature-based solutions* in which biodiversity is used to enhance ecosystem services to address a number of challenges – from water purification to climate resilience and adaptation – and generate economic value for public and private stakeholders.

This taxonomy has the potential to help inform the private sector more broadly on how to define biodiversity investment. The IFC's Performance Standards were not designed to define what a biodiversity investment is.

5. PRODUCE METRICS AND DECISION SUPPORT TOOLS

Although decisions affecting biodiversity involve economic and financial trade-offs, they are often made based on incomplete information about the potential effect on and exposure to risks related to nature loss. Decision support provides policy makers and private actors accurate and up-to-date data and valid metrics to find optimal options for territorial, macroeconomic, and sector planning; policy reform; and investments. Two measurement dimensions are relevant to biodiversity: the need to assess the effect of decisions on biodiversity and ecosystem services and the need to assess exposure and risks (to people and economies) related to nature loss. What makes this task challenging is that ecosystem processes

are complex, nonlinear, and interrelated. Unlike for climate change, there is no single impact metric for biodiversity and ecosystem services (for example, increase in average global temperature above pre-industrial levels) that could make target setting and monitoring simple and comparable across sectors and countries. Moreover, the effects of biodiversity loss can be highly location specific, underscoring the need for high-resolution, up-to-date, geographically explicit information to map the pressures, responses, and impacts relevant to biodiversity. It is therefore important to invest in the development of appropriate methodologies, standards, and data collection (leveraging digital technologies such as geospatial tools, machine learning, and approaches using artificial intelligence) as well as in capacity building, to help policy makers, financial regulators, and private actors integrate such information into decision making.

Promote the Use of Biodiversity Impact Measurement in Decision Making

Advances in biodiversity impact measurement need to be harnessed for better informing planning. Technological advances are rapidly changing the realm of possibilities in assessing and minimizing the impact of projects and investments on biodiversity and ecosystem services. The granularity of data, computing ability, and analytical tools available to make smart development planning decisions and investments[51] are improving. Examples of the use of biodiversity data to inform nature-smart planning include the following:

- *Road infrastructure planning.* In Kenya, it was found that it is possible to reconcile the objectives of avoiding wildlife loss and connecting much of the country through a network of roads at roughly the same cost as default infrastructure investment plans (Damania et al. 2019). It is known from a vast body of statistical work that roads and agricultural extensification are (jointly) the main drivers of habitat loss and degradation. By using statistical tools and geospatially disaggregated information, it is possible to identify priority areas for conservation and habitat connectivity and compare the potential effects of different location or alignment scenarios for a piece of infrastructure.

- *Marine spatial planning.* The Seychelles has adopted marine spatial planning to inform decision-making processes for the development and conservation of natural capital. Implementation of the Coastal Management Plan, which designates 30 percent of the country's exclusive economic zone as having high and medium biodiversity protection status, is expected to reduce flood and erosion risk to coastal communities and infrastructure and help sustain economic activity in the coastal zone (World Bank 2019d). Marine spatial planning has also been applied in Belize to model development scenarios and inform planning (World Ocean Review 2021).

51. "Smart" development decisions and investments in this context refer to outcomes that adequately weigh the trade-offs between maintaining natural habitats and the ecosystem services they generate and land use change and the economic opportunities it brings, seeking to minimize the effects on natural habitats and capture the benefits of ecosystem services for development. In the context of road planning, this has been framed as "building right" – minimizing or avoiding ecological damage and maintaining the productivity of natural capital – rather than simply "building more" and disregarding the trade-offs associated with natural capital (Damania et al. 2019).

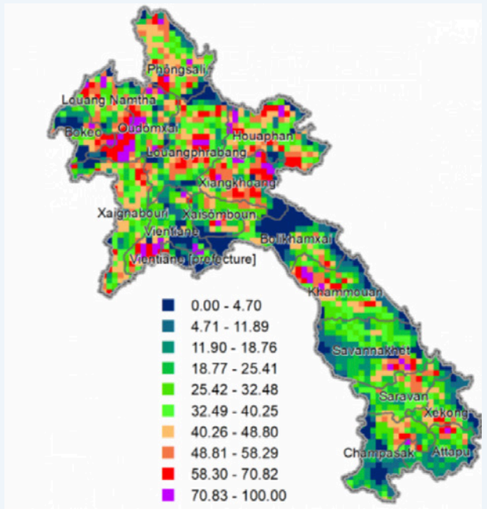
In support of these efforts, the World Bank could offer technical assistance to its client countries in integrating these data into planning decisions. In a similar vein, the IFC has been developing upstream approaches for better integration of biodiversity considerations into sectors such as renewable energy and agriculture.

Open-access tools are also emerging to support biodiversity impact assessment, and their use should be scaled up at the project level to limit and manage the impact of investments on critical ecosystems and biodiversity. One example is the database that the World Bank's research team recently developed that project developers can use worldwide given its open-access feature.[52] The database compiles a comprehensive set of information from overlapping habitat maps of 6,532 amphibians, 5,435 mammals, 4,291 reptiles, and 11,126 birds. The maps contain an exhaustive inventory of known and catalogued species, drawing from the rich data sets of the International Union for Conservation of Nature, Birdlife International, and the World Wildlife Fund. The information in the database can be used to assess the potential effects of infrastructure projects, such as construction of new roads. By providing detailed biodiversity information to the global community, the database can support implementation of environmental safeguards for infrastructure projects and investment in environmentally sensitive infrastructure in a cost-effective, environmentally sound manner (box 6). Tools are emerging in other sectors, too. For example, the Biodiversity Integrated Assessment and Computation Tool[53] has been developed for biodiversity assessment of project-level activities in the agriculture, forestry, and land use sectors. Projections of agricultural expansion under a business-as-usual scenario to 2050 are also being developed to enable policy makers to identify the species and landscapes most at risk from agricultural expansion under current trajectories and to project how alternative proactive agricultural policies might reduce these threats (Williams et al. 2020). Collaboration among different stakeholders – governments, the private sector, academia and research institutions, and investors – is needed, to scale up application of such tools, adopt common data standards, and strengthen access to and use of the data, including in the public domain.

52. The database is accessible at https://datacatalog.worldbank.org/dataset/terrestrial-biodiversity-indicators, and a brief description of the database is accessible at https://blogs.worldbank.org/opendata/overlapping-priorities-data-mapping-biodiversity-and-development-activities?CID=WBW_AL_BlogNotification_EN_EXT.

53. The EX-Ante Carbon-balance Tool (EX-ACT) team of the Food and Agriculture Organization of the United Nations has developed the Biodiversity Integrated Assessment and Computation Tool, which has been designed to extend the scope of environmental assessments to capture biodiversity concerns in the agriculture, forestry, and other land use sector that are not accounted for in conventional carbon pricing (FAO 2020a).

BOX 6 Using Spatially Explicit Biodiversity Information to Inform Investments



By providing detailed biodiversity information to the development community, the terrestrial biodiversity database that the World Bank has developed can support the implementation of environmental safeguards for infrastructure projects and investment in environmentally sensitive infrastructure in a cost-effective and environmentally sound manner. Recent research applications present methodological frameworks of nature-smart infrastructure planning that combine these innovative data with the tools of economic reasoning (Dasgupta and Wheeler 2016; Damania et al. 2018; Danyo, Dasgupta, and Wheeler 2018). Although the database is comprehensive and was assembled with the best available information, project teams should supplement the information it provides with project-specific data collection.

The map illustrates the sort of information that can inform project development. In the context of the Lao People's Democratic Republic, an important concern is the effects of future road improvement on the suitability of more biodiversity-rich areas for expanding nature-based tourism. The composite indicator constructed from the database combined with forest cover data derived from satellite depicts potential changes in biodiversity due to forest clearing after a hypothetical future upgrading of all secondary and tertiary roads to primary status in Lao PDR. Referring to the legend, the regions where the potential infrastructure upgrades leave biodiversity relatively unscathed appear in blue, and the regions where biodiversity is severely affected appear in red and magenta.

The results indicate significant clustering of the largest biodiversity impacts from road upgrading in southern Phôngsali, northwestern Louang Namtha, western Oudômxai, east-central Louangphrabang, northern and southeastern Houaphan, northeastern Xaisômboun, southwestern Vientiane, northwestern Khammouan, southeastern Savannakhét, northeastern Champasak, and southern Xékong. Clusters of lower but substantial impact are also visible in widely scattered locations.

The development of effective metrics is essential for a wide range of financial decisions as well, including not only public sector finance, but also private finance and concessional multilateral development bank finance. Financial regulators will increasingly respond to the need to encourage or require financial institutions to incorporate biodiversity criteria into risk assessment, investment, and disclosure. For example, the European Union's Sustainable Finance Disclosures Regulation entered into force in March 2021, requiring asset managers to define entity-level environmental, social, and governance (ESG) policies and submit annual product-level ESG disclosures.[54] For the banking sector, this means that central banks encourage or require scenario and stress testing of loan portfolios, particularly in banks that are exposed to highly biodiversity-dependent sectors or locations. Regulators overseeing nonbank financial institutions, such as insurance companies and pension funds, should also provide guidance on how biodiversity could be incorporated into the risk assessments and investment processes of the firms they oversee. The formation of the Informal Working Group for the TNFD is a major step in advancing this agenda. Support for implementation of the recommendations of the TNFD will be needed to ensure that countries and private companies and financial institutions adopt them.

Promote the Use of Ecosystem Valuation in Decision Making

Developing and implementing natural capital and ecosystem valuation is a critical step to shedding light on the significance of nature at the macroeconomic policy level and engaging economic decision makers, including ministers of finance and planning, in the global response to the biodiversity crisis. Building on the advances that the System of Environmental and Economic Accounts has made and the United Nations Statistical Division has championed,[55] it is important to develop practical and actionable guidance for integrating ecosystem services into national accounting and estimating the economic value of a wide range of ecosystem services. This should include nature-based solutions such as carbon sequestration, flood and erosion protection, and food security (for example, fisheries and agroforestry). Such information would provide the basis for development of the economic analyses that are needed to compare investment options such as roads, seawalls, and policy reforms, including land and marine use planning policies. It would also complement the traditional GDP metric that examines only one part of economic performance – income – but says nothing about the depletion of underlying natural capital – including assets such as forests, water, fish stocks, biodiversity, and agricultural land – that threatens sustainable development objectives. The availability of such data would also greatly benefit the private sector, helping to inform the decisions of firms and financial institutions at the project and portfolio levels and helping them engage with sovereigns in an effort to manage natural resources more sustainably.

Advances in economic valuation should be complemented with technical assistance to help countries adopt sustainability metrics in decision making. The incorporation of natural capital accounts and ecosystem valuation in decision making at the country level represents a long-term agenda and could be promoted through technical assistance and experience sharing. Accounting for natural capital at the

54. Regulation (EU) 2019/2088 of the European Parliament and of the Council of November 27, 2019, on sustainability-related disclosures in the financial services sector.

55. https://seea.un.org/content/seea-experimental-ecosystem-accounting-revision.

macro level has limits in the absence of proper accounting prices and the substitutability assumptions implicit in valuation efforts. An incremental effort that starts with identifying possibilities for providing micro-level evidence of the effects of changes in ecosystem services on productivity, and thus on income and economic welfare, may be appropriate. The aim would be to increase the capacity of countries to acquire, maintain, and update data on natural capital and ecosystem services in physical and monetary terms and use such data in designing and implementing development policies, programs, and projects. One immediate opportunity is to use these data to inform programs in rebuilding greener after the COVID-19 economic crisis (box 7).

BOX 7 Putting Sustainability at the Center of the COVID-19 Recovery

The COVID-19 pandemic has changed the global social and economic landscape, with important implications for the priorities of the development community. Despite all its challenges, the COVID-19 recovery also presents significant opportunities to reorient development in a greener, more resilient, and inclusive direction. In response to COVID-19, the World Bank has moved quickly to support its clients and has identified "greening the recovery" as a priority in this effort.

The World Bank, including through the Global Program on Sustainability, is assisting clients with country-specific assessments of opportunities for integrating biodiversity and ecosystem services into economic stimulus programs (during and after recovery from COVID-19). Such technical assistance could also be complemented with Development Policy Financing, whereby World Bank financing in support of government budgets is enhanced by identifying policy actions that governments would undertake as a prerequisite to receiving financing.

Such work could help in evaluating (subject to the availability of the necessary data) the effects on growth, jobs, and environmental outcomes of alternative designs of stimulus packages and in assessing the merits of including measures to boost the resilience of countries to future epidemic and pandemic outbreaks in the recovery programs (for example, measures such as improved landscape management as a way to reduce the risks of zoonosis, and better air quality management as a way to reduce the population's susceptibility to airborne contagious diseases). Another possible area for engagement is identification of opportunities to decrease the cost of servicing present or future debt in return for increased action on nature loss (and climate change). In many countries, the economic downturn that COVID-19 has caused is reducing the fiscal space and hampering the ability of countries to meet their debt obligations. The fiscal easing that debt restructuring, interest buy-down, and other measures make possible could make resources available to be invested in actions to sustain natural capital, with global and domestic benefits (for example, waterflow regulation, coastal protection, and erosion control).

The World Bank uses its knowledge and analytics to support client countries in gradually advancing in the use of natural capital accounting and ecosystem valuation. *The Changing Wealth of Nations* is an example of the analytical work and innovative tools for better natural capital management that the World Bank is promoting in client countries. In its 2021 edition, for the first time, it estimates the value of blue natural capital (mangroves, coral reefs, and fisheries) as part of the national wealth accounts of 150 countries (World Bank 2020b). Another example is the integrated Global Trade Analysis Project and Integrated Valuation of Ecosystem Services and Tradeoffs modeling that the World Bank is pioneering to assess the impact of various policy responses on ecosystem services to 2030 and the ensuing economic consequences (Johnson et al. 2021).

Develop Comprehensive Biodiversity Finance Tracking

Tracking public and private investments with biodiversity and ecosystem service co-benefits also needs to be improved. Because of a lack of data and investment taxonomies, biodiversity finance tracking systems mostly track public investments in conservation ("financing green" projects or programs), which conceals a greater problem: lack of alignment of broader financial flows with biodiversity goals and subsequent lack of private investment in curbing the causes of nature loss (WBG 2020b). In recognition of this challenge, it is important to improve the tracking of biodiversity and ecosystem service co-benefits in investment portfolios. Many of the activities that governments and private entities have financed have a direct or indirect impact on nature. For example, in the case of the World Bank, based on an Independent Evaluation Group (2018) assessment,[56] analysis conducted for this paper identified that as much as 30 percent of the World Bank's lending in FY2015 to FY2017 addressed at least one of the drivers of biodiversity loss. There are opportunities for multilateral development banks and other development partners to reinforce internal monitoring tools and practices to measure biodiversity and ecosystem service co-benefits in their portfolios, for example by tagging relevant projects, building on the climate change co-benefit tracking systems.

6. LEVERAGE PARTNERSHIPS

Biodiversity and ecosystem services provide local benefits, but they often have regional and global public good characteristics, which means that progress on conserving, sustainably using, and equitably sharing the benefits of biodiversity rely on transboundary approaches and close cooperation between stakeholders at the local, regional, and global levels. The value of biodiversity and ecosystem services transcends political boundaries, and nature has an inherent potential for providing benefits to society at large. Ecosystems such as the Amazon basin in South America, the savannas in East Africa, and the forests in the Congo Basin are important local and national assets, but they also span countries, and their services (for example, hydrological regulation) go beyond their perimeters. This requires that multiple stakeholders at multiple levels work together toward a common vision. The consequences of biodiversity loss are also not confined to nation-states. The global decline in biodiversity affects all countries, although the effects of

56. An in-depth review was performed of project documents for a representative sample (~one-third) of World Bank projects approved between FY2008 and FY2010 and between FY2015 and FY2017.

loss are not equally distributed, and it is often the poorest countries that are most affected. To overcome this challenge, multilateral cooperation, including North-South and South-South cooperation, is required.

Build Multistakeholder Consensus around the post-2020 Global Biodiversity Framework

An ambitious, effective post-2020 global biodiversity framework is critical for a swift response to the biodiversity crisis and requires broad stakeholder engagement and consensus building. Multistakeholder cooperation is a crucial aspect of the response to the biodiversity crisis because it helps combine multidisciplinary expertise, engage different sectors, and mobilize much-needed financial resources. There are numerous examples of diverse actors working to help prepare the framework – ranging from initiatives to advance the scientific base (for example, IPBES) to those developing the economics of biodiversity (for example, the Independent Review on the Economics of Biodiversity) and biodiversity-relevant risk assessment and disclosure frameworks in the financial and private sectors (for example, TNFD).[57]

More work remains to build consensus on what is needed for a global deal for nature. The post-2020 global biodiversity framework calls for transformative action, assuming that a whole-of-government and -society approach is necessary to implement the systematic changes that are needed. Consensus needs to be built on what amounts to ambitious yet realistic targets and a systemic response that addresses the drivers of biodiversity loss. The same applies to the support mechanisms that are needed to harness sufficient technical and financial resources from all sources, including by leveraging private sector investment and innovation, and in all countries, including in low- and middle-income countries. Such support mechanisms could include, for example, increased emphasis on performance-based official development assistance and debt restructuring packages, gradually moving away from the current input- and transaction-based approaches; it could also include special financing provisions in the case of global or regional public biodiversity goods.

Engage Development Partners

Active engagement of the United Nations system, the GEF, multilateral development banks, and bilateral donors is needed for an effective, coordinated response. The catalytic financing role of multilateral development banks and other development partners can help in forging multistakeholder partnerships that can comprise the public and private sectors, research institutions, and civil society actors to advance collective action on nature conservation.

57. The scientific community, notably through the IPBES, is providing science-based evidence on biodiversity trends and the relevance of the contributions of nature to people. In March 2019, Her Majesty's Treasury – the United Kingdom's economic and finance ministry – commissioned an independent review of the economics of biodiversity to assess the economic benefits of biodiversity globally, assess the economic costs and risks of biodiversity loss, and identify a range of actions that can simultaneously enhance biodiversity and deliver economic prosperity. The TNFD, launched earlier this year, will provide biodiversity-relevant data and risk assessment frameworks and thus redirect global flows of finance toward nature-smart activities.

Bilateral partners and multilateral development banks are promoting biodiversity and ecosystem services in their strategic frameworks and operations. For instance, the European Investment Bank has launched the Eco.business Fund, which provides debt financing, channeling most funds into local financial institutions. Its objective is to promote business and consumption practices that contribute to biodiversity conservation and sustainable use of resources and to mitigate the effects of climate change in four priority sectors – agriculture, fisheries, forestry, and tourism. The European Investment Bank is also revising the methodology for biodiversity finance tracking, based on the European Union Sustainable Finance Taxonomy. The Inter-American Development Bank Natural Capital Lab provides a one-stop shop for members to encourage innovation in conservation, landscape, regenerative agriculture, biodiversity, and marine ecosystem finance. The Legacy Landscapes Fund, which the KfW Development Bank of Germany manages, draws in philanthropic and other donor funds to support landscapes of high biodiversity value in developing countries. More work is needed to expand North-South and South-South cooperation for a coordinated biodiversity response. The South-South cooperation is an opportunity to go beyond conventional development cooperation to cover areas such as trade, investment, and technology exchange as part of regional approaches.

The World Bank could support coordination of global programs and the establishment of partnerships to implement the post-2020 global biodiversity framework at the regional level. The World Bank has the capacity to support transboundary approaches and engage at the regional level through its advisory work and lending activities and is doing so in areas such as fisheries management under regional conferences (for example, the Indian Ocean and Pacific islands) and sustainable forest management under the Amazon Sustainable Landscape Program. The World Bank is also implementing global GEF programs such as the Global Wildlife Program and the Food Systems, Land Use, and Restoration Program, which encourage and facilitate implementation of activities in countries, sharing of experience and best practices, and regional coordination.

IDA is also able to leverage its Regional Window[58] to address transboundary issues and the challenges of small and fragmented markets, to create more integrated solutions, increase connectivity, manage shared resources, and provide global and regional public goods. Recent examples of such engagements include the following:

- The West Africa Coastal Areas Resilience Investment Project, which supports six country governments (Benin, Côte d'Ivoire, Mauritania, Senegal, São Tomé and Príncipe, and Togo) with funding and technical assistance through the Regional Window to determine which factors are threatening people, ecosystems, and economic assets along the West African coastline. The project acts as a catalyst for cooperation and mobilizes technical expertise, financing, and political will to ease regional integration and expand proven results. An expansion of this project to include Guinea Bissau and Ghana is being planned.

58. The goal of the IDA Regional Window is to promote development through regional approaches by providing top-up funding for eligible regional investments and facilitate collective action to address shared goals while taking advantage of economies of scale by acting together. Financial support from the IDA Regional Window is provided using Investment Project Financing and, starting in the 19th IDA replenishment, through Development Policy Financing (World Bank 2021d).

- The First South West Indian Ocean Fisheries Governance and Shared Growth Project, which used the IDA Regional Window allocation in Tanzania, Mozambique, and the Comoros to enhance regional collaboration by supporting the provision of a regional public good (fish stocks in international waters) through development of management plans.

Analytical work has also supported regional dialogue and platforms. For example, the Pacific Possible flagship work served as a platform for IDA's regional strategy in the Pacific and includes seven key themes, three of which directly benefit from and affect nature conservation: fisheries, tourism, and climate change and disaster management.

Harness Coalitions of Economic and Financial Policy Makers

Partnerships of governments and financial regulators from developing economies could help address the systemic risks stemming from nature loss and influence global agendas. Multiple economic and financial sector initiatives focused on climate change and sustainability have emerged in recent years and have convinced economic and financial policy makers of the need to integrate climate into their respective agendas. Such initiatives could be replicated or expanded to include biodiversity. Examples include the Coalition of Finance Ministers for Climate Action – a group of finance ministers from 50 countries that have endorsed the Helsinki Principles and committed to aligning fiscal policy and public expenditure with climate action plans. The World Bank serves as the Secretariat and an institutional partner of the coalition. Another example is the central banks' and supervisors' Network for Greening the Financial System, which the World Bank also supports. The Sustainable Banking Network – a voluntary community of financial sector regulatory agencies and banking associations from emerging markets – committed to advancing sustainable finance. The IFC spearheaded this effort in 2012 and serves as the Secretariat for the Sustainable Banking Network, which includes 38 member countries and accounts for US$43 trillion (85 percent) of emerging market banking assets (IFC and SBN 2019).

The Financial Sector Assessment Program,[59] conducted in coordination with the IMF, is one avenue for better integrating nature risks into financial stability monitoring. The scope of the program has recently been expanded to incorporate climate-related risks. Eventually, expanding this scope to include nature-related risks, once the methodologies to do so are developed through the work of initiatives such as TNFD, would help ministries of finance, central banks, and supervisors identify and assess these risks and could lay the foundation for more active monitoring, mitigation, and management.

Promote Trade Policy Coordination across Countries

The role that coordinated trade policies can play in curbing environmental degradation is increasingly being recognized. The past 30 years have witnessed a rapid increase in the number of preferential trade agreements and intensification of their coverage of the environment (for example, EU free trade

59. The Financial Sector Assessment Program comprehensively analyzes a country's financial sector. Assessments are the joint responsibility of the IMF and World Bank in developing economies and emerging markets and of the IMF alone in advanced economies. The program has two components: a financial stability assessment, which is the responsibility of the IMF, and a financial development assessment, which is the responsibility of the World Bank (IMF 2019).

agreements include trade and sustainable development chapters with binding provisions on environmental protection, climate change, biodiversity, and forests). These are important first steps, often supported by high-income importing countries. To avoid "leakage,"[60] importing countries also impose border tax adjustments, with the goal of encouraging environmentally sustainable production in exporting countries and reducing the scope for substitution of cheaper imports from unsustainable production in other countries, although border tax adjustments by importing countries can have unintended consequences. In the case of climate mitigation, border tax adjustments are implemented to create a level playing field between domestic producers subject to carbon pricing and imports from producing countries that do not have similar instruments. Recent research shows the environmental bias of trade policies, which tend to provide implicit subsidies to dirty industries (Shapiro 2020). Support for trade policy coordination between countries on biodiversity risks could be expanded, in partnership with the World Trade Organization, regional trading blocs (for example, the European Union), and global commodity chains.

60. "Leakage" refers to the situation that may occur if, to avoid the costs related to environmental policies, businesses were to transfer production to other countries with laxer emission or environmental degradation constraints (adapted from the concept of "carbon leakage," as defined by the European Commission (https://ec.europa.eu/clima/policies/ets/allowances/leakage_en).

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CONCLUSION

Addressing the rapid loss of biodiversity and ecosystem services requires vision, economywide leadership, capacity building, and resources that have not been tapped. CBD COP-15 has given new momentum to the transition to nature-smart development. Taking the right approach to developing food systems, building infrastructure, producing energy, and producing goods and services for a growing global population will support the transition. Change requires greater ability of public and private decision makers at all levels to recognize the value and harness the benefits of a healthy, productive planet and a stronger voice and greater participation of local communities and Indigenous Peoples.

Preparation of a post-2020 global biodiversity framework is well underway. The framework will be designed to galvanize urgent, transformative action by governments and all of society to achieve the outcomes it sets out in its vision, mission, goals, and targets and thereby to contribute to the objectives of the CBD and other biodiversity-related multilateral agreements, processes, and instruments. It will be implemented primarily through activities at the national level, with supporting actions at the subnational, regional, and global levels. The framework provides a global, outcome-oriented basis for developing national and as appropriate, regional goals and targets; updating NBSAPs to achieve these as necessary; and facilitating regular monitoring and review of progress at the global level.

Efforts to recover from the COVID-19 crisis provide new impetus for the world to build back better, following a year in which risks associated with degradation of nature brought many economies and livelihoods to the brink. The draft of the post-2020 global biodiversity framework calls on the global community to address the systemic risks stemming from the nature crisis in a coordinated fashion. The parameters of a global green deal would entail elevating to the highest political level the importance of systematically addressing biodiversity losses and including reciprocal commitments. It would also entail forging a consensus or perhaps coalition of willing countries, initially, to define what a systemic approach means.

In this context, for the benefit of policy makers, this approach paper outlines the development challenges and opportunities associated with blue and green biodiversity and ecosystem services in the run-up to CBD COP-15. By adopting a development focus, stressing the importance of mainstreaming nature in decision making at all levels, and seeking to harness additional finance, the paper is consistent with negotiation efforts. It outlines six global response areas on which countries could focus to unlock nature-smart development to promote efficiency, resilience, and inclusion. In support of these efforts, the paper also outlines contributions of the WBG to the six response areas, which include closing the biodiversity and ecosystem services data gaps; increasing institutional capacity to manage natural capital effectively; engaging financial and economic policy makers to bring biodiversity into macroeconomic, financial sector, and trade policy; and fostering intersectoral and global cooperation.

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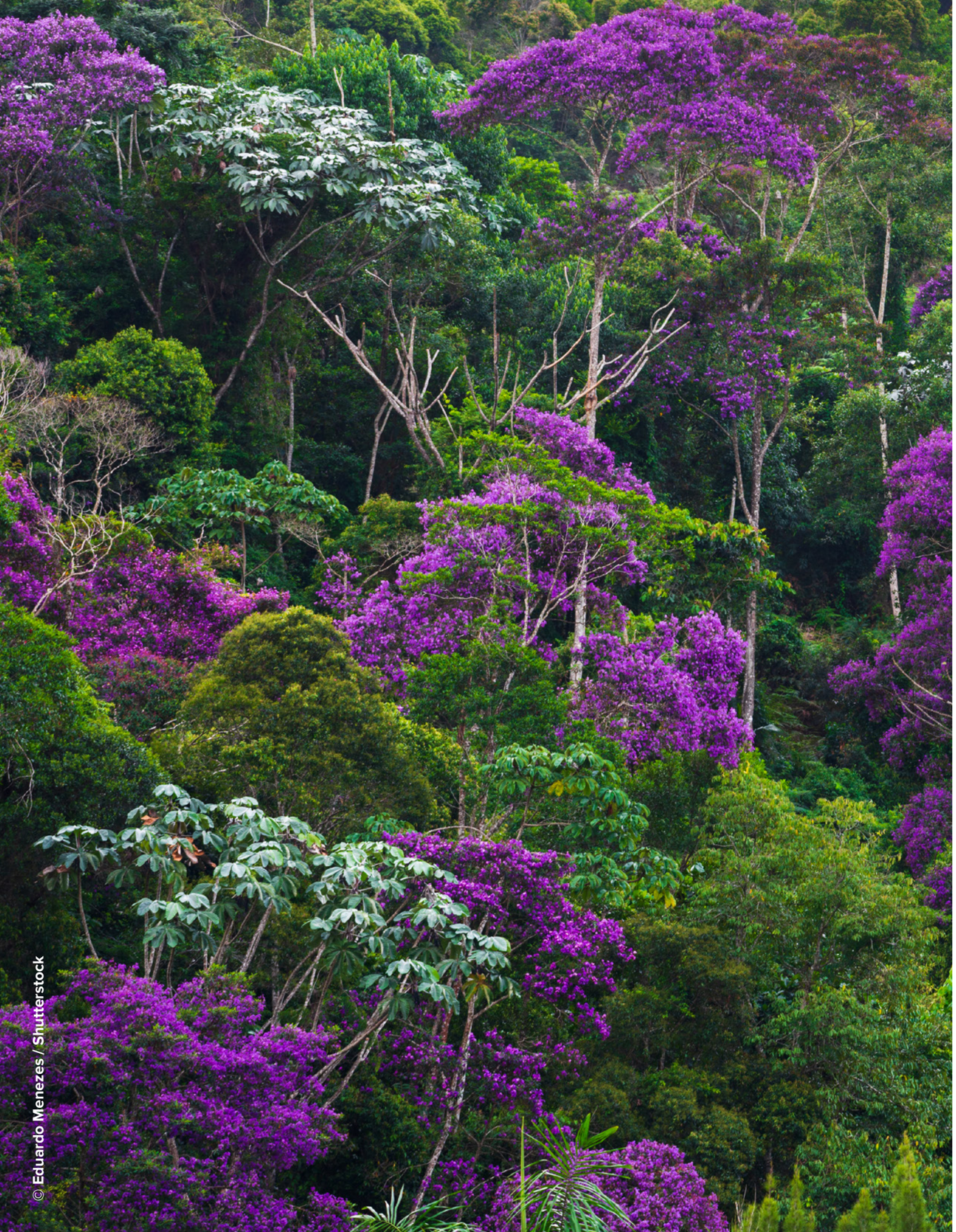


GLOSSARY

Biodiversity is 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; this includes diversity within species, between species, and of ecosystems. (Convention on Biological Diversity)

Biodiversity loss is the reduction of any aspect of biological diversity (that is, diversity at the genetic, species, and ecosystem levels) in a particular area through death (including extinction), destruction, or manual removal; it can refer to many scales, from global extinctions to population extinctions, resulting in decreased total diversity at the same scale. (IPBES)

Biodiversity offsets are measurable conservation outcomes resulting from actions designed to compensate for significant residual adverse biodiversity impacts arising from project development and persisting after appropriate avoidance, minimization, and restoration measures have been taken. (International Finance Corporation)

Biosphere is the sum of all the ecosystems of the world. It is both the collection of organisms living on the Earth and the space that they occupy on part of the Earth's crust (the lithosphere), in the oceans (the hydrosphere), and in the atmosphere. The biosphere is all the planet's ecosystems. (IPBES)

Blended finance is the use of catalytic capital from public or philanthropic sources to increase private sector investment in sustainable development. (Convergence) More specifically, it is the use of concessional donor funds to mitigate specific investment risks and help rebalance risk-reward profiles of pioneering, high-impact investments so that they have the potential to become commercially viable over time. (International Finance Corporation)

Blue economy refers to sustainable and integrated development of economic activities in healthy oceans. (World Bank)

Catalytic/concessional capital accepts disproportionate risk and/or concessionary return to generate positive impact and enable third-party investment that otherwise would not be possible. (Convergence)

Circular economy is a broad conceptual framework aiming to go beyond the traditional linear industrial model ("take – make – dispose") to decouple economic growth from resource consumption by retaining as much value as possible from products, parts, and materials and organizing the economic activities into a closed-loop process of "resource – production – consumption – regenerated resource" (Enriquez, Sánchez-Triana, and Guerra López 2021). It is based on three principles: design out waste and pollution, keep products and materials in use, and regenerate natural systems. (Ellen McArthur Foundation)

Climate change is change of climate that is attributed directly or indirectly to human activity that alters the composition of the global atmosphere and is in addition to natural climate variability observed over comparable time periods. (UNFCCC)

Drivers of change, in the context of the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services (IPBES) and this paper, are all the factors that, directly or indirectly, cause changes in nature, anthropogenic assets, nature's contributions to people, and a good quality of life. Drivers have direct physical (mechanical, chemical, noise, light, and so forth) and behavior-affecting impacts on nature. They include, inter alia, climate change, pollution, different types of land or sea use change, invasive alien species and zoonoses, and exploitation. Indirect drivers are drivers that operate diffusely by altering and influencing direct drivers, as well as other indirect drivers. They do not impact nature directly. Rather, they impact it by affecting the level, direction, or rate of direct drivers. Global indirect drivers include economic, demographic, governance, technological, and cultural ones. (adapted from IPBES)

Ecosystem is a dynamic complex of plant, animal, and micro-organism communities and their nonliving environment interacting as a functional unit. (IPBES)

Ecosystem services (also referred to as nature's contributions to people) are the benefits people obtain from nature (Millennium Ecosystem Assessment). Ecosystem services are organized into four types: (i) provisioning services, which are the products people obtain from ecosystems and which may include food, freshwater, timber, fiber, or medicinal plants; (ii) regulating services, which are the benefits people obtain from the regulation of ecosystem processes and which may include surface water purification, carbon storage and sequestration, climate regulation, or protection from natural hazards; (iii) cultural services, which are the nonmaterial benefits people obtain from ecosystems and which may include natural areas that are sacred sites and areas of importance for recreation and aesthetic enjoyment; and (iv) supporting services, which are the natural processes that maintain the other services and which may include soil formation, nutrient cycling, and primary production. (World Bank)

ESG stands for environmental, social, and governance. It is a generic term used in capital markets and by investors to evaluate corporate behavior and determine the future financial performance of companies. ESG is a subset of nonfinancial performance indicators that include sustainable, ethical, and corporate governance issues. (Financial Times) Investors are increasingly applying these nonfinancial factors as part of their analysis process to identify material risks and growth opportunities. ESG metrics are not commonly part of mandatory financial reporting, although companies are increasingly making disclosures in their annual reports or standalone sustainability reports. (CFA Institute)

Financial sector is the set of institutions, instruments, and regulatory framework that permit transactions to be made by incurring and settling debts, that is, by extending credit. (OECD)

Financing green is increasing financial flows to projects that contribute – or intend to contribute – to the conservation, sustainable use, and restoration of biodiversity and ecosystems and their services to people (WBG 2020b).

Greening finance is directing financial flows away from projects with negative impacts on biodiversity and ecosystems and toward projects that mitigate negative impact and/or pursue positive environmental impacts as a co-benefit (WBG 2020b).

Green, resilient, and inclusive development (GRID) is an approach that pursues economic progress through a recovery path that is inclusive and consistent with environmental and social sustainability. (World Bank)

Impact assessment is a formal, evidence-based procedure that assesses the economic, social, and environmental effects of public policy or any human activity. (IPBES)

Land use is the human use of a specific area for a certain purpose (such as residential, agriculture, recreation, industrial, and so forth). Land use is influenced by, but not synonymous with, land cover. Land use change refers to a change in the use or management of land by humans, which may lead to a change in land cover. (IPBES)

Materiality refers to the significance of a matter in relation to a set of financial or performance information. If a matter is material to the set of information, then it is likely to be of significance to a user of that information. (OECD) Materiality is rarely determinable by a bare quantitative equation; rather, it requires an assessment of whether a reasonable investor would consider the information relevant to its decision whether or not to invest in a company. That assessment may require consideration of both quantitative and qualitative factors. (Commonwealth Climate and Law Initiative)

Mitigation hierarchy is a tool that guides users toward limiting as far as possible the negative impacts on biodiversity from development projects (The Biodiversity Consultancy). It consists of four sequential steps that must be taken throughout the project's life cycle to limit any negative impact on biodiversity: (i) anticipate and avoid risks and impacts; (ii) where avoidance is not possible, minimize or reduce risks and impacts to acceptable levels; (iii) once risks and impacts have been minimized or reduced, mitigate; and (iv) where significant residual impacts remain, compensate for or offset them, where technically and financially feasible. (World Bank)

National Biodiversity Strategy and Action Plan (NBSAP) is a policy document, developed and adopted by Parties to the Convention on Biological Diversity, in line with the requirements of Aichi Biodiversity Target 17. (Convention on Biological Diversity)

***Nature*,** in the context of this paper, refers to the natural world, with an emphasis on biodiversity. Within the context of science, it includes categories such as biodiversity, ecosystems, ecosystem functioning, evolution, the biosphere, humankind's shared evolutionary heritage, and biocultural diversity. Within the context of other knowledge systems, it includes categories such as Mother Earth and systems of life. Other components of nature, such as deep aquifers, mineral and fossil reserves, and wind, solar, geothermal, and wave power, are not the focus of the paper. Nature contributes to societies through the provision of contributions to people. (adapted from IPBES)

Nature-based solutions are actions to protect, sustainably manage, and restore natural or modified ecosystems, which address societal challenges effectively and adaptively, simultaneously providing human well-being and biodiversity benefits. (IUCN)

Nature-smart, in the context of this paper, refers to approaches to policy, investments, and practices that include biodiversity and ecosystem service considerations from the perspectives of mitigating risks arising from the loss of nature and harnessing the economic and social benefits and opportunities that ecosystem services provide.

One Health is a collaborative, multisectoral, transdisciplinary approach – working at the local, regional, national, and global levels – to achieve optimal health and well-being outcomes, recognizing the interconnections between people, animals, plants, and their shared environment. (One Health Commission)

Paris Agreement or, in full, the Paris Agreement under the United Nations Framework Convention on Climate Change (UNFCCC), was adopted in December 2015 in Paris, France, at the 21st session of the Conference of the Parties (COP) to the UNFCCC. One of the goals of the Paris Agreement is "holding the increase in the global average temperature to well below 2°C above pre-industrial levels and pursuing efforts to limit the temperature increase to 1.5°C above pre-industrial levels," recognizing that this would significantly reduce the risks and impacts of climate change. Additionally, the Agreement aims to strengthen the ability of countries to deal with the impacts of climate change. (adapted from IPCC)

Payment for ecosystem services, in this paper, refers to mechanisms under which those who provide positive externalities are compensated for doing so, usually through payments from the beneficiaries. There is no settled definition of the term, however, and it can be used very broadly to include, for example, pollution charges. (World Bank)

Tail risks refer to events that have a small probability of occurring, namely those that fall outside three standard deviations from the mean under a normal distribution. Empirical studies in macroeconomics tend to approximate the deviations of aggregate economic variables from their trends with a normal distribution, which does not provide a good approximation of the distribution of aggregate variables at the tails and may significantly underestimate the frequency of large economic downturns (Acemoglu, Ozdaglar, and Tahbaz-Salehi 2017). In this paper, the concept is applied in the context of nature loss, which is increasingly seen a source of "fat" tail risks, like those arising from climate change (Weitzman 2011).

Taxonomy refers to a classification system for investments, particularly as they relate to a government's environmental goals (scientific taxonomies are not discussed in this paper).

Tipping points refer to critical thresholds in an ecological system that, when exceeded, can lead to a significant change in the state of the system and prevent the system from returning to its former state. (adapted from Hoegh-Guldberg et al. 2018; IPBES).

Triple bottom line is an accounting framework that incorporates three dimensions of performance: social, environmental, and financial. It differs from traditional reporting frameworks because it includes ecological and social measures in addition to financial ones. The concept was introduced by John Elkington. (California Management Review)

Zoonotic disease (or zoonosis) is an infectious disease that has jumped from a nonhuman animal to humans. (WHO)

APPENDIX A: DEVELOPMENT CHALLENGE: SUPPORTING EVIDENCE

ECONOMIC CASE FOR NATURE

The economic case for action is twofold: preservation of biodiversity and functioning ecosystems averts systemic risks and offers win-win opportunities for development. This appendix presents the relevant evidence by outlining recent trends in biodiversity and ecosystem services (box A.1), discussing how these translate into material and systemic risks for productive sectors and economies, and contextualizing them in low-income and lower-middle-income countries that stand to lose the most from nature loss. The appendix outlines the synergies between sustainable management of nature and development, as well as climate change action, and identifies challenges to be overcome — direct drivers of nature loss, market and institutional failures, and binding constraints that act as barriers to the transition to nature-smart development.

BOX A.1 Trends in Biodiversity and Ecosystem Services

Globally, biodiversity and ecosystem health are deteriorating at an unprecedented rate in human history. The past century has been dubbed "the age of the Anthropocene,"[a] denoting a geological era during which human activity has become the dominant influence on climate and the environment. The past 50 years, in particular, have witnessed accelerating changes in the socioeconomic sphere that are rapidly decreasing the extent and condition of natural habitats and the abundance of wildlife in them.

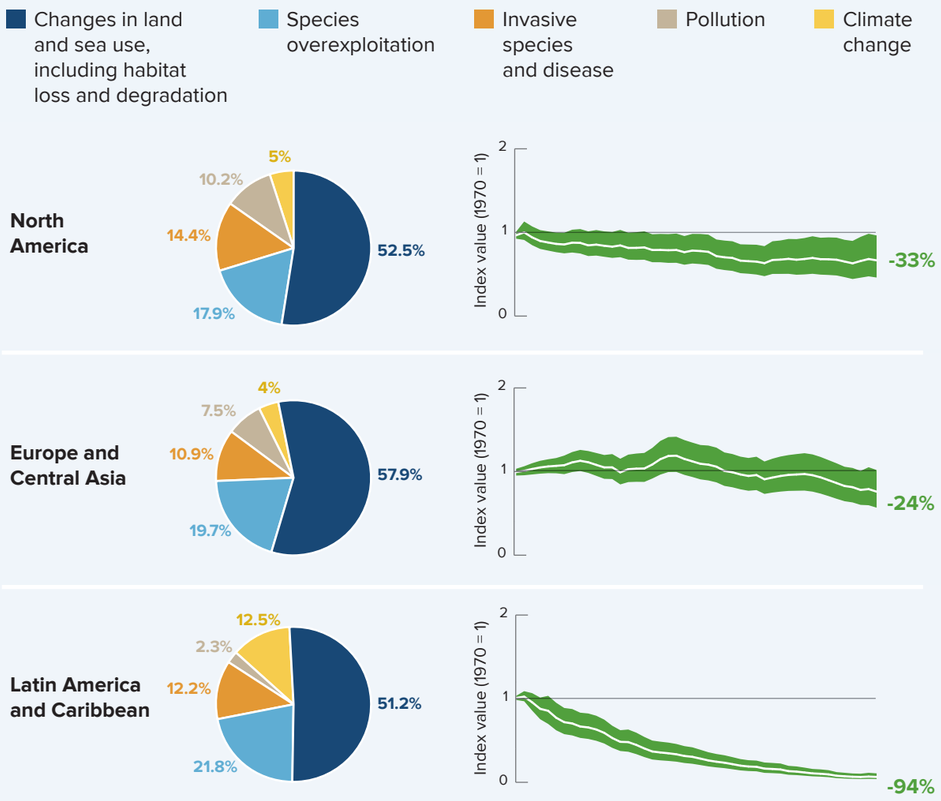
- Approximately 75 percent of the Earth's ice-free land surface and 66 percent of its marine environment have been significantly altered; more than 85 percent of the area of wetlands has been lost (IPBES 2019).
- The average abundance of mammals, birds, fish, reptiles, and amphibians declined by 68 percent between 1970 and 2016 (WWF 2020).

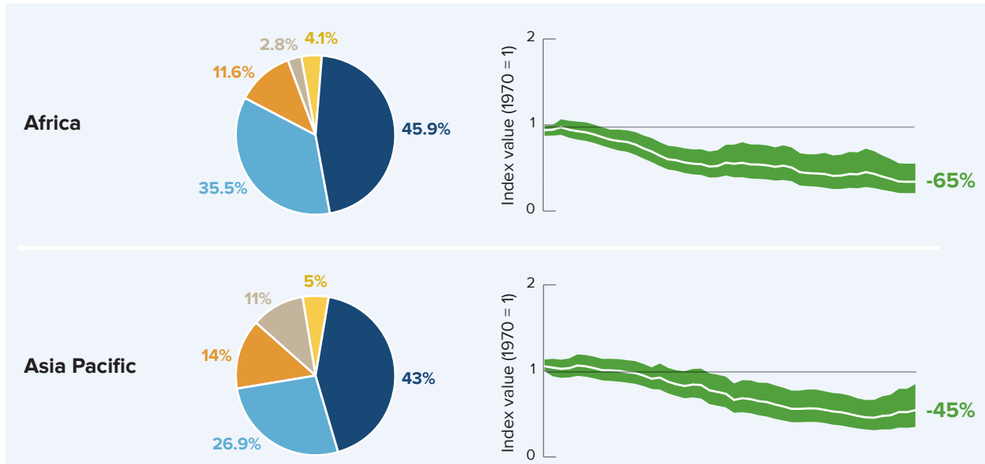
- Nearly one million animal and plant species are threatened with extinction, and many are expected to disappear within decades (IPBES 2019); it is estimated that current extinction rates are 1,000 times as high as the background (pre-human) rate (Pimm et al. 2014), threatening to trigger a sixth mass extinction.

Biodiversity loss is occurring in all regions, but Latin America and Africa have experienced the greatest decline in the past 50 years. South America, which saw a 94 percent decline in average abundance of mammals, is the worst affected region, followed by Africa, with a 65 percent decline (WWF 2020) (figure BA.1.1). No ecosystem is immune, and vital ecosystem services are starting to deteriorate worldwide, with 14 of the 18 assessed categories of nature's services in decline since 1970 (IPBES 2019).

a. Biologist Eugene Stormer and chemist Paul Crutzen coined the term and made it popular in the 2000s.

FIGURE BA.1.1. Regional Threats to Populations, Living Planet Index 2020





Source: WWF 2020

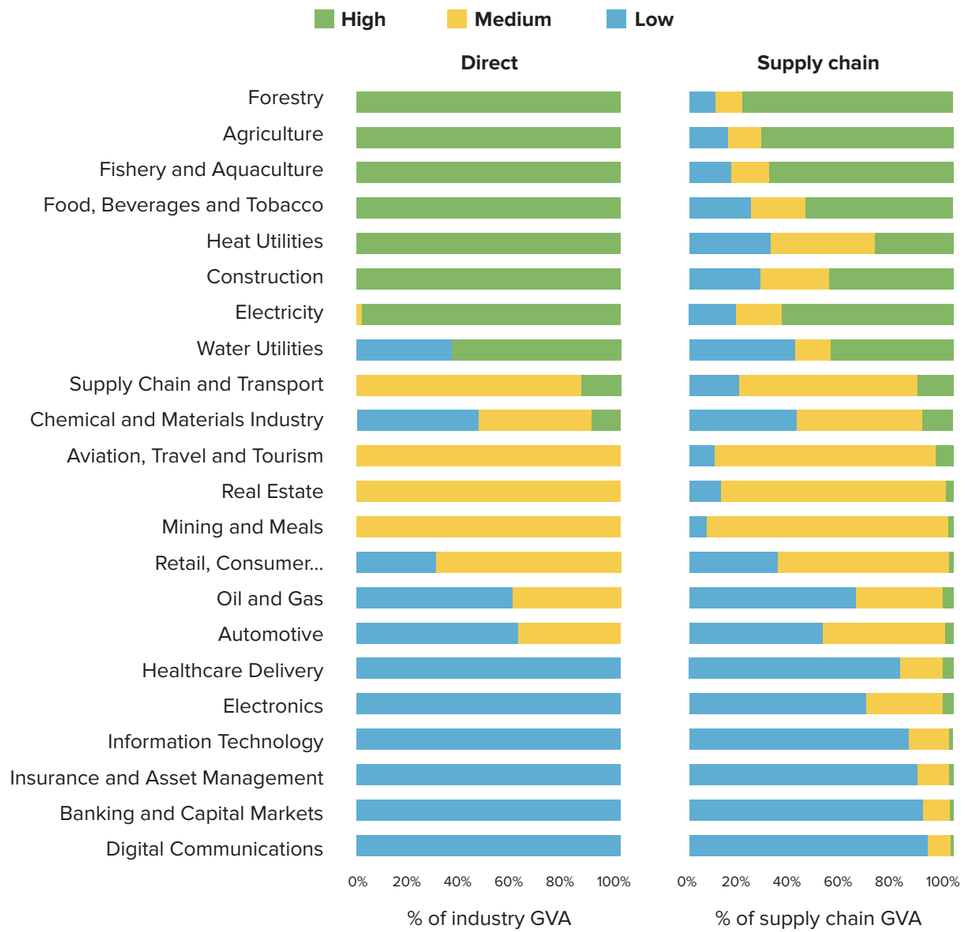
NATURE RISKS ARE MATERIAL AND SYSTEMIC

Biodiversity and ecosystem services underpin economies in tangible, measurable ways. The World Economic Forum estimates that US$44 trillion of global value added (corresponding to more than half of the world's gross domestic product (GDP)) is generated in industries that highly (US$13 trillion) or moderately (US$31 trillion) depend on nature and its services (WEF 2020a) (figure A.1). Key economic sectors such as construction, agriculture, and food and beverages depend on direct extraction of resources from forests or oceans and regulating and supporting ecosystem services[61] that ensure pollination, soil productivity, pest control, and clean water. More than 75 percent of food crops rely on animal pollination, for example, representing US$235 billion to US$577 billion of global crop output annually (Potts et al. 2016). Six other major sectors, including travel and tourism, real estate, and retail, have hidden dependencies on nature.

As the physical risks of biodiversity loss materialize, they affect the relative productivity of economic activities, sectors, and geographic areas. The extent and condition of natural habitats and the abundance of biodiversity in them have dropped drastically in recent decades, already causing the decline of 14 of the 18 assessed categories of nature's services to people. This means smaller fish catches, poorer freshwater quality, less availability of medicinal and biochemical resources, and less ability of nature to control pathogens and protect economic assets from extreme weather. The consensus is growing that biodiversity

61. Ecosystem services are the benefits people obtain from nature (Millennium Ecosystem Assessment). Ecosystem services are organized into four types: (i) provisioning services, which are the products people obtain from ecosystems and which may include food, freshwater, timber, fiber, or medicinal plants; (ii) regulating services, which are the benefits people obtain from the regulation of ecosystem processes and which may include surface water purification, carbon storage and sequestration, climate regulation, or protection from natural hazards; (iii) cultural services, which are the nonmaterial benefits people obtain from ecosystems and which may include natural areas that are sacred sites and areas of importance for recreation and aesthetic enjoyment; and (iv) supporting services, which are the natural processes that maintain the other services and which may include soil formation, nutrient cycling, or primary production (World Bank 2016).

FIGURE A.1 Percentage of Direct and Supply Chain Gross Value Added with High, Medium, and Low Nature Dependency, by Industry



Source: WEF 2020a.

Note: The World Economic Forum and Price Waterhouse Coopers (WEF 2020a) analyzed the nature dependency of 163 sectors and their supply chains across a range of ecosystem services. Each sector was assigned an overall dependency rating based on three factors: number of dependencies identified, mean strength of those dependencies, and maximum strength of any individual dependency. The sector-level dependency ratings were then applied to data on gross value added. For supply chain dependency, a global multiregional input-output model was used to analyze commercial relationships between sectors to assess the level of nature dependency in supply chains.

risks are material,[62] meaning that such disruptions of ecosystem services affect the performance and financial position of companies and can in turn affect whole value chains and the communities that depend on them. Countries with high concentrations of export-oriented sectors, such as agriculture and fishing, or those that are sensitive to changes in commodity prices are especially vulnerable to degradation of ecosystems. For example, 33 percent of India's GDP, 32 percent of Indonesia's, and 23 percent of the African continent's is generated in sectors that are highly dependent on nature (WEF 2020a).

Nature loss and climate change reinforce one another; the interaction of the two is capable of triggering ecological tipping points and regime shifts. The approximately 1.0°C rise in global temperatures over the past 30 years is having widespread impacts on species and ecosystems, affecting species distribution, phenology, population dynamics, and ecosystem function. For example, ocean heatwaves have led to mass coral bleaching and loss of half of the shallow-water corals on Australia's Great Barrier Reef (Lenton and Williams 2013). Even under a 1.5°C to 2°C global warming scenario, the majority of terrestrial species ranges are projected to shrink profoundly (IPBES 2019). For example, a World Bank study on the impacts of climate change on African fisheries estimated that, even under the most optimistic climate change scenario, the maximum catch potential will decrease by 30 percent or more as soon as 2050 in many tropical West African countries (World Bank 2019b). Likewise, the loss of nature contributes to climate change. Terrestrial and marine ecosystems sequester 60 percent of gross annual anthropogenic carbon emissions (IPBES 2019); their degradation results in the release of carbon and a reduction in their capacity to sequester carbon. The interaction of nature loss and climate can trigger potentially disruptive, irreversible tipping points and regime shifts – from the collapse of ice sheets, which can unleash self-reinforcing global warming,[63] to the disappearance of coral reefs and self-amplified forest loss in the Amazon (Zemp et al. 2017). The key takeaway for policy makers is that environmental degradation follows a nonlinear pattern; it is capable of compounding and causing catastrophic ecological losses that can permeate the global economy. The COVID-19 pandemic serves as an example (box A.2).

Of critical importance to the Sustainable Development Goals is the fact that nature loss is expected to affect the poorest economies the most. Although renewable natural capital, including land assets (such as agricultural land, protected forests, and productive forests) and blue assets (such as fisheries and mangroves), accounts for 5 percent of wealth globally, it accounts for 23 percent of the wealth in low-income countries (World Bank forthcoming a) (figure A.2). Current trends in the degradation of nature therefore have the potential to undo the development gains made in recent decades and strip low- and lower-middle-income countries of the foundations for future growth. Their most vulnerable populations may be at greatest risk; 79 percent of the global population living below the poverty line resides in rural areas (World Bank 2018a), and evidence suggests that they tend to be highly dependent on biodiversity

62. Materiality refers to the significance of a matter in relation to a set of financial or performance information. If a matter is material to the set of information, it is likely to be of significance to a user of that information (OECD 2013). Materiality is rarely determinable by a bare quantitative equation; rather, it requires an assessment of whether a reasonable investor would consider the information relevant to their decision as to whether to invest in a company (Staker, Garton, and Barker 2017).

63. One scenario of self-reinforcing global warming is where the rising global temperatures trigger large-scale melting of the ice sheets, which in turn reduces the reflective surface of the Earth (albedo effect). With less sunlight reflected into space, Earth's surface absorbs more heat, amplifying global warming and melting of the ice sheets (Steffen et al. 2018).

BOX A.2 Global Pandemics and Ecosystem Loss

The COVID-19 pandemic, which is having far-reaching economic impacts, is a powerful reminder of the link between human and planetary health. An estimated 60 percent of all known human infectious diseases and 75 percent of emerging infectious diseases are zoonotic (Taylor, Latham, and Woolhouse 2001). In the past half-century, we have faced several deadly disease outbreaks caused by novel viruses of animal origin, such as COVID-19, Ebola, AIDS, avian influenza, West Nile virus, Rift Valley fever, Severe Acute Respiratory Syndrome, and Middle East Respiratory Syndrome (WHO, FAO, and OIE 2004; Gebreyes et al. 2014). Many originate in wildlife, and livestock often serves as a bridge between wildlife and human infections. The rate of zoonotic disease emergence has increased markedly since the 1940s (Jones et al. 2008).

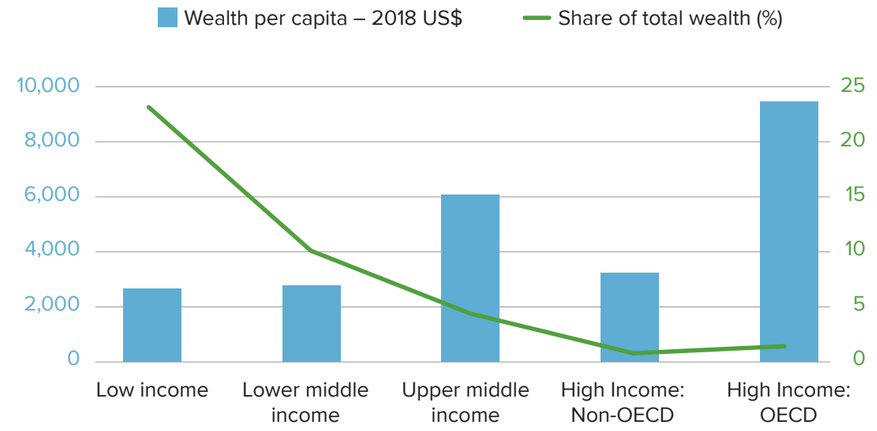
Science suggests that habitat loss or degradation is a key trigger of the spillover of zoonotic diseases to humans. The pathogens behind such outbreaks have wildlife reservoirs, with natural habitats acting as natural barriers, limiting human exposure to and the impact of many pathogens through a buffering effect (Cunningham, Daszak, and Wood 2017), but habitat destruction, unregulated wildlife trade, and climate change compromise the ability of nature to act as a shield. For example, almost half of the new zoonotic diseases since 1940 have resulted from land use change, agricultural intensification, and other food production practices that increased human-wildlife interaction or wildlife consumption and bushmeat hunting (Johnson et al. 2020; Keesing et al. 2010).

The effect of such outbreaks in terms of human lives and economic cost can be devastating. Among recent examples, the economic cost of the 2002 Severe Acute Respiratory Syndrome outbreak was estimated at US$41.5 billion, with 8,000 confirmed infections (UNEP 2016). The West Africa Ebola epidemic of 2014–16 claimed more than 11,000 lives and had pronounced socioeconomic impacts, including substantial losses in investments, private sector growth, agricultural production, and cross-border trade. In 2015 alone, it cost Guinea, Liberia, and Sierra Leone an estimated US$2.8 billion in gross domestic product (GDP) (US$125 per capita) (GPMB 2019). In Sierra Leone, the 20 percent drop in GDP that year erased five years of development. The COVID-19 crisis is exceeding these numbers and is doing so on a global scale. It has already shut down large parts of the global economy and may deeply affect certain sectors, such as travel and tourism, for years to come. Long-lasting impacts such as lower investment, erosion of human capital through lost work and schooling, and potential ruptures of global trade and supply linkages may be expected (World Bank 2020d).

Source: Adapted from WBG 2020b.

and ecosystem services for their livelihoods[64] and are likely to experience environmental degradation.[65] Addressing poverty and inequality and protecting the biosphere are closely related tasks. Biodiversity can no longer be seen as a niche topic; it must be central to the development process.

FIGURE A.2 Renewable Natural Capital: Wealth per Capita Value versus Share of Total Wealth in 2018, by Income Group



Source: World Bank forthcoming a.

Reaching ecological regime shifts, or tipping points, could jeopardize the prospects of some of the poorest countries to escape from poverty. Results from World Bank modeling estimates (Johnson et al. 2021),[66] referred to in the main text, show that a 90 percent reduction in pollination of crops by wild pollinators, provision of timber from tropical forests, and food from marine fisheries could result in 10 percent lower global real GDP growth from 2021 to 2030 than under a "no tipping point scenario." This represents a loss of US$2.7 trillion over the period. The geographic distribution of these effects reveals particularly staggering losses in some of the poorest countries and regions (see figure 2 in section 1 of the main text).

64. Examples from the literature: environmental income represents 28 percent of the total income of forest-adjacent communities (Angelsen et al. 2014), and without income from natural resources, poverty among smallholders in Latin America, South Asia, East Asia, and Sub-Saharan Africa would be higher (Hickey et al. 2016; Noack et al. 2015). In addition, more than 90 percent of people living in extreme poverty depend on forests for wild food, firewood, or part of their livelihoods (FAO and UNEP 2020).
65. As much as 83 percent of the world's extremely poor people (~one billion) live in areas characterized by factors such as deforestation, soil erosion, decreasing or low net primary productivity, and air pollution (World Bank 2019e).
66. The study uses an integrated Global Trade Analysis Project and Integrated Valuation of Ecosystem Services and Tradeoffs model to assess the effect on ecosystem services and global GDP of three tipping points: pollinators collapse, widespread conversion of tropical forests into grassland and shrubland, and marine fisheries collapse (~90 percent reduction in extent for each). The model comprehensively accounts for the pathways through which the economic shocks that ecosystem regime shifts induce are transmitted to various sectors of the economy (for example, reduction in fish stocks limits availability of key inputs for the fisheries industry) and across borders (for example, via commodity trade and movement of factors of production) (Johnson et al. 2021).

NATURE AS A DEVELOPMENT OPPORTUNITY

Risk mitigation alone does not justify action; investments in biodiversity have tangible development benefits. At the macroeconomic level, investments to reverse nature loss are welfare-enhancing (table A.1). More efficient long-term management of natural resources is key to unlocking sustainable development opportunities and building resilient infrastructure and human capital. Policies and investments that protect biodiversity can also be highly effective strategies to reduce poverty, increase shared prosperity, and boost the competitiveness of local economies. Steering markets and value chains toward nature-smart models ensures inclusive, long-term value creation.

TABLE A.1 Potential Benefits of Investments in Nature

Type of benefit	Impact on welfare	Channels through which policy affects welfare
Environmental	Increases welfare directly	Improved environment
Economic	Increases welfare by raising income	Increase in factors of production (physical capital, human capital, and natural capital) Accelerated innovation, though correction market failures in knowledge Enhanced efficiency, through correction nonenvironmental market failures and influencing behaviors
Social	Increases welfare through distributional effects, reduced volatility, and other social indicators	Increased resilience to natural disasters, commodity price volatility, and economic crises Job creation and poverty reduction

Source: Adapted from World Bank 2012.

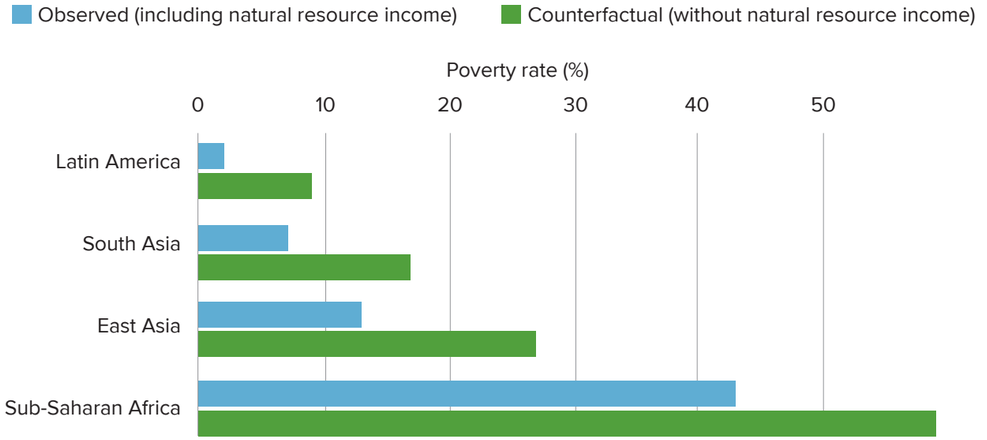
The fight against global poverty is not yet won, and in some places, such as rural areas, it is becoming more difficult. Roughly 10 percent of the global population (736 million people) live below the international poverty line of US$1.90 per day; 79 percent of them reside in rural areas (World Bank 2018a) and depend on agriculture, forestry, grazing, and hunting for subsistence livelihoods. Healthy ecosystems help prevent the descent of poor households into deeper poverty by providing food, water, and raw materials; enable movement out of poverty by creating economic opportunities; and ensure that the non-poor do not become poor, for example by acting as a barrier against natural disasters and as a safety net during economic crises (World Bank 2007). Because the COVID-19 pandemic was expected to plunge an additional 88 million to 115 million people into extreme poverty[67] in 2020, with the total potentially reaching

67. Extreme poverty, defined as living on less than US$1.90 a day, is likely to affect between 8.9 and 9.4 percent of the world's population in 2021 (World Bank 2020d).

as many as 150 million by 2021 (World Bank 2020d), nature's services to poor communities are more important than ever.

There is evidence that biodiversity and ecosystems support poverty reduction by providing livelihoods and jobs. Multiple examples of linkages between biodiversity, livelihoods, and jobs exist, particularly in the context of forest ecosystems. One-third of humanity has a close dependence on forests and forest products, but more than 90 percent of people living in extreme poverty depend on forests for at least part of their livelihoods (FAO and UNEP 2020). Figure A.3 shows that, without income from natural resources, poverty among smallholders in Latin America, South Asia, East Asia, and Sub-Saharan Africa would be higher. There is also evidence that sustainable forest management can serve as a steppingstone out of poverty. Community-based forest management significantly reduced poverty and deforestation across Nepal (Oldekop et al. 2019). Likewise, payments for ecosystem services helped conserve forest while also achieving small poverty reduction gains in Mexico (Sims and Alix-Garcia 2017).[68] Forests also create economic opportunities, with the formal forest sector accounting for 45 million jobs globally and generating labor income in excess of US$580 billion per year (FAO 2018).

FIGURE A.3 Poverty Rate in Subtropical Smallholder Systems



Source: Noack et al. 2015.

68. Causal links between good natural resource management and poverty reduction are hard to demonstrate. Miller, Mansourian, and Wildburger (2020) highlight how different social, economic, political, and environmental factors intersect to shape forest-poverty dynamics (see also Busch and Ferretti-Gallon 2017 and Ferraro, Sanchirico, and Smith 2019). These relationships are strongly context-dependent, varying with location and social, economic, and political contexts. Future research should place greater emphasis on more spatially disaggregated poverty data, longitudinal approaches, causal chains, and comparative analyses for better understanding the role of socioeconomic, political, and biophysical factors in the forest-poverty dynamics.

Further work is needed for better understanding of the causal linkages between poverty and forests. The Center for International Forestry Research (Miller, Mansourian, and Wildburger 2020) concludes that the understanding of how social, economic, political, and environmental factors intersect to shape forest-poverty dynamics remains limited, and these relationships are strongly context dependent, varying with geography and social, economic, and political contexts.[69] The paper recommends that future research should place greater emphasis on longitudinal approaches, causal chains, and comparative analyses to achieve a better understanding of the role of socioeconomic, political, and biophysical factors.

Marine and coastal ecosystems are another example of the importance of biodiversity for livelihoods and economic opportunities. Fish provide 3.3 billion people with 20 percent of their average per capita intake of animal protein, reaching 50 percent in some countries, such as Bangladesh, Cambodia, The Gambia, Ghana, Indonesia, Sierra Leone, Sri Lanka, and several Small Island Developing States (FAO 2020b). In 2016, nearly 60 million people were engaged in fisheries and aquaculture, many of them in small-scale fishery operations in developing countries (85 percent in Asia, 10 percent in Africa, and 4 percent in Latin America and the Caribbean) (FAO 2018). Coral reefs provide US$36 billion a year in economic value through tourism, with US$19 billion generated through on-reef tourism such as diving and the remainder from tourism in reef-related areas (Spalding et al. 2017).

Nature also serves as a physical buffer and safety net, making communities more resistant to natural and economic shocks. Exogenous shocks such as natural disasters and economic recessions can wipe out household assets and push people into poverty or aggravate existing poverty. Natural barriers such as mangroves and coral reefs diminish the effects of these shocks. Mangroves annually reduce property damage by more than US$65 billion and protect more than 15 million people. If current mangrove stands were lost, 29 percent more land, 28 percent more people, and 9 percent more property would be damaged every year. These values and benefits can be much higher locally (Menéndez et al. 2020). For example, the Sundarbans – the world's largest mangrove forest in coastal Bangladesh and West Bengal – offers multiple benefits, such as cyclone protection, waste recycling, and trapping of sediment for millions of people (Dasgupta et al. 2020).

Investment in biodiversity generates economic growth. The World Economic Forum identified 15 transitions in the three socioeconomic systems driving nature loss – food, land use, and ocean use; infrastructure and the built environment; and energy and extractives[70] – that could produce US$10.1 trillion in annual business opportunities and 395 million jobs by 2030 (WEF 2020b). There are opportunities in productive and regenerative agriculture, sustainable management of forests and fisheries, expansion of nature-based solutions for climate change mitigation and provision of infrastructure, and utility services. Box A.3 illustrates how nature-based solutions can offer win-win opportunities for development and nature.

69. For example, studies by Alix-Garcia et al. (2013) in Mexico and Heß, Jaimovich, and Schündeln (2019) in The Gambia to determine the causal impact of income growth on deforestation showed that income growth induced by a conditional cash transfer program and a community-driven development program, respectively, increased forest loss. By contrast, other studies in Mexico and Uganda suggest that programs offering payment in compensation for conservation activities have reduced rates of deforestation (Alix-Garcia, Sims, and Yañez-Pagans 2015; Jayachandran et al. 2017).

70. The World Economic Forum estimates that together with climate change, the threats emerging from these three socioeconomic systems endanger 80 percent of threatened or near-threatened species (WEF 2020b).

BOX A.3 Nature-Based Solutions for Development

Nature-based solutions are defined as "actions to protect, sustainably manage, and restore natural or modified ecosystems, that address societal challenges effectively and adaptively, simultaneously providing human well-being and biodiversity benefits" (IUCN 2020). Food and water insecurity, climate change, disaster risk, and development are some of the challenges that can be addressed using ecosystem-based approaches involving restoration, protection, and management of ecosystems (IUCN 2020). The following are examples of nature-based solutions (WBG 2020b; Burgess et al. 2019):

- ***Protection and restoration of forests*** – to capture carbon, protect watersheds and provide water supply (including predictability and quality), and support drought management.
- ***Green urban infrastructure*** – to capture stormwater and reduce flooding through green walls and roofs and increases in permeable ground surface.
- ***Conservation or rehabilitation of mangroves, reefs, and wetlands*** – to capture carbon; reduce flooding, coastal and soil erosion, and water salination; and purify water.
- ***Regenerative agriculture*** – to increase soil moisture retention and store carbon.

Nature-based solutions offer economic and environmental gains. It is estimated that mangroves in China, India, and Vietnam protect more than 12 million people from flooding, and including Mexico and the United States, mangroves avert flooding damage to residential and industrial property worth US$57 billion each year (World Bank 2018b). Because conventional approaches to defending the coastline tend to focus on built infrastructure, they neglect the potential to conserve natural habitats for coastal defense.

Water security is another example. An estimated 3.6 billion people (nearly half the global population) live in areas that are potentially water-scarce at least one month per year, and this could increase to 4.8 billion to 5.7 billion by 2050 (UN WWAP and UN Water 2018). Ecosystem degradation[a] is a leading cause of growing water resource management challenges. Nature-based solutions that rely on ecosystem-based restoration and protection can restore these functions. For example, in Kenya, the Tana River provides 80 percent of the drinking water for Nairobi, generates 70 percent of the country's hydropower, and irrigates approximately 645 square kilometers of farmland. Conversion of adjacent land to agriculture has triggered erosion and sedimentation that has reduced the capacity of the reservoirs. A US$10 million investment in sustainable land management (including to restore and reforest degraded lands) over 10 years is expected to help control sedimentation and generate a return of US$21.5 million in economic benefits over 30 years (UN WWAP and UN Water 2018).

a. For example, two-thirds of forested area is potentially degraded, and the majority of wetland areas have been lost since the beginning of the 20th century. Soil is eroding and deteriorating in quality. Climate change increases the risk of floods and droughts, aggravating ecosystem degradation (UN WWAP and UN Water 2018).

TRADE-OFFS AND OPPORTUNITIES

DRIVERS OF LOSS OF BIODIVERSITY AND ECOSYSTEM SERVICES

Nature is essential to human survival and economic prosperity, but total demand for the goods and services it provides exceeds its ability to regenerate. In the past five decades, the human population has doubled, the global economy has quadrupled, and global trade is 10 times as large. Incomes also increased, and the world has made remarkable and unprecedented progress in reducing poverty, which dropped from 60 percent in 1970 to less than 10 percent in 2018 (World Bank 2018c). Recent estimates show that 1.6 Earths would be required to maintain the world's current living standards with current economic systems (Dasgupta 2021). Global demands and pressures on nature have drastically increased (box A.4), and the way that renewable natural capital has been managed to meet these demands has not been efficient from an economic standpoint.

Market and policy failures facilitate unsustainable production and consumption patterns. Public goods, positive and negative externalities, and information asymmetries are some of the market failures that misalign the private and social costs and benefits of the use of nature, encouraging its use beyond the level that is socially optimal. First, many ecosystem services are public goods that are free (or virtually free), accessible, and open to all. Because markets cannot capture their value, they underprovide them. Second, the actors driving environmental degradation only partially feel its costs, whereas the benefits of nature conservation often accrue to the general public. This means that private actors see conservation and sustainable use of biodiversity as costs (direct or opportunity costs). Third, despite advances in technology and traceability, information asymmetries make it difficult for consumers to gauge the environmental footprint of products and services and for actors pursuing sustainable practices to communicate their value.

Environmentally harmful incentives embedded in fiscal policies remain widespread. It is estimated that governments spend at least US$500 billion annually in fiscal support to agriculture, forestry and fisheries, and fossil fuels that is potentially harmful to biodiversity (OECD 2020a). For example, more than half of global subsidies to fisheries, estimated at US$35 billion per year, are for fuel support and result in overfishing (Sumaila et al. 2016). Experiences from countries such as Mexico, Indonesia, India, and Brazil demonstrate that such policies encourage unsustainable production practices (OECD 2020b). They can amplify market failures, encouraging underpricing of biodiversity risks and value in private investment, production, and consumption decisions.

TRENDS IN KEY ECONOMIC SECTORS

Solutions to reverse biodiversity and ecosystem services loss lie in key economic sectors. Addressing the nature crisis requires a shift toward nature-smart practices in three key socioeconomic systems: food,

BOX A.4 Direct Drivers of Biodiversity Loss – An Assessment by the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services

Five man-made drivers are pushing nature to the limits. The 2019 landmark report of the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services (IPBES) identifies five direct "drivers of change" behind the unprecedented decline in biodiversity in recent decades: land use change, overexploitation,[a] pollution, climate change, and invasive species (table BA.4.1).

Over the past 50 years, 75 percent of the Earth's ice-free land surface and 66 percent of its marine environment have been significantly altered, and more than 85 percent of wetlands area has been lost (IPBES 2019). Between 1990 and 2020, the world lost approximately 178 million hectares of forests, an area the size of Libya, mainly to agricultural expansion[b] (FAO and UNEP 2020). The most biodiverse forests have suffered the most; approximately 100 million hectares of tropical forest was lost from 1980 to 2000 (IPBES 2019). In the oceans, live coral cover on reefs has nearly halved in the past 150 years, but the rate of decline has dramatically accelerated in recent decades, mostly because of climate change (IPBES 2019). Humans are also using the biosphere as a sink for unprecedented amounts of waste. Regional variations in these pressures and corresponding declines in biodiversity (as assessed according to the World Wildlife Fund Living Planet Index) are summarized in figure BA.1.1, in box A.1.

a. Overexploitation means harvesting species from the wild at rates faster than natural populations can recover. It Includes overfishing and overgrazing (IPBES 2019).

b. Agricultural expansion continues to be the main driver of deforestation and forest fragmentation and the associated loss of biodiversity. Large-scale commercial agriculture (primarily cattle ranching and cultivation of soya bean and palm oil) accounted for 40 percent of tropical deforestation between 2000 and 2010, and local subsistence agriculture accounted for another 33 percent (FAO and UNEP 2020).

TABLE BA.4.1 Direct Drivers of Biodiversity Loss: An Assessment by IPBES

Land use change	Overexploitation	Pollution	Climate	Invasive species
75 percent of land surface altered More than 85 percent of wetlands lost since 1700 Urban areas doubled since 1992 100 million hectares of tropical forest lost from 1980 to 2000	33 percent of marine fish stocks are overfished; 60 percent maximally sustainably fished Land degradation; lost productivity of 23 percent of terrestrial areas	Marine plastic pollution up tenfold since 1980 80 percent of wastewater discharged untreated 115 million tons of mineral nitrogen fertilizers applied each year to crops 300 million to 400 million tons of industrial toxic waste and heavy metals discharged into waterways annually	Greenhouse gas emissions doubled since 1980 Average global temperatures ~1°C higher in 2017 relative to preindustrial levels	Cumulative records of alien species increased by 40 percent since 1980

Sources: IPBES 2019; Gassert et al. 2013.

land, and ocean use; infrastructure and the built environment; and extractives and energy, which impact 80 percent of threated and near-threated species (WEF 2020b) (see section 1 in the main text). How these sets of sectors plan, invest, and produce matters not only for the environment, but also for development. They are the backbone of the global economy, accounting for one-third of global GDP and providing two-thirds of all jobs (WEF 2020b). Their output is critical to satisfying the needs and projected demand of a global population that could reach nearly 10 billion in 2050 (UN DESA 2019b).

Broadly speaking, common unsustainable practices in these sectors include resource intensity, low intensification, reliance on pesticides and artificial fertilizers, and overextraction. For example, livestock production is known to be resource intensive,[71] using one-third of all crops grown globally (WEF 2020b), and it is a major direct driver of tropical deforestation. It is projected that demand for ruminant meat will grow by 88 percent between 2010 and 2050 (WRI 2019). Although intensive, high-yield production systems with high-quality feeds, such as those found in New Zealand, are less emissions intensive and do not rely as much on natural habitat conversion to expand production (OECD 2020b), in non–Organisation for

71. For every food calorie generated, animal-based foods – and ruminant meats in particular – require many times more feed and land inputs, and emit far more greenhouse gases, than plant-based foods (WRI 2019).

Economic Co-operation and Development countries that are major exporters of beef and dairy products, such as Indonesia and Brazil, extensive production systems are the norm. In turn, crop cultivation tends to have comparatively high yields, but it often over-relies on fertilizer inputs, which over time contributes to land degradation and nutrient and pesticide water pollution. Intensification in food production brings environmental risks; thus, a holistic approach to assessing which practices are best suited in which context is required. By adjusting production practices in the food sector, it is possible to generate new sources of revenue while maintaining the natural resource asset base for sustained production.

A shift to nature-smart practices in infrastructure and the built environment could also unlock nature-smart development. Although cities occupy 2 percent of the Earth's total land surface, they account for 60 to 80 percent of global energy consumption, 75 percent of natural resource consumption, and 75 percent of global greenhouse gas (GHG) emissions (Swilling et al. 2013). The built environment expanded by 66 percent between 2000 and 2012 (WEF 2020b; Chen et al. 2019). Like with food systems, there are opportunities for the transport and building sectors and urban settlements to align practices with sustainable development objectives to help them meet growing infrastructure needs in an inclusive way. The share of the urban population is expected to increase to 70 percent by 2050, from 55 percent in 2019, with most of this growth occurring in developing countries (UN DESA 2019a). Basic infrastructure gaps persist. In 2017, nearly 785 million people lacked basic drinking water services (WHO 2019a), and two billion did not have adequate sanitation (WHO 2019b). One-third of the population is not served by an all-weather road (World Bank 2015).

There are also opportunities to reduce the environmental impact of infrastructure and urban development (in terms of GHG emissions, land use change, and waste), including through nature-based solutions. A recent study of the impact of road expansion in Kenya (Damania et al. 2019) shows that roads that were built over the past four decades have caused an 80 percent decrease in wildlife within a 20-kilometer radius; this coincided with a 70 percent decline in wildlife in Kenya as a whole. In contrast, spatial road planning that factors in wildlife constraints can significantly reduce the impact of new roads on wildlife and produce infrastructure that generates economic benefits. Globally, it is projected that the length of paved roads will increase by 25 million kilometers by 2050, with 90 percent of all road construction occurring within the least developed and developing countries (IPBES 2019). This highlights the need for planners to consider the long-term biodiversity implications of irreversible infrastructure decisions. Another example is waste, with 80 percent of the world's wastewater discharged untreated into biodiversity-rich freshwater and 80 to 90 percent of plastic waste inadequately discharged in many countries in South Asia and Sub-Saharan Africa (WEF 2020b). Finally, nature-based solutions are a missed opportunity. Although many infrastructure problems can be cost-effectively solved using green or a combination of green and grey infrastructure, such solutions are underused.

There are also opportunities in the energy and extractive sectors. Global resource extraction tripled from 27 billion tons in 1970 to 92 billion tons in 2017. Meanwhile, material productivity, defined as GDP relative to material and energy inputs, is stagnating (WEF 2020b). Extraction and processing account for approximately half of total GHG emissions, increase water stress, and decrease biodiversity. Mining uses less than 1 percent of global land area, but because of damaging extraction techniques and emissions of highly toxic pollutants (WEF 2020b; Cocks and Lewis 2019), its impact on biodiversity, water, and human health may be even larger than that of agriculture (WEF 2020b; IPBES 2019). Demand for minerals is expected only to increase, in

part because a low-carbon future will be mineral intensive, because clean energy technologies need more materials than fossil fuel–based electricity generation (World Bank 2020e). Another trend has been the rapid increase in hydro dams over the past 50 years. Worldwide, there are now approximately 50,000 large dams and 17 million large reservoirs[72] (IPBES 2019). Sound planning and biodiversity risk management could help exploit the synergies between climate change mitigation and the biodiversity agenda.

BINDING CONSTRAINTS ON A TRANSITION TO NATURE-SMART DEVELOPMENT

Despite broad recognition of the need to correct these economic inefficiencies that facilitate nature loss, little progress has been made, indicating the presence of binding constraints. This section identifies five binding constraints on or barriers to change that are keeping sectors and economies locked in unsustainable pathways and need to be addressed: short- and long-term trade-offs, lack of data and knowledge, capacity constraints, domestic political economy factors, and the global public good nature of many ecosystem services.

Short- and Long-Term Trade-offs

Short-term priorities are undermining decisions about natural resource management in communities and productive and financial sectors. Conservation or sustainable use of nature is typically seen as incurring large costs (direct or opportunity costs) now for benefits that will materialize only in the long term. For example, subsistence farmers may have food surpluses that are too small to make the conservation or land intensification investments that are needed to prevent land and resource degradation in the long term. Landowners are likely to prioritize productive activities that generate immediate gains, such as planting annual crops, over setting aside forest for sustainable management, whose gains do not fully materialize for 10 to 20 years. These trade-offs are amplified where property rights are weak and markets for environmental services are absent. In the financial sector, the "tragedy of the horizon" means that investors are mandated to pay attention to performance over shorter timeframes than what is typically required for impacts of biodiversity protection or destruction to accrue (WBG 2020b).

The tension between short- and long-term trade-offs is also inherent in policy. From a policy maker's perspective, the decision to set aside a mangrove forest involves tangible opportunity costs for short-term development (for example, development of shrimp farming or tourism) and no obvious direct benefit for local communities (World Bank 2012). Fiscal, economic, and trade incentive structures tend to favor rapid expansion of economic activity and maximizing output, and often environmental harm, over the conservation, restoration, and sustainable use of nature that supports long-term growth (IPBES 2019). Continued reliance on GDP as the main metric for measuring economic progress and lack of understanding of the value of natural capital and how it can generate economic returns, and support local development, amplifies the short-term bias.

72. Large dams are defined as taller than 15 meters, and large reservoirs are defined as larger than 0.01 hectare or 100 square meters (IPBES 2019).

Lack of Data and Knowledge

Data gaps related to the value of biodiversity, the impact of various activities on biodiversity, and the risks associated with its loss persist at every level of decision making. Impact traceability in key value chains remains limited because company-level data related to dependencies on and the impact of activities on biodiversity are typically not available. Global trade allows consumption to be geographically decoupled from environmental degradation, reinforcing the problem, because it shifts the burden of environmental degradation from the countries driving the consumption to the exporting (and often developing) countries. In financial markets, the lack of relevant data and measurement standards for assessing biodiversity impact and risk means there is limited tracking of biodiversity in financial portfolios. Better understanding and disclosure of biodiversity's impact and risks is a prerequisite for building a strong business and economic case for the transition to nature-smart practices in key sectors.

At the policy level, incorporation of ecosystem accounts into natural capital accounting and national policy more broadly is incipient. Policy makers rely on measures of economic performance that do not account for the economic benefits of sustainable management of nature. For example, projections of monetary benefits from maintaining a mangrove cover, including avoided damage to built assets due to extreme weather, fisheries productivity, and availability of wood for local communities (World Bank 2012), may not be available and accounted for in land use planning decisions. Data gaps reinforce silos of economic sectors and make it challenging to identify and quantify the true trade-offs between and synergies across alternative policy options. An example of this is the limited coordination in the global response to the climate and biodiversity crises.

Capacity Constraints

Biodiversity-relevant capacity gaps span individual, organizational, and systemic levels. The United Nations Environment Programme and the World Conservation Monitoring Centre (UNEP and WCMC 2020) define these levels as: (i) individual, focusing on the skills, knowledge, and experience individuals need to perform their roles; (ii) organizational, relating to internal policies and structures of the institutions or organizations where those individuals perform their roles; and (iii) systemic, referring to the enabling environment and broader context in which individuals and organizations exist, including legal and policy frameworks, power relations, and social norms. The three levels of capacity are interdependent and mutually reinforcing. A recent assessment of biodiversity-relevant capacity-building needs and gaps under the Convention on Biological Diversity (UNEP and WCMC 2020) found significant theme-specific and functional capacity gaps. Governments report challenges in key technical areas such as benefit sharing, human-wildlife conflict, monitoring and impact measurement, pollution control, and ecosystem restoration. Awareness of the value of biodiversity among countries, particularly its economic and socioeconomic importance and its link to development, is limited, which undermines mainstreaming efforts. Broadly speaking, the capacity to engage proactively and constructively with a wide range of stakeholders to address biodiversity loss is limited. At the systemic level, countries stress the need for support to establish science-policy "bridge" institutions and for sensitization of the public to biodiversity because there are gaps in public awareness. Private sector actors face similar

challenges. Overall, these trends reflect the complexity of the biodiversity crisis and confirm that capacity building is crucial.

Domestic Political Economy Factors

Political economy considerations often act as salient barriers to decisive policy action to reverse biodiversity loss. Concerns about potential impacts on competitiveness or distributional effects and the influence of vested interests or the political and social acceptability of reform may undermine efforts to implement an ambitious reform program or put it at risk of policy reversals. The World Bank has conducted modeling work to analyze the impact of a set of nature-smart policy scenarios that avoid conversion of natural ecosystems on different factors of production, including land and labor (Johnson et al. 2021); in most countries, none of the reform scenarios resulted in both land and labor both being better off (figure A.4).

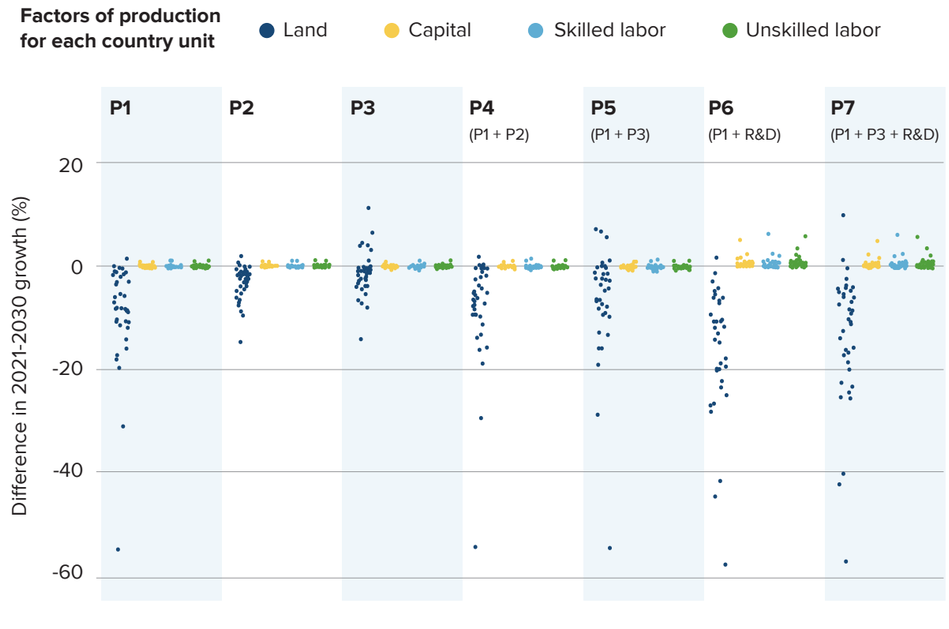
Empirical evidence also reveals challenges with political economy, including in relation to environmental fiscal reform programs (OECD 2017) and the need to ensure an inclusive and equitable transition. For example, concerns about competitiveness have been widespread in Organisation for Economic Co-operation and Development countries that have tried environmental fiscal reform, leading to exemptions of key sectors such as agriculture and industry (Chaturvedi et al. 2014). Environmental fiscal reforms have also been met with opposition and controversy in several developing countries, for example in India in relation to reform of diesel subsidies and in Ghana in relation to an increase in electricity prices (Chaturvedi et al. 2014). Yet, there is scarce empirical evidence suggesting that environmental regulation reduces competitiveness and social equity outcomes if it is implemented as an integrated policy solution. Environmental fiscal reforms can be revenue neutral, providing revenue sources to minimize costs to affected sectors in a targeted, non-distorting way.

Existence and Under-provision of Global Public Goods

Although not all of nature and its services are global public goods, many associated costs and benefits transcend borders, and success in restoring ecosystems relies on international cooperation and burden sharing. Even if all other binding constraints are eliminated at the country level, success at the global level is not guaranteed as long as there is no international cooperation and burden sharing. Multiple countries exert pressure on shared ecosystems, such as the Amazon in South America, forests in the Congo Basin, and fisheries in the Mediterranean. Preserving the great African migrations of large herbivores and migrating bird species requires close cooperation across national jurisdictions (Helm and Hepburn 2012). This implies the need for international treaties, bargaining between nation-states, consideration of potential trade-offs and connections between poverty reduction and biodiversity, and design of institutions that are capable of facing this global challenge (Helm and Hepburn 2012).

An international agreement exists for biodiversity; however, it has not been fully effective at halting the global biodiversity loss to date. The Convention on Biological Diversity entered into force in 1993, and in 2010, the 194 member countries adopted the 20 Aichi Biodiversity Targets for 2010 to 2020, although the latest assessment shows that the international community fell short of meeting them. None of the

FIGURE A.4 Effects of Selected Policy Scenarios on Returns to Factors of Production



Source: Johnson et al. 2021.

Note: Three policy scenarios were analyzed: (i) decoupled support to farmers in which agricultural subsidy rates (as defined in the Global Trade Analysis Project 10 database, also based on Organisation for Economic Co-operation and Development) are replaced with lump sum transfers to landowners; (ii) implementation of a global forest-carbon (FC) payment mechanism in which high-income countries pay based on historical emissions, and countries receive payments according to avoided deforestation; and (iii) a combination of decoupled support to farmers, a global FC payment mechanism, and a boost in public spending on agricultural research and development (R&D). P1 = decoupled support to farmers; P2 = domestic FC payment; P3 = global FC payment; P4 = subsidy reform + domestic FC payment; P5 = decoupled support to farmers + global FC payment; P6 = decoupled support to farmers + agricultural R&D; P7 = decoupled support to farmers + agricultural R&D + global FC payment.

20 targets has been fully achieved, and only six have been partially achieved (CBD Secretariat 2020b). The overall picture is one of progress at the country level but progress that is insufficient to address the global crisis.

Fishing activity along the Angoche coast, Mozambique, in the area supported by the World Bank's South West Indian Ocean Fisheries Governance and Shared Growth Program.

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APPENDIX B: WORLD BANK GROUP ENGAGEMENT ON BIODIVERSITY AND ECOSYSTEM SERVICES

The World Bank Group's (WBG) engagement on biodiversity and ecosystem services spans investments in conservation, livelihood development, institution- and capacity-building, financial innovation, and comprehensive risk management. The World Bank has a long track record of supporting institution- and capacity-building in client countries, expanding areas under protection, and creating incentives and financing mechanisms and instruments to maintain ecosystem services in productive landscapes while creating local economic opportunities. Increasingly, attention is shifting to economic sectors and policies outside of the purview of environmental ministries to mitigate the pressures on biodiversity and promote nature-smart sector practices. Biodiversity considerations are also mainstreamed into World Bank projects through the Environmental and Social Framework, and into IFC and MIGA projects through the Environmental and Social Performance Standards, which have become a global benchmark for public and private sector biodiversity risk management. Beyond risk mitigation of impacts at the project level, IFC has been expanding its reach to develop sector-wide approaches to integrating biodiversity. The ability of the World Bank, IFC and MIGA to join forces to develop integrated financing solutions in client countries has been a comparative advantage in WBG's efforts to support this agenda.

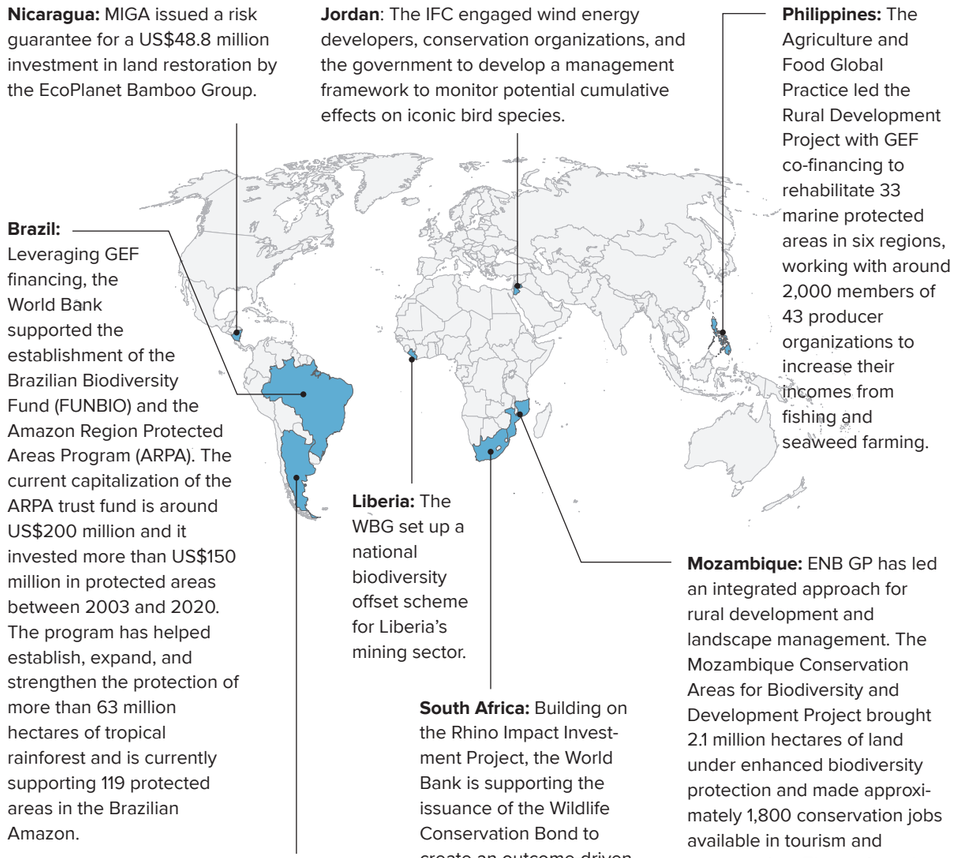
TRACK RECORD

The World Bank has actively supported global biodiversity for longer than three decades. The World Bank portfolio included 70 active projects in fiscal year (FY) 2020,[73] with total estimated commitment amount of US$1.18 billion.[74] The portfolio covered projects that not only directly invested in conservation of

73. A fiscal year begins July 1 and ends June 30.

74. The active portfolio estimate is conservative. Projects with a biodiversity theme amounting to less than 5 percent of the total commitment are excluded. An important limitation is that the methodology uses a narrow definition of support to biodiversity (focusing on direct investments in biodiversity conservation) and may underreport World Bank investments that address the drivers of biodiversity loss. A preliminary analysis of this broader work was conducted for this paper, based on an Independent Evaluation Group (2018) assessment. The analysis consisted of a review of project documents for a representative sample (~one-third) of World Bank projects approved between FY2008 and FY2010 and between FY2015 and FY2017. The analysis concluded that as much as 30 percent of the World Bank's lending in FY2015 to FY2017 addressed at least one of the drivers of biodiversity loss.

FIGURE B.1 Examples of World Bank Group Innovations in Nature Conservation and Sustainable Use



species and natural habitats, but that also supported livelihoods through sectors that rely on natural capital, such as forestry, fisheries, and agriculture. Approximately 16 percent of the projects in the FY2020 World Bank biodiversity portfolio were blended operations that leveraged concessional lending to increase the impact of trust fund financing. Global Environment Facility–financed stand-alone projects accounted for approximately 9 percent of the total biodiversity commitment. The FY2020 portfolios supported creation and consolidation of 10 million hectares of marine and coastal protected areas and 6 million hectares of terrestrial protected areas and brought 72 million hectares under enhanced biodiversity conservation. Approximately 460,000 beneficiaries were supported through alternative livelihood generation.[75] In addition, the portfolio encompassed projects that are establishing and capitalizing endowment funds for long-term financing of protected areas. Figure B.1 and table 2 provide examples of this work.

Beyond area-based conservation, biodiversity is integrated into the broader portfolio of the World Bank, which promotes biodiversity-friendly practices in agriculture, forestry, watershed management, fisheries, and coastal zone management. The Environment, Natural Resources, and Blue Economy Global Practice (US$832 million) and the Agriculture and Food Global Practice (US$273 million) together were responsible for 84 percent of the biodiversity commitments in the FY2020 portfolio. Other global practices such as Transport (US$34 million); Urban, Disaster Risk Management, Resilience, and Land (US$23 million); and Macroeconomics, Trade, and Investment (US$3 million) also have projects that directly contribute to the biodiversity theme. The WBG is also one of the largest multilateral development bank investors in forests. Its Forest Action Plan (FAP) portfolio analysis includes WBG projects that support conservation of biodiversity by decreasing threats to deforestation, reducing greenhouse gas (GHG) emissions, and promoting sustainable landscape management. A recent review of FAP FY2016 to FY2020 achievements shows that 5.8 million people benefitted from these projects, 960,000 land users adopted sustainable landscape management practices, approximately 400 government institutions were strengthened to improve forest management, and GHG emissions were reduced by 17 million tons.

The World Bank biodiversity portfolio builds on analytical and operational engagement on pollution, landscape and forest management, blue economy, environmental economics, and risk management.[76]

- The work on pollution management is addressing the broad spectrum of pollution issues driving biodiversity loss through operations spanning sectors such as solid waste management (Morocco), water pollution control (Lao People's Democratic Republic), and air quality management (Mongolia) (World Bank 2021e). Between 2000 and 2019, the WBG committed an average of US$3.26 billion per year to address these issues (World Bank 2021e). The WBG is expected to broaden these efforts, further integrating multisectoral and circular economy approaches by leveraging resources such as the upcoming PROCLEAN multidonor trust fund.
- With respect to development of the oceanic sectors, as of March 2020, the World Bank had a portfolio of approximately US$5.6 billion in active projects and US$1.5 billion in the pipeline

75. This analysis considers projects where the biodiversity theme amounted to more than 50 percent of the total commitment amount.
76. The World Bank's work on environmental sustainability is organized around five business lines: forests, watersheds, and sustainable landscapes; blue economy, fisheries, and coastal resources; pollution management and circular economy; environmental economics; and environmental risk management.

(World Bank 2020f). Over the last five years, the World Bank initiated a transition to a blue economy, defined as sustainable, integrated development of oceanic sectors in healthy oceans. PROBLUE, a new multidonor trust fund focused on these priorities, with an emphasis on traditional (fisheries, shipping, waste management, coastal tourism) and innovative (e.g., offshore renewable energy) sectors, has supported this transition in part. With its focus on healthy oceans, the program supports conservation and sustainable use of marine biodiversity and mitigates pressures on these ecosystems in numerous ways. Biodiversity is also at the heart of marine spatial planning.

- On the environmental economics front, the Changing Wealth of Nations 2021 is an example of the analytical work and innovative tools the World Bank is developing for better natural capital management that the World Bank is promoting in 150 client countries. The Blue Natural Capital component of the Changing Wealth of Nations 2021 will estimate, for the first time, the value of blue natural capital (mangroves, coral reefs, fisheries) as part of national wealth accounts (World Bank 2020b). Other examples include the integrated ecosystem-economy model that combines Global Trade Analysis Project and Integrated Valuation of Ecosystem Services and Tradeoffs models to assess the interactions between ecosystem services and the global economy to 2030 (Johnson et al. 2021).

IFC's strategic engagement in private sector biodiversity conservation, which has expanded over the past decade, complements this work. IFC has been expanding its reach to develop sector-wide approaches to integrate biodiversity at the earliest stages of landscape planning, notably in the energy sector. This work does not constitute project lending and is largely financed by IFC's own capital and donor funds. Given that a large portion of development in emerging market countries is private sector related, IFC is well placed to advise governments and companies on development of sustainable landscapes that prioritize nature conservation. Specific examples of such work include the following.

- IFC has been working with governments to develop landscape planning approaches in the infrastructure sector that mainstream biodiversity considerations. In the hydropower sector in Myanmar, IFC is incorporating biodiversity sensitivity screening alongside other technical factors in early sectoral planning. This initiative allows governments to plan for projects at the earliest stages to avoid areas of high biodiversity value. In Nepal and Pakistan, multistakeholder initiatives are being undertaken to establish basin-wide approaches to biodiversity management. IFC is also working with the government of Pakistan to quantify environmental and social costs, including biodiversity, into the tariff structure. In Ethiopia, IFC and the World Bank are piloting the first Scaling Wind initiative, accounting for biodiversity in the earliest stages of government planning so that the real costs of mitigation could also be better incorporated into the tariff structure and built into power purchase agreements. These approaches are all upstream of the often "too late" stage of the environmental and social impact assessment
- The World Bank and IFC can build partnerships that leverage the expertise and reach of both institutions. In addition to the wind sector in Ethiopia, another example is the WBG Offshore Wind Program, which the World Bank Energy Sector Management Assistance Program is funding and leading and is being implemented as a partnership between the World Bank and IFC. The program development objective is to support inclusion of offshore wind in the energy sector policies and strategies of WBG client countries and the upstream work needed to build a pipeline of bankable projects. Through funding sourced through the World Bank PROBLUE program, IFC, in collaboration with World Bank colleagues, is leading on integrating environmental and social aspects of this program, notably biodiversity. The first environmental and safety deliverables under the Energy Sector Management Assistance Program are an environmental framework and a social framework to integrate environmental and safety aspects into marine spatial planning in the offshore wind sector. The frameworks are being designed for downstream implementation by client countries.

The WBG is ensuring that its entire investment portfolio mitigates and manages environmental, including biodiversity, risks holistically. Roughly 30 percent of IBRD and 44 percent of IDA commitments in FY2019 were in sectors that tend to have a large (positive or negative) impact on nature: agriculture, transport, water, and energy, among others. To help all economic sectors mitigate the risks associated with biodiversity and capture the benefits of well-functioning ecosystems, the WBG applies rigorous environmental and social safeguard policies through the Environmental and Social Framework and the IFC and MIGA Performance Standards (box B.1). The WBG is building capacity in countries, with the participation of the private and public sectors, to replicate and expand those standards in their own investment programs. Nature-smart approaches are being adopted across sectors in the WBG to ensure development and nature co-benefits.

A crucial element of the WBG's comparative advantage is the ability of the IBRD, IDA, IFC, and MIGA to join forces to develop integrated financing solutions in client countries. Using the Maximizing Finance for Development approach, the WBG leverages different sources of finance, expertise, and solutions to support sustainable development in client countries. In Vietnam, the WBG supported the transition to more competitive and sustainable coffee and rice value chains in the Central Highlands and Mekong River Delta by helping eliminate structural and regulatory constraints on greater private investment in these key sectors (World Bank) and by directly investing in companies to help them move to higher-value-added products and improve supply chain management (IFC) (World Bank 2018d). Another example is Solomon Islands, where the WBG helped the government create a more sustainable, dynamic fisheries sector by increasing institutional capacity to manage coastal fisheries (World Bank) and issuing loans to the local tuna processing facility and vessel operator (IFC) to improve their gender, labor, and health and safety practices, raising their performance (World Bank 2018e). In Argentina, the WBG helped the government develop the market for renewable energy and attract large-scale private investment by providing investor guarantees and insurance-to-energy project obligations (World Bank, MIGA) (World Bank 2018f). The WBG also helped design renewable energy auctions and finance two long-term deals through loans and the co-lending program (IFC). IFC then developed the *Good Practice Guidelines for the Wind Energy Sector in Argentina: Management of Impacts on Birds and Bats* with IDB Invest (IFC and IIC 2019), in collaboration with the Undersecretary of Renewable Energy and Energy Efficiency of Argentina.

BOX B.1 Biodiversity and Ecosystem Services in the World Bank Environmental and Social Framework and IFC and MIGA Performance Standards

The Environmental and Social Framework (ESF) is a major step forward in treating environmental, including ecosystem, risks of World Bank investments holistically. Launched in 2018, the ESF further strengthens the commitment of the safeguard policies and extends it beyond a do-no-harm approach toward active promotion of positive environmental outcomes in all projects. The ESF adopts a holistic approach to biodiversity, promoting not only risk mitigation, but also environmentally responsible maximization of contributions of nature to economic activity and infrastructure. Environmental and Social Standard (ESS) 6 on Biodiversity Conservation and Sustainable Management of Living Natural Resources, which was modeled after IFC Environmental and Social Performance Standard 6, recognizes that protection and conservation of biodiversity, preservation of core ecological functions of habitats, and sustainable management of living natural resources are fundamental to sustainable development. In addition to requiring that all investment projects[a] conserve biodiversity and ecosystem services and apply the mitigation hierarchy and a precautionary approach to the design and implementation of projects, the framework promotes broader integration of conservation needs and development priorities for sustainable and inclusive economic growth.

In addition to ESS6, other policies incorporate biodiversity in different sectors. ESS1, Assessment and Management of Environmental and Social Risks and Impacts, requires that projects conduct environmental assessments and identify the most resource-efficient and least polluting project alternatives, such as Nature-Based Solutions. ESS3, Resource Efficiency and Pollution Prevention and Management, promotes integrated pest management, leveraging biodiversity resources in the agricultural, health, water, and energy sectors. ESS5, Land Acquisition, Restrictions on Land Use, and Involuntary Resettlement, promotes protection of livelihoods, including through nature-based social safety nets. ESS8, Cultural Heritage, encourages equitable sharing of benefits from commercial use of biodiversity with cultural value.

At IFC and MIGA, biodiversity considerations are similarly mainstreamed into projects through Environmental and Social Performance Standards. IFC's Performance Standard 6, Biodiversity Conservation and Sustainable Management of Living Natural Resources, resulted from 3 years of strategic consultation with conservation organizations and other stakeholders starting in 2008. IFC and MIGA reviews client assessments of environmental and social risks — including biodiversity risks — for each of its projects and requires client companies to avoid, minimize, or manage any identified environmental and social risks. Similar to World Bank projects, IFC's and MIGA's projects are screened for biodiversity risk using globally recognized tools at the earliest stages of the project cycle. As with ESS6, Performance Standard 6 emphasizes the mitigation hierarchy, which prioritizes avoidance of impact and requires clients to achieve no net loss of biodiversity, where feasible, in natural habitats and net gain in critical habitats. Performance Standard 6 emphasizes engagement with relevant experts and conservation organizations during biodiversity impact assessment and mitigation planning. In addition to application by IFC's and MIGA's own clients, Performance Standard 6 has become a global benchmark for private sector biodiversity management, and has been widely adopted by global financial institutions,[b] governments,[c] and corporations on a voluntary basis. The Convention of Biological Diversity, Conference of Parties-11 Decision XI-7 on Engagement with Business references IFC's Performance Standards. Similar to the ESF, other IFC and MIGA Performance Standards also help incorporate biodiversity in different sectors.

a. The environmental and social framework applies to all investment project financing operations but excludes development policy operations and Programs for Results.

b. The IFC Performance Standards are the backbone of the Equator Principles, which 105 financial institutions in 38 countries, as well as the Organization for Economic Cooperation and Development Export Credit Agencies, have adopted.

c. Examples include Canada's Corporate Social Responsibility Strategy for the Extractive Sector, Myanmar's environmental impact assessment procedure, the U.S. Millennium Challenge Corporation's environmental guidelines, the South African Development Community's Guidelines for Mainstreaming Biodiversity and Ecosystem Services in Extractive Industry.

The WBG has also brought innovative approaches to green financing that carry important potential for biodiversity. These have positioned the WBG as an important source of insight into how to mobilize private investment and catalyze capital markets to support broader environmental goals and could be extended to biodiversity. They include pioneering thematic bonds and standards for sustainable investment.

The WBG has created the foundation for what is today a more than US$750 billion market connecting environmental projects with capital markets and mainstream investors. The World Bank issued the world's first labeled green bond in 2008 (figure B.2), creating a new investment category that catalyzed sustainable investment in the capital markets that were previously out of reach for most green project developers. In 2012, the first corporate green bond was issued, and the market has surged since. In 2019, annual green bond issuance reached a new global record of US$258 billion – a 51 percent increase over 2018 (CBI 2020), bringing cumulative global issuance to more than US$750 billion. The WBG continues to use green bonds to support its projects and programs. Portfolio data as of November 2020 suggest that, since 2008, the World Bank has raised US$14.3 billion through 168 green bonds issued in 22 currencies.

Although the focus of green bonds globally has been on climate change mitigation and adaptation, the instrument represents a big opportunity to finance biodiversity and ecosystems. In 2019, the energy, building, and transport sectors accounted for 81 percent of global green bond issuance, and land use (sustainable agriculture and fisheries, forestry, ecosystem conservation) accounted for only 4 percent (CBI 2020), although the biodiversity theme can become more prominent in the green bond portfolio. The Green Bond Principles, as the International Capital Markets Association defines them, identify "sustainable management of living natural resources and land use" and "terrestrial and aquatic biodiversity

conservation" as eligible activities,[77] and various initiatives are under way to develop corresponding definitions and reporting standards.[78] Investment in climate mitigation and adaptation can have multiple biodiversity co-benefits. For example, the green bonds that the World Bank has issued to support climate adaptation projects are also supporting biodiversity preservation activities such as coral reef rehabilitation in Indonesia (Coral Reef Rehabilitation and Management Program Coral Triangle in Indonesia project), control of desertification and land degradation in China (Ningxia Desertification Control and Ecological Protection project), and grassland management practices for livestock production in Armenia (Second Community Agriculture Resource Management and Competitiveness Project). These synergies between climate change and biodiversity could be explored and articulated better in green bond impact reporting.

FIGURE B.2 A Decade of Thematic Bonds

2008	• World Bank's inaugural green bond • Climate Bonds initiative
2010	• Concept of "Climate Finance" established under the united Nations Framework • Convention on Climate Change
2013	• First corporate Green bond • First municipality green bond
2014	• Green Bond Principles
2015	• Paris Agreement signed and UN SDGs launched
2016	• First Sovereign Green Bond • Financial Stability Board launched Task force on Climate-related Financial Disclosures
2017	• World Bank launches first Green Sukuk • Market size: US$ 100 bn of cumulative issuance
2018	• World Bank Guide for Public Sector Issuers, IFC Guidance of Green Sovereign Issuers • European Union launches action Plan on Sustainable Finance • Market size: US$168 billion in issuance, US$521 billion of cumulative issuance
2019	• World Bank issues Sustainable Development Bond • EU Taxonomy, Green Bond Standard • Market size: US$258 billion in bond issuance, US$750 billion in cumulative issuance

Sources: CBI 2020; World Bank 2019f.

77. Eligible green project categories include "environmentally sustainable management of living natural resources and land use (including environmentally sustainable agriculture; environmentally sustainable animal husbandry; climate-smart farm inputs,... environmentally sustainable fishery and aquaculture; environmentally sustainable forestry, including afforestation or reforestation; and preservation or restoration of natural landscapes" and "terrestrial and aquatic biodiversity conservation (including the protection of coastal, marine and watershed environments)" (ICMA 2018).

78. Definitions, impact assessments, and reporting standards for biodiversity are being developed under the EU taxonomy for sustainable activities, the Green Bond Principles, and the Climate Bonds Initiative's Climate Bonds Taxonomy, among others.

The success of green bonds has inspired creation of other thematic bonds such as blue bonds and the green sukuk, as well as green credit instruments. In 2016, the WBG supported the Central Bank and the Securities Commission of Malaysia in issuing the first green sukuk, which opened the possibility of accessing the US$2 trillion Islamic finance market for green and sustainable investment (Kamil et al. 2019). In 2018, the WBG helped the government of Seychelles develop the world's first sovereign blue bond, designed to raise capital from impact investors to finance marine and ocean-based projects that have environmental, economic, and climate benefits. The proceeds will be used to capitalize a Blue Grants Fund (US$3 million) and a Blue Investment Fund (US$12 million), each of which will provide financing for marine and ocean-related activities that contribute to the transition to sustainable fisheries (World Bank 2018g). In 2019, the World Bank issued its first sustainable development bond, with the objective of raising awareness of water, sanitation, and plastic pollution in oceans. The success of the thematic bond market has also encouraged financial innovation. One example is green loans. In 2018, the Loan Market Association and industry leaders developed the Green Loan Principles, which closely mirror the Green Bond Principles. In 2018, labeled green loan issuance reached US$60 billion (WBG 2020b). A more accessible instrument to many private investors, the size of the green loan market is expected to surpass that of the green bond market, as is the rapidly growing sustainability-linked loan market.

As the issuer of the first green bond, the World Bank provided the blueprint for the Green Bond Principles. Drawing on best practices from the design, monitoring, and evaluation of its own projects, the WBG has been actively engaged in developing the Green Bond Principles — voluntary guidelines that an industry group of underwriters, issuers, and investors established that determine eligible activities and set standards for transparency, disclosure, and integrity in the green bond market.

Another example is IFC Performance Standards on Environmental and Social Sustainability, which have become globally recognized as good practice in managing environmental and social risk management in private investment in emerging markets. IFC's performance standards are the backbone of the Equator Principles, which 105 financial institutions in 38 countries, as well as the Organization for Economic Cooperation and Development export credit agencies, have adopted. The Equator Principles embed sustainable finance in the practices of local financial institutions, including approaches to assessing and managing biodiversity risks. They provide an important entry point for development of appropriate tools and financial decision-making frameworks.

***Unlocking Nature-Smart Development: An Approach Paper on Biodiversity and Ecosystem Services* is part of a series of papers by the World Bank Group that outlines the development challenges and opportunities associated with blue and green biodiversity and ecosystem services**. The paper makes the case that the rapid global decline in nature is a development issue and proposes six global response areas intended to guide governments and inform broader discussions on how to integrate nature into development agendas. As countries formulate a set of new biodiversity targets at the fifteenth meeting of the Conference of the Parties to the Convention on Biological Diversity, this paper also offers insights that could inform the design and implementation of the post-2020 global biodiversity framework, as well as the World Bank Group's ongoing support to this agenda.

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