

Chapter 6. Options for delivering sustainable approaches to public and private finance for biodiversity-related elements of the nexus¹

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Note:

The Nexus Assessment chapters share a common thread of case studies highlighting Indigenous Peoples' and local communities' (IPLC) food systems. Chapters 1-4, 5.1-5.5 and 6 include one or more of these case studies. The case studies are presented in boxes and are distinguished by *box titles in italicized font*. Lessons learned from the common case studies are presented in Chapter 7, online Supplementary material 7.1.

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Executive Summary

There is a mismatch between the current scale of global economic activity, its impacts on nexus elements and the volume of financial flows to counter these impacts (*well established*) {6.1.1, 6.2.2}. In 2022, the world economy was estimated at \$101 trillion. Estimates of annual spending on nature (e.g., for biodiversity but capturing related investments that yield wider nexus benefits, most notably in connection with food and water) vary, but are universally less than 0.2% of this total (*established but incomplete*) {6.2.2}. Conversely, the externalities impacting biodiversity, water, food, health and climate change associated with global economic activity have been estimated in the range of \$6 to \$19 trillion (depending what impacts are considered): even at the lower bound this represents impacts equivalent to a sizable proportion of the world economy (*established but incomplete*) {6.1.1}.

Gaps in finance required to achieve biodiversity conservation goals are significant relative to current expenditures, but do not exceed 1 per cent of global GDP in 2022 on an annual basis (*established but incomplete*) {6.2.2, 6.2.4}. Efforts to close the biodiversity financing gap (identified at \$700 billion per year in the Kunming-Montreal Global Biodiversity Framework) as well as to quantify and address a broader ‘nexus financing gap’ have gained momentum but remain insufficient (*well established*) {6.2.2, 6.2.3}. Mobilizing more “nature-positive” flows from both public and private sources, separately as well as in combination, can help to compensate for present shortfalls in financial resource mobilization (*well established*) {6.2.2}. However, the biodiversity finance gap cannot be resolved in isolation from the broader nexus financing gap of up to \$4 trillion, as both will grow in severity over time if present financial shortfalls remain unaddressed and financial and economic risks ignored (*established but incomplete*) {6.2.1, 6.2.4, 6.2.5}. Limited “nature-positive” financing has been provided for IPLC relative to their crucial role in owning, managing and sustainably utilizing biodiverse lands and natural resources (*well established*) {6.3.3} (**Box 6.8**), presenting another important funding gap.

Closing the biodiversity and nexus financing gaps is likely to be more successful if “nature-negative” financial flows are simultaneously curtailed, including illegal flows (*well established*) {6.2.3, 6.2.5, 6.3.2}. Efforts to increase levels of financial resource mobilization for biodiversity and other nexus elements are constrained by negative incentives in the contemporary financial system, as well as by the wider political economy, including criminal activities and flows of finance (*well established*) {6.2.4, 6.2.5}. Financial flows that contribute to the underlying drivers of biodiversity loss, ecosystem degradation and ecosystem services depletion prevent sustainability-oriented flows from achieving their objectives. These include harmful public subsidies estimated in the order of \$1.7 trillion per year, private flows into economic activities that directly damage nature estimated at \$5 trillion per year and environmental crime estimated between \$0.1 trillion and \$0.3 trillion per year (*established but incomplete*) {6.2.3}. Overall, this suggests spending that is considered damaging to biodiversity is at least 35 times greater than spending that aims to protect or restore it.

Prevailing financial institutions and norms often present barriers to closing the biodiversity and nexus financing gaps (*well established*) {6.2.5, 6.3.1}. The total value of financial assets invested around the world are around three times the size of world GDP, with the majority not subject to any sustainability standards, and very little of this focused on investment in biodiversity or nature (*established but incomplete*) {6.2.3}. Investors are largely driven by incentives, requirements and duties to generate financial returns over often short time horizons, and their ability to deliver benefits across nexus elements is often limited (*well established*) {6.2.4, 6.2.6}. Most economic and financial instruments aimed at increasing financial flows to environmental objectives have a comparatively narrow focus (e.g., creating or revealing financial benefits connected to often a single nexus element) meaning that widespread deployment of options could reduce trade-offs between some nexus elements but increase or maintain them with others (*well established*) {6.2.6}.

As the state of nature declines, associated financial risks and inequalities are increasing (*well established*) {6.2.1, 6.2.2, 6.3.1}. Modelling capacity to examine impacts stemming from the loss of nature on mainstream macroeconomic variables is improving to identify future economic and financial instabilities. The impacts of business-as-usual economic growth on nexus elements, and feedbacks from this for economic activities and human well-being, are not expected to be evenly distributed (*established but incomplete*) {6.3.1}. Current trajectories of siloed and inequitable governance, in combination with deteriorating outcomes for nexus elements and growing systemic risks, constrain future response options including through impacts on the availability and costs of accessing finance (*well established*) {6.1.3, 6.2.3, 6.3.1} (**Box 6.2, Figure 6.13**). If financial and economic systems can adapt to reflect how they are embedded within nature, improvements in well-being, equity and the state of nature should be attainable (*established but incomplete*) {6.1.4, 6.3.2}.

Several categories of response options exist that can collectively be transformative in aligning economic and financial systems with sustainable development that reinforces nexus connections. These cover options to improve availability and access to information for decision making as well as financial flows, and those which can reduce negative flows and barriers to access to finance (*well established*) {6.2.6}. Multiple instruments exist for different actors across different parts of the economic and finance systems which can help increase access to and the availability of finance for investment in biodiversity and the nexus. For these to be well used, decision-makers need access to information to inform decisions and measure their impacts. Likewise, they are more likely to achieve impact and scale if negative incentives and financial barriers to access finance are removed (*well established*) {6.2.6}. As such, response options are complementary and focus on both the quantity and quality of finance once it is used, and thus they are also often measures which are likely to improve equity (*established but incomplete*) {6.2.6}.

Subsidy reform is a key component to achieving global sustainability goals, as negative subsidies drive finance away from sustainable investments, leading to increases in financial returns from activities that erode biodiversity and degrade other nexus elements (*well established*) {6.2.2, 6.2.3}. Negative subsidies are estimated to be at least five times greater than direct investments to support biodiversity and are likely even higher (*well established*) {6.2.2, 6.2.3}. As subsidies both entrench behaviours and can interact with other economic policy areas (e.g., trade regulations), they can be challenging to address (*well*

established) {6.2.1, 6.2.3}. Reform of subsidies to improve the alignment of incentives with sustainable development objectives, rather than direct removal which could result in social harm while people adapt, may be more politically palatable in many contexts, especially where other social safety nets do not exist (*established but incomplete*) {6.2.3}.

High indebtedness creates fiscal constraints and thus is a barrier to investments in nature, especially in low- and middle-income countries (*well established*) {6.2.2.3, 6.2.5.4}. Increases in debt burdens can make low- and middle-income countries more economically vulnerable to climate change, environmental degradation and biodiversity loss while also reducing their fiscal space to allocate public resources to help address these issues (*established but incomplete*) {6.2.6, 6.3.1}. Broader reforms of the global debt architecture can help solve funding gaps and reduce vulnerabilities, particularly as the general cost of borrowing is expected to rise due to the impacts of global climate change, biodiversity loss and ecosystem degradation (*established, but incomplete*) {6.2.5, 6.3.1}.

Transformations in the governance of the financial and economic system have the potential to address complex equity and sustainability dimensions, including the distribution of risks and benefits, as well as inequitable power relations in decision-making across scales and between social groups (*well established*) {6.3.3} (Box 6.13, Box 6.14). Prioritizing the protection of nature and mobilizing the requisite financial resources through reformed economic models aims at improving the efficiency of resource use, realigning incentives and redirecting financial streams from biodiversity-harmful to biodiversity-positive impacts. Improved decision-making in financial and economic arenas of engagement as well as other arenas can play a pivotal role in shifting towards these more sustainable trajectories (*established but incomplete*) {6.3.3}. Collaborations between civil society and private and public actors can particularly assist in shifting finance systems towards supporting system transitions in land, water and ecosystems. Incorporating better understanding of the non-monetary values of nature, integrating these into decisions and creating incentive and regulatory structures that allow these values to be reflected can also enable transformation of economic and financial systems (*well established*) {6.3.2, 6.3.3}. Other enablers include sustainability coalitions and transparency, safeguard and accountability mechanisms, and social inclusion approaches (*well established*) {6.2.7}. By shifting development pathways away from business-as-usual values, structures and decision-making, financial and economic reforms can enhance current and future development opportunities and keep options open for the future (*established but incomplete*) {6.3.4} (Figure 6.10, Figure 6.11).

Major research gaps need to be addressed to enable the financial sector to contribute significantly to positive nexus outcomes (*well established*) {6.4}. There is a lack of standardized methods to accurately estimate, report and account for direct and indirect nexus financing by governments and the private sector (*well established*) {6.2.2}. Understanding of the interconnections between ecological stability, the efforts required to address this and financial and economic stability are developing but need to be advanced (*well established*) {6.1.3, 6.1.4}. Other gaps include understanding of the impacts of removing subsidies, developing case studies on nexus-positive financial response options, particularly for private finance (*well established*) {6.2.6}, and better understanding of the impact of transformations

in values and objectives within the financial system for nature and equity (*well established*) {6.2.5}.

6.1 Introduction

The global economy is not currently structured to support decision-making or allocating financial resources in a way that consistently accounts for the interrelationships between biodiversity, water, food, health and climate change or their connections to human well-being and the economy. The financial system – including public, private, domestic and international institutions like banks, insurance companies and stock exchanges – plays an important role in helping to direct financial resources towards their most productive uses, channelling funds from where surpluses are generated to where there are shortfalls in ways which reduce transactions costs and manage risks (Schoenmaker et al., 2012). Critically, however, what appears as productive uses of financial resources within the financial system in fact depends on the information that is considered in allocating resources and the enabling environment in which an investment is taking place; thus, responding to signals provided only by markets can lead to a significant misallocation of resources (Dasgupta, 2021b). Likewise, the hypothesis that financial markets can efficiently allocate resources assumes that financial markets are equally developed around the world, which is not the case, and means that access to affordable finance for investments can be a significant problem in lower income countries (Schoenmaker & Volz, 2022).

In this context, how the wider economic system is governed and economic activity regulated, particularly with respect to their interlinkages with nature and biodiversity, will influence the kinds of investment that are likely to appeal, especially to private financial investors (Dasgupta, 2021b). Crucially, not all financial resources are allocated through financial institutions; for example, central government expenditure was estimated to represent 32% of GDP in 2022 (Our World in Data, 2024), which may be allocated based on different appraisal criteria and will influence how this wider set of financial resources are allocated. It is also important to consider the economic system more broadly to capture a wider range of financial flows, and to assess why and how they relate differently to biodiversity as well as across other nexus elements of water, food, health and climate change. Moreover, not all financial resources and investments are allocated through formal or legal structures, and illegal flows of finance can be significant, with their impact on biodiversity highlighted in this chapter.

The chapter can be seen, broadly, as an hourglass – opening with an assessment of the broad relationship between the economy and biodiversity, then narrowing focus to assess biodiversity finance in this context and explore how economic and financial response options could catalyze greater interest in the allocation of resources to biodiversity and the nexus, and then finally broadening back out to discuss the case for wider transformation of economic and financial systems (**Figure 6.1**).

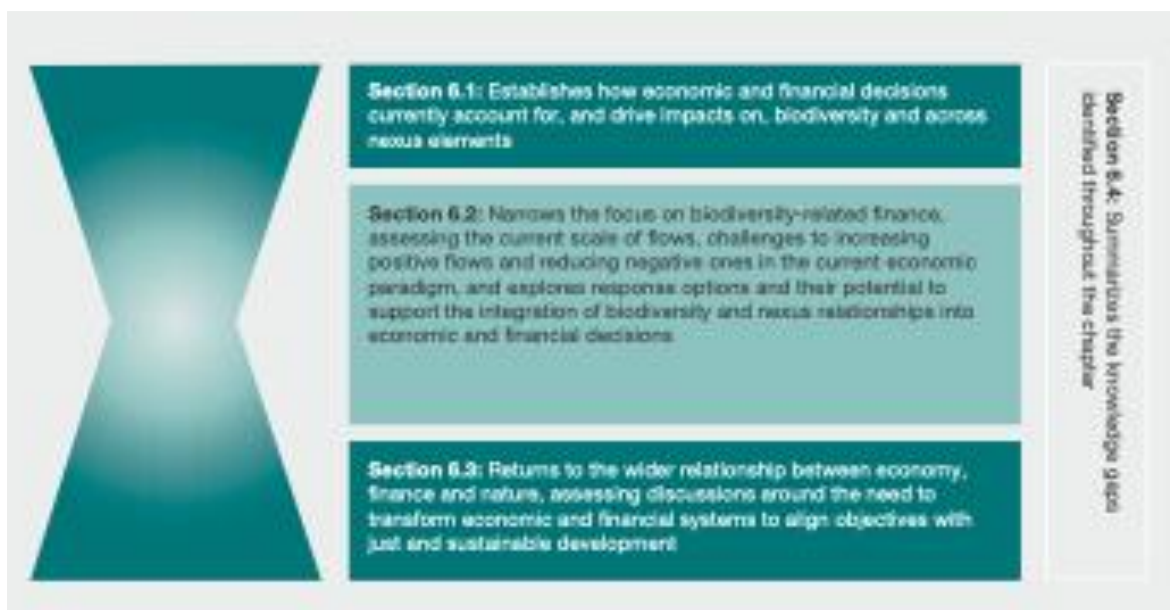


Figure 6.1. Chapter structure.

6.1.1 Scope of the chapter within the Nexus Assessment

In previous chapters of the assessment, the current status and trends in biodiversity and the other nexus elements have been assessed, highlighting current challenges related to biodiversity loss, climate change, water and food insecurity and health inequities (**Chapter 2**). **Chapter 3** has assessed future trends in the nexus elements and their interlinkages showing how business-as-usual leads to the continuation of unsustainable development patterns that drive deterioration in nexus interconnections, but that pathways for more just and sustainable futures are possible. Rebuilding more sustainable and resilient relationships between the economy, society and nature depends on governance and response options that address the direct and indirect drivers of unjust and unsustainable development and open space for transformative change (**Chapter 4**). As described in **Chapter 4**, the way that actors interact to make decisions in diverse arenas of engagement shapes the nature and course of development, including the extent to which this development drives deterioration or supports improvement across the nexus elements and their interconnections.

Arenas of engagement, ranging from international banks to national policymaking, village environmental management committees and cultural ceremonies, are sites where diverse government, private sector, science, civil society and IPLC actors can enable the design and implementation of decision-making approaches and related response options (such as those assessed in **Chapter 5** and Section 6.2). Transformative decision-making in economic and financial arenas of engagement can generate change in other arenas, as comprehensive measures are needed to address the underlying values, structures and processes that currently enable negative financial flows to those actors that facilitate environmental degradation. Such changes – towards sustainable and equitable relations and decision-making across arenas of engagement – help to constitute system transitions and societal transformations. Shifting of development pathways away from business-as-usual values, structures and decision-making towards more sustainable trajectories that enhance current and future development opportunities, nexus interactions and outcomes can contribute to transformative change (A. Martin et al., 2022). Section 6.3 assesses how the actions, decisions and response options

through which development trajectories emerge contribute to necessary transitions in interconnected systems – urban and infrastructure, energy, industrial, land, water and ecosystems – that can better advance sustainable and just futures.

6.1.2 Economic and financial actors and their biodiversity-related interactions

Understanding how economic and financial systems relate to biodiversity, water, food, health and climate change requires not only an assessment of the scale of financial flows and the different ways in which these interact with the nexus elements, but also the ways in which this influences current development trajectories and outcomes across space and time (Liu et al., 2018). In accordance with the scoping document for the Nexus Assessment, this chapter primarily focuses on biodiversity finance, rather than finance flows associated with all nexus elements. However, possible synergies between biodiversity funding and the nexus elements and related nexus funding gaps are highlighted. For the purpose of this assessment, the flows of resources and actors that have been examined include:

- **Public:** domestic public sources (e.g., public institutions) and public-private institutions
- **International:** international cooperation, multilateral organizations and international banks
- **Private:** private investors and lenders, philanthropic foundations and NGOs
- **Community financing:** local financial and non-financial flows, non-monetary exchanges (e.g., community labour) and community financing (both financial and non-financial flows)

The economy can be considered an overarching arena in which many actors engage to influence the financial system, including consumers (e.g., citizens or civil society), producers (e.g., private sector and business organizations) and regulators (including government and financial institutions). Financial and economic governance actors include those actors who participate formally or informally in decision-making and those whose choices or behaviors influence how flows of finance are allocated. Economic actors make decisions regarding instruments that influence economic behaviour and the development of economic systems, such as subsidies, taxes, charges, incentives and fiscal transfers, as well as production, consumption, development and creation of new markets, modes of environmental exploitation, and the distribution of social and environmental costs and benefits. Financial institutions are a distinct set of governance actors, dealing specifically with financial and monetary transactions, including loans, grants, debts and investments, and range from international development and commercial banks to institutional investors. Their choices and behaviours influence flows of finance, and they can play key roles in ecosystem change and are increasingly concerned about sustainability (Galaz et al., 2018; IPBES, 2022a). **Table 6.1** exemplifies key economic and financial governance actors discussed in this chapter. The chapter seeks to understand how the choices made by these different actors interact or could interact to create or break down barriers to improving both the quantity and quality of biodiversity and nexus financing.

Table 6.1. Financial and economic actors.

Actor categories	Actors relevant to the financial and economic sectors	Examples
Global and regional institutions	Multilateral and transnational institutions (e.g., UN system; World Bank; International Monetary Fund); regional development banks, (e.g., Asia Development Bank); INTERPOL; International Consortium on Combatting Wildlife Crime, etc.	<p>Assessing nature-related and climate risks for financial institutions (Box 6.3): Carried out by the Taskforce on Nature-Related Financial Disclosures and Network of Central Banks and Supervisors for Greening the Financial System along with country specific assessments in the Netherlands (Kingdom of the), France and Brazil as well as Africa-wide assessment of climate and nature-related risks up to 2050.</p> <p>Distortive subsidies: Agricultural nitrogen pollution in EU (Box 6.5): EU Common Agricultural Policy subsidies negatively impact nexus outcomes. The best way to reduce impacts is contested between importing and exporting countries, with impacts on individual farmers, and challenge of reconciling EU directives, national regulatory provisions and emissions standards, and on-farm practices.</p> <p>Can REDD+ finance drive equitable and sustainable transformations in forest governance in the tropical Global South? (Box 6.11): This UNFCCC initiative incentivizes developing countries to reduce deforestation through results-based payments for emission reductions, supported by multilateral and bilateral public finance as well as private sector finance. It has been challenging to realise the promise of REDD+, with concerns about justice, equity, land rights, and sustainability, and the need for benefits to accrue to rights holders and those managing forests at the local level.</p>
Governments	Local and regional governments, including municipalities and state/provincial agencies, e.g., compliance and enforcement agencies; National government departments, agencies and Ministries, including judiciary	<p>Financing sustainable marine resource use and climate action in the Caribbean (Box 6.8): Governments of Small Island Developing States and Large Ocean States are key actors in mobilizing multilateral aid to support development initiatives that generate positive nexus outcomes for local communities. For example, Caribbean Island governments have been key to securing finances from the Inter-American Development Bank to initiate projects with significant local benefits. Ensuring ongoing delivery will likely depend on sustained financing through the UNFCCC Loss and Damage Fund.</p>
Financing institutions	Central / Reserve Banks; financial regulators; bilateral agencies and	<p>Inclusive nature finance: The impact of microfinance institutions (Box 6.12): Green micro-finance initiatives are underway around the globe, from Mexico to Bangladesh and Indonesia. They can support</p>

	development banks, e.g., USAID, DFID; retail and commercial banks; credit unions; pension funds, etc.	environmental initiatives and poverty reduction, including through enabling ecosystem regeneration and adaptation to climate stress and change. Key is helping small-scale farmers overcome barriers to accessing finance and help reduce social vulnerability, build capability and build social capital. Support by local organizations and government is important.
Private sector and business organizations	Business organizations, e.g., private equity firms, asset managers; corporations, e.g., insurance companies, institutional investors; shareholders; producers	Biodiversity credits risk emulating nature-based carbon credit risks (Box 6.14): Some concerns have been expressed about emerging biodiversity credit markets that follow in the footsteps of the more established voluntary carbon credit markets – primarily because of their technical complexity, and measurement, report and verification capacity limits of many stakeholders. Key actors include credit providers e.g., Swiss carbon credit provider South Pole, and the ‘Big 4’ credit registries: Climate Action Reserve, Verra, Gold Standard and American Carbon Registry who work with individuals and firms on REDD+ and associated projects through organizations like Carbon Green Investments.
Civil society	Community-based organizations; non-governmental organizations; citizens, etc.	<p>Finance for response options and economic performance measurement in the Central American Dry Corridor (Box 6.13): The ability of communities to adapt to environmental, social and economic pressures and conflicts is hampered by inadequate legal and policy support. Countries in this region are combining natural capital accounting, payments for ecosystem services, water pricing and green bonds to internalize environmental costs and promote investments with positive nexus outcomes, with active involvement of civil society organizations, IPLCs, governing authorities and multilateral and bilateral agencies like the FAO and Green Climate Fund in projects like RECLIMA in El Salvador.</p> <p>Ensuring finance advances social justice: local climate finance and the inclusion of persons with disabilities (PWDs) in East Africa (Box 6.15): Including persons with disabilities in local climate finance processes and decisions helps deliver social justice and overcome the challenges faced by PWDs. Often exposed to extreme prejudice and even violence, PWDs can be supported by devolved climate finance through networks like the Least Developed Countries Initiative for Effective Adaptation and Resilience (LIFE-AR) Partnership Compact. Kenya’s Financing Locally-led Climate Action programme is another example where planning and action is taken by local committees involving PWDs, youth and women.</p>

Indigenous Peoples and Local Communities (IPLCs)	Tribal authorities; local community committees / boards, etc.	<p>Indigenous fire management in northern Australia to mitigate climate change (Box 6.7): Indigenous Traditional Knowledge informs landscape management efforts to sustain livelihoods, mitigate greenhouse gas emissions, and conserve biodiversity. This involves local Indigenous People and an Indigenous Carbon Industry Network in a highly valuable carbon economy with support by the Australian Government at different levels and financing mechanisms like the Queensland Land Restoration Fund, along with regulatory, verification and accounting support.</p> <p>Finance for IPLC food systems (Box 6.9): The value of these initiatives is recognised in forums from the local to global level, e.g., in communities in India, Canada and Australia; farmer-led organizations like Naydanya; the International Network of Mountain Indigenous People; and the UN Global Biodiversity Framework Fund. It is also recognised by philanthropic organizations like the Rockefeller Foundation. Micro-finance and social finance schemes could be important funding mechanisms with government support.</p> <p>Enabling transformative change using nexus approaches to tackle rhino poaching in southern Africa (Box 6.16): Rhino poaching in southern Africa reveals challenges and opportunities for transforming coupled conservation-development pathways, often in remote rural settings. Key actors include local communities, poachers, criminal networks, conservation agencies, local police and the justice system. Nexus approaches can build community capabilities and create opportunities for sustainable rural livelihoods; strengthen local governance institutions and practices that foster wildlife stewardship; promote rural democratization; and institutionalize social learning to address the root causes and drivers of poverty, inequity and environmental crime.</p>
Science and media	Universities and research organizations; educational institutions; news and social media; the arts, etc.	<p>Financing improved water quality through carbon markets (Box 6.10): In 2007, the University of Colorado Boulder developed and implemented the first UN Clean Development Mechanism programme for earning carbon credits for water delivery. Subsequent programme development has delivered household water filters to millions of people in Rwanda and Kenya and generated major nexus benefits, with hundreds more programmes operational around the globe now. Other actors include government agencies, philanthropy and donors.</p>
Criminal networks and	Networks, syndicates and enterprises	<p>Blue crime, maritime piracy and sustainable ocean development in east and west Africa (Box 6.6): Ad hoc</p>

organized crime	involved in environmental crime, including timber and wildlife trafficking; illegal fishing, mining, waste trading and dumping, pollution; and animal cruelty like finning	groups of pirates and those linked to transnational organized crime have disrupted global maritime trade, significantly increasing direct and indirect shipping costs on some routes, and adversely impacting nexus elements and outcomes. Responses by a range of governance actors include government naval escorts; security measures by shipping companies; insurance adjustments; cooperative marine law enforcement and judicial initiatives; and initiatives to improve governance and local community development prospects.
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Box 6.1. Definitions and key terms

Biodiversity finance: all financial resources mobilized to support and deliver biodiversity outcomes, including:

- **Biodiversity funding sources:** the source of financial expenditures (including either public, private or a blend of both).
- **Biodiversity financing mechanisms:** the instruments or tools through which financing is provided from a given funding source to an activity related to delivering a biodiversity outcome (e.g., market-based instruments such as payments for ecosystem services, financial instruments such as green bonds, or institutions such as the Global Environment Facility (GEF)). Depending on the mechanism, financing may be provided under the expectation of repayment or some form of compensation (Deutz et al., 2020; OECD, 2020a).

Biodiversity finance (private): financing provided by private businesses, corporations, financial organizations or individuals to any activity related to delivering biodiversity outcomes. This can include biodiversity and water offsets, the certification of sustainable commodities, conservation NGOs, philanthropic foundations, financing mobilized by countries' development finance institutions (e.g., development banks or agencies), financing leveraged by the Global Environment Facility, carbon financing and payments for ecosystem services (OECD, 2020a). Such instruments can also be used to channel public finance, and often also require some form of public support such as regulation.

Biodiversity finance (public domestic): financing provided within a country by national and subnational governments, public agencies and public financial institutions to any activity related to delivering biodiversity outcomes (OECD, 2020a).

Biodiversity finance (public international): financing provided by governments, public agencies or public financial institutions in one or more countries to support the pursuit of biodiversity objectives in another country(-ies). This includes official development assistance (ODA), other official financial flows (OOF), as well as both bilateral and multilateral flows (OECD, 2020a).

Blended finance: refers to the strategic use of public or philanthropic finance to help mobilize private capital flows by reducing risks or increasing returns to investments with benefits beyond private market interests (World Economic Forum, 2015).

Market-based instruments: the policy tools that involve either mechanisms for changing the price structure in a given market (with the intention to acknowledge and internalize environmental costs or benefits), for creating new commodities derived from environmental features (new markets or products), or for setting up monetary transfers aiming to improve the environmental performance of the targeted agents (IPBES, 2019).

6.1.3 Magnitude and impacts of current economic activity

Over half of global GDP – estimated at \$101 trillion per annum in 2022 (World Bank, 2023) – is moderately, highly or very highly dependent upon the state of nature (WEF, 2020). Yet at the same time growth in the world economy remains coupled to resource use (UNEP, 2024), which generates significant negative externalities. These negative externalities can be understood as direct and indirect consequences of economic activity that are not accounted (or paid) for by those involved in the decisions related to that activity. Such negative externalities often include impacts on biodiversity and consequent ramifications across the other nexus elements. While it is acknowledged that positive externalities can also exist, we focus here on negative externalities as they reveal significant costs of current economic development trajectories across nexus elements. Global estimates of the magnitude of such negative externalities vary depending on what they include (see **Box 6.2**) (and tend not to be directly comparable due to differing assumptions), with estimates ranging in the trillions of dollars with significant distributional impacts (e.g., the benefits of the economic activities that result in externalities are captured by different people to those who face the burden of externalities) (Damania, Balseca, et al., 2023; FAO, 2023; FOLU, 2019; Hendriks et al., 2023; Lord, 2023; Ruggeri Laderchi et al, 2024; Trucost, 2013; UNEP, 2015). Safeguards and investments in nature and biodiversity are dwarfed by these externalities and have not been sufficient to counter drivers of negative declines. For example, OECD estimates suggest biodiversity-related taxes make up less than 1% of environmental taxation, implying very limited efforts to correct externalities through this route (OECD, 2021).

In part due to current incentive structures, economic activities that are causing the most significant damage to biodiversity are often financed from private sector sources, while the private sector's contribution to positive biodiversity finance remains disproportionately small. The most recent estimates suggest that of a global total of \$200 billion of “nature positive” financial flows currently identified (e.g., in the form of nature-based solution financing, covering protection of biodiversity as well as nexus investments in sustainable agriculture, water resources and climate change mitigation with benefits for nature), only 18% (\$35 billion per year) stems from private investments, a figure that is less than 1% of the “nature-negative” financial flows estimated from the private sector (UNEP, 2023e). These large-scale negative impacts of economic activity result from economic decisions that have predominantly taken a narrow view of nature and its value to human well-being (Section 6.2.5.1).

Furthermore, the relatively small extent of “nature-positive” financial flows tends to disproportionately benefit certain categories of actors over others. For example, projects supporting IPLC tenure and forest management received approximately \$2.7 billion between 2011-2020, from bilateral and multilateral donors and private philanthropies, equivalent to only \$270 million per year and less than 1% of Official Development Assistance (ODA) for climate change mitigation and adaptation over the same period (Rainforest Foundation Norway, 2021). Although these disbursements to IPLC have been scaled up since 2020, they still amounted to only around \$514 million in 2023 (Rights and Resources Initiative (RRI), 2024). Financial and economic decisions often disregarded and fail to reward the contributions of many IPLC and others who care for nature across lands and ocean (Dawson et al., 2021; Sangha, 2020). Moreover, IPLC currently possess formally-recognized legal rights of ownership to only a fraction of the areas that they customarily manage, which limits their direct access to financing (Alden Wily, 2021; Tauli-Corpuz et al., 2020)

Box 6.2. Estimating externalities

Externalities tend to be understood as costs (imposed on others) that are not considered as part of decision-making processes. Estimating the magnitude of global externalities in monetary terms necessarily requires a number of assumptions, including what impacts are included. For example, estimates focusing on the environmental impacts of production have included:

- \$7.3 trillion (Trucost, 2013) – “unpriced natural capital costs” covering the impacts of land use, water consumption, greenhouse gas emission, air pollution, land and water pollution and waste that arise from primary production. This was based on 2009 production data, and the impact represented 13% of global GDP. Monetary values of impact were taken from global literature and applied to estimates in the researchers own input output model. UNEP’s Inquiry into the Design of a Sustainable Financial System (UNEP, 2015) estimated environmental externalities of a similar magnitude (\$7 trillion) based on the 2014 Inclusive Wealth Report, highlighting that current trends in economic growth at the time of writing could be expected to erode a further 10% of global natural wealth by 2030.
- \$6 trillion to 10.8 trillion (Damania, Balseca, et al., 2023) – “implicit subsidies” capturing undercharging for environmental costs and forgone consumption taxes. Estimates relate to production in the fossil fuel, agriculture and fisheries sectors, covering the impacts of greenhouse gas emissions, pollution and reductions in natural capital stocks such as ecosystems and fish stocks. Estimates of the monetary values were based on International Monetary Fund (IMF) estimates for fossil fuels and World Bank estimates for fisheries and greenhouse gas emission estimates from agriculture, and wider environmental impacts taken from (FOLU, 2019).

A number of broader estimates have looked at the agrifood system as a whole, including environmental impacts both up and downstream of primary producers, impacts of food production, processing and transporting as well as the health impacts of consumption patterns and the social impacts of how the benefits of the system are distributed. The most recent estimate of the unaccounted-for burdens of the current food system from the Food System Economics Commission (Ruggeri Laderchi et al, 2024) is \$15 trillion (PPP) per year (based on 2020 data), equated to 12% of GDP. At least \$11 trillion was associated with impacts on

human health linked to production and consumption. (FAO, 2023) analyzes three of such estimates to compare across the environmental, social and health impacts and how they are considered. Although not perfectly comparable, due to differences in years included and whether nominal USD or PPP USD estimates are used, these fall in the range of \$12 trillion to \$19 trillion per year. The burden of externalities is likely to be significantly larger once system-wide impacts across nexus elements are taken into account, rather than solely focusing on the more direct environmental impacts associated with primary production.

A provisional estimate of the global externalities associated with three economic sectors can be calculated by combining, and partially updating estimates above, e.g., using Damania et al.'s reported estimate of the externalities from fisheries (\$0.83 trillion) and updating estimates for the fossil fuel sector as this is based on IMF estimates that are updated annually, increasing the 2021 \$5.4 trillion estimate to \$5.7 trillion in 2022 (the most recent data) (Black, Liu, Parry, & Vernon-Lin, 2023). From a nexus perspective, these figures reflect impacts on food (from fisheries) and on health and climate change (from fossil fuels). The lower bound of the range reported by Damania et al. (\$6 trillion) includes only the lower bound estimate of the climate change impacts of agriculture, whereas wider impacts are across nexus elements are available. Those include the impacts of natural capital loss and pollution and antimicrobial resistance: adding these to the lower bound carbon estimate gives an estimate of \$4.3 trillion. This limits the externalities to those only associated with agricultural production, covering aspects of biodiversity, water, climate change and health from a nexus perspective. However, taking this as a lower bound estimate, it suggests a minimum global estimate of externalities from fossil fuels, fisheries and agriculture would be \$10.8 trillion per year.

Taking on board the wider external impacts of the food system and how food is distributed, consumed and wasted can however add to these figures. Adding these wider impacts from (FOLU, 2019) would add \$6.6 trillion to this figure. Replacing the estimates of the environmental, health and economic externalities of agriculture entirely with those presented in the report with the higher estimates of the food system covered above (Hendriks et al., 2023) would suggest externalities generated across the three sectors reaching \$24.8 trillion per year. These later figures would consider in particular a broader range of impacts on health from a nexus perspective.

6.1.4 Repercussions of the declining state of nature back into the economic and financial system

Declines in the condition of the nexus elements (see **Chapter 2**) also lead to growing costs and future risks, including systemic risks for the financial system itself (see **Box 6.3**). The 2023 Inclusive Wealth Report suggests that the world has lost more than one quarter of its natural wealth over the past 30 years, while overall wealth increased as measured across natural, human and produced capital (UNEP, 2023d). However, per capita wealth has actually fallen due to population growth and the loss of natural capital, highlighting sustainability issues with current levels and measures of economic progress (UNEP, 2023d). Preliminary estimates of the impact of this decline are now being developed through financial and economic models which integrate the impacts of reductions in the availability of ecosystem services. For example, looking at a narrow range of four ecosystem services, one such

modelling suite connects a partial ecosystem collapse scenario with \$2.7 trillion a year of GDP losses, showing that such costs will be concentrated in low-income countries (Johnson et al., 2021, 2023). Production losses can have wider impacts through the financial system, with studies beginning to demonstrate the pathways through which the impacts of ecosystem service loss on economic activity could – at the national level – impact the ability to sustainably finance debt (Kraemer & Volz, 2022), as well as increase the costs of borrowing through impacting sovereign credit ratings (M. Agarwala et al., 2022). These would create wider social and economic impacts as well as reducing fiscal space for countries to invest in protecting and restoring the state of nature.

There is increasing focus on understanding the impacts of changes in the state of nature from central banks and financial supervisors, given their mandates with respect to financial and economic stability (OECD, 2023b) and a recognition that nature-related risks can amplify climate risks (N. Ranger et al., 2023) (**Box 6.3**). The risks identified tend to reflect nexus interlinkages: for example, in preliminary analysis estimating nature-related economic values at risk for 1 in 20 year shocks impacting ecosystems, the largest impacts were found to relate to water availability, with the agriculture sector disproportionately impacted (N. Ranger et al., 2023). Physical risks that impact businesses and financial institutions relate to their dependence on nature. In addition, the same organizations will have impacts on nature through their activities which, in turn, present a different set of risks should policy and public sentiment change, known as transition and reputational risks. Transition risks relate to the uncertainty around costs which may be faced by such organizations in adapting to the changing landscape in which they operate. Jointly, therefore, organizations' impacts and dependencies create a “double materiality” issue for financial institutions (Calice et al., 2021; N. A. Ranger et al., 2022; Svartzman, R. et al., 2021; van Toor et al., 2020).

Box 6.3. Central bank and financial supervisors' exploration of nature-related risks

Despite stepping stones such as the launch of the Taskforce on Nature-Related Financial Disclosures (TNFD) in 2021 and the Network of Central Banks and Supervisors for Greening the Financial System (NGFS) establishing its nature working group in 2022, the “double materiality” of nature is not yet embedded in financial decision-making. In addition, the interdependence between nature and climate change is largely unexplored, increasing the level of potential systemic risks to the economy (N. A. Ranger et al., 2022).

Nature scenarios of systemic risks

Nature-related risks assessments by central banks and supervisors' have been undertaken for the Netherlands (Kingdom of the) (van Toor et al., 2020), France (Svartzman, R. et al., 2021) and Brazil (Calice et al., 2021). The De Nederlandsche Bank undertook pioneering work on assessing biodiversity's physical risks to the Dutch financial sector. It estimated that 36% of their portfolio has a high/very high dependency on at least one ecosystem service with groundwater and surface water ranking first with 25% investment dependency (van Toor et al., 2020). Their methodology used the ENCORE tool to link their portfolio to 86 different business sectors and, in turn, their dependencies and impacts on 21 ecosystem services (ENCORE, n.d.). Some caveats to this approach include that only first order ecosystem service dependencies and impacts are considered, and ecosystem services are not location

specific but based on global average values. The De Nederlandsche Bank study also focused on transition and reputational risks. Their work on transition risks consisted of three analyses. First, using the GLOBIO global biodiversity model for policy support (A. M. Schipper et al., 2020), they estimated their global biodiversity footprint to be 1.7 times the area of the Netherlands (Kingdom of the). Second, they mapped the locations of companies in their portfolio which operate in protected areas and estimated €15 billion exposure, which could rise to €28 billion in a higher protected area scenario (30%). Third, given Dutch policy to regulate nitrogen emissions, they assessed exposure by estimating the loan value to nitrogen-emitting sectors. The results in this study provide lower boundary estimates given that neither nature-related systemic risks nor nature-climate change risk interactions are included.

Banque de France analysis built on De Nederlandsche Bank's work by estimating "upstream dependencies" using the EXIOBASE3 input-output table (Svartzman, R. et al., 2021; Wood et al., 2018). In line with results from De Nederlandsche Bank, surface water and groundwater were found to be the ecosystem services with higher dependencies. The Bank Negara Malaysia analysis follows a similar approach to De Nederlandsche Bank but also includes exploratory nature-related physical and transition risk scenarios for Malaysia (World Bank & Bank Negara Malaysia (BNM), 2022). These were developed based on the ecosystem service dependencies/ impacts results using ENCORE and stakeholder interviews. Their results showed that "reduced ecosystem services due to continued high resource use, pollution and urban sprawl", "sudden and unexpected introduction of new climate policy" and "deterioration of ecosystem services due to continued high rates of deforestation" affect 44%, 38% and 30% of their portfolio (World Bank & Bank Negara Malaysia (BNM), 2022).

Nature and climate change scenarios of systemic risks

Building on De Nederlandsche Bank's and Banque de France's work, a report by Vivid Economics and FSD Africa (Vivid Economics by McKinsey, 2022) quantifies the opportunities and risks for financial institutions in Africa under a range of climate change and nature scenarios up to 2050. It presents results of the first stress test on nature risk for financial institutions by applying the first three stages of the TNFD's Locate-Evaluate-Assess-Prepare (LEAP) approach (TNFD, 2023). The scenarios are based on plausible narratives around 22 key levers on policy (e.g., protected areas and restoration regulations), demand-driven change (e.g., diet shift to plant-based) and technology (e.g., carbon capture and storage). The levers resulted from an extensive literature review on existing scenarios (e.g., NGFS). Some caveats to the approach include that physical nature risks are underestimated (e.g., only incremental changes to ecosystems, average risk at country level, only subset of physical risks included, and a 2050 time horizon) and tipping points are not captured. In spite of this, under the 'Climate + Nature now' scenario, expected profits for the agriculture and 'deforestation-linked extractives' sectors could be 20% and 15% less than the baseline by 2050, similar in magnitude to climate risk impacts to other sectors (e.g., -10% for manufacturing, -15% for chemicals, and -25% for extractives).

A recent report presented the first "integrated nature and climate scenario for use by investors" (IPR, 2023). This new scenario builds on an existing climate transition scenario Forecast Policy Scenario (FPS), which was developed from plausible policy trajectories. The FPS+nature scenario focuses on transition risk up to 2050. Changes in land use, climate

change and direct exploitation of organisms are included whereas sea use change, pollution and invasive species are not. The global integrated assessment model (MAgPIE) (Dietrich et al., 2019) is used to produce indicative value drivers based on assessed policy, technology and market trends. One of the caveats to this approach is that it is a transition risk scenario and does not account for acute physical risk, however key messages include that the commodity-driven reputational risks around biodiversity impacts are highest for Brazil, tropical Africa and southeast Asia by 2030; alternative protein could grow from 1% (2020) to 24% (2050) of protein markets driven by dietary changes (reducing ruminant meat demand); and that investments in Nature-based Solutions could reach over \$20 billion and \$200 billion annually in 2030 and 2050 respectively.

Additional scenario development which integrates nature and climate is critical to assess double materiality further and also to identify not only risks but opportunities from better managing the nexus. This could lead to financial institutions avoiding systemic risks to financial stability as well as advocating for policies which strengthen sustainable decision-making.

However, it is noted that recent evidence from scenarios and models on the interaction between the economy and the state of nature suggests that this negative feedback loop can be broken. For example if policies (such as payments for ecosystem services, agricultural subsidy reform and investment in agriculture related research and development) are developed to protect and restore nature, modelling efforts suggest the potential for both economic gains and human welfare benefits can be delivered alongside benefits for nature, with the greatest benefits for low-income countries (Johnson et al., 2023). Likewise, other efforts have shown policies that reward land-based greenhouse gas sequestration and improve the efficiency of land-use could increase carbon sequestration by 85.6 billion tons with no adverse economic impacts, and that better allocation and management of land, water and other inputs could increase food production by enough to feed the world to 2050 without the net loss of forests and natural habitats (Damania, Polasky, et al., 2023).

6.2 Biodiversity-related finance: Current status and trends

6.2.1 Introduction: framing the problem and potential solutions

Financial resource mobilization to support biodiversity conservation, ecosystem restoration and sustainable resource use has been gathering momentum, but after more than 50 years of multilateral cooperation, shortfalls remain in generating sufficient volumes (McCarthy et al., 2012; UNEP, 2023a; UNEP & ELD, 2022; Waldron et al., 2017) and calls for urgent action across nexus elements – including with respect to the role of finance and financial institutions - are increasing (Atwoli et al., 2021). The Kunming-Montreal Global Biodiversity Framework (Kunming-Montreal Global Biodiversity Framework) of the UN Convention on Biological Diversity (CBD) makes clear that a biodiversity finance gap of \$700 billion per year must be closed to achieve the 2050 Vision for Biodiversity (UNCBD, 2022). Barriers encountered when meeting other multilateral finance targets, however, underscore the challenges. Developed-country parties to the United Nations Framework Convention on Climate Change (UNFCCC) have previously failed to deliver upon pledges to raise \$100

billion per year in finance for climate change adaptation and mitigation purposes by 2020 (Timperley, 2021), though preliminary analyses suggest the \$100 billion per year may be delivered in 2022 (Abnett, 2023). There is considerable potential for climate change mitigation-related disbursements to support the simultaneous achievement of biodiversity and other nexus-related objectives, and vice versa, if risks of trade-offs between these objectives can be managed (Baldwin-Cantello et al., 2023; Streck, 2023).

Both the “biodiversity financing gap” (Deutz et al., 2020) and the “nexus financing gap” will grow in severity over time if present resource mobilization shortfalls remain unaddressed. This nexus financing gap is manifested in both the inadequate scale of funding that is nexus-centred as well as investment in just and equitable outcomes, especially for the world’s poor and marginalized peoples, and that aligns with the value and rights of nature (Costanza, 2020; Washington & Maloney, 2020). Some appreciation of the “nexus financing gap” (for the other elements that go beyond biodiversity-related investments) can be gleaned by looking at financing needs to deliver the SDGs. This has grown since 2015 (when it was estimated at \$2.5 trillion per year) due to underinvestment and increasing needs (particularly after the COVID-19 pandemic) to reach an estimated \$4 trillion per year in 2022. This includes \$2.2 trillion relating to clean energy, \$0.5 trillion for water and sanitation, \$0.3 trillion for food and agriculture, and \$0.1 trillion for health (UNCTAD, 2023a). The corresponding estimate for the biodiversity finance gap was \$0.3 trillion, noting that these figures are focused on capital spend needs in developing countries only, hence identifying a smaller biodiversity financing gap than elsewhere in this chapter.

Failures to act and close these gaps will not only lead to continued deterioration in most nexus elements (see **Chapters 2 and 3**), but also risk the economic activities and livelihoods that rely upon them. This has direct ramifications for finance sector decision-makers, including for investments or assets that become stranded. Stranded assets are investments which experience unanticipated falls in their financial value and therefore may no longer be used or become financial liabilities before their planned end of life due to environmental changes such as climate change or biodiversity loss, or (unexpected) policy responses to address them. The costs of asset stranding both to their owners and in the geographical locations where the investment took place can be very significant; initially studied with respect to fossil fuel extraction investments, the concept is being more broadly explored, for example for deforestation free supply chains (Caldecott et al., 2021; Orbitas, 2020; Semieniuk et al., 2022). In spite of increasing awareness and development of biodiversity policies in businesses, a review of over 11,000 of the world’s largest listed companies found that only 29% had biodiversity policies by 2018, and as a result \$7.2 trillion of enterprise value was estimated to be exposed to unmanaged biodiversity risks (Carvalho et al., 2023).

Such risks reinforce the recognized need for broader financial and economic reforms beyond simple increases in either public or private flows of biodiversity and other sustainable development finance (CBD, 2023; UNCCD, 1994) which is captured most directly in the Sharm el-Sheik Implementation Plan established at UNFCCC COP27 that highlights that delivering the resources needed to achieve net zero emissions by 2050 will require a “transformation of the financial system and its structures and processes, engaging governments, central banks, commercial banks, institutional investors and other financial actors” (UNFCCC, 2022). The complementary role of public policy and government action

and action across finance sector institutions is flagged as imperative to mobilize resources to meet the needs of emerging markets and developing countries in the context of an economic transformation to deliver net zero, and improved adaptation and resilience including through the restoration of natural capital (Songwe et al., 2022).

Ultimately, financial flows that contribute to the underlying drivers of biodiversity loss and ecosystem degradation must be reduced in order for sustainability-oriented flows to achieve their objectives in practice (Deutz et al., 2020; UNEP, 2015). Indeed, this is particularly the case given that the size of the former (“nature-negative”) flows are frequently multiple orders of magnitude larger than the latter (“nature-positive”) flows (Deutz et al., 2020; Portfolio Earth, 2020; UNEP & ELD, 2022). An example of such efforts – recognizing that negotiations are still ongoing with regard to some unresolved matters – is the fisheries subsidies agreement adopted at the World Trade Organization in June 2022 (WTO, 2022), which was supported and advocated as significant milestone on the route towards achieving SDG target 14.6 - to end subsidies contributing to overfishing (Sumaila, Skerrett, et al., 2021). Such subsidies are estimated to lead to more than \$80 billion per year in lost potential profit from global fisheries because they further increase fishing pressure on overexploited stocks, thereby reducing catch and increasing risk of stock collapse (World Bank, 2017). This agreement addresses this financial issue by prohibiting the use of such capacity-enhancing subsidies and instead encouraging the redirection of support for stronger management and more sustainable fishing strategies that can help rebuild stocks and thus make fishing more profitable.

Long-term policy coherence within the financial system can catalyze innovation and deliver the urgent realignments needed to achieve multifaceted biodiversity and sustainability goals. Beyond disincentivizing harmful subsidies and investments that contribute to unsustainable patterns of interaction across nexus elements, this could also entail the further mainstreaming of both biodiversity and other environmental, social and governance (ESG) objectives throughout the private sector and via public-private partnerships across regions and country income groups (e.g., (Carvajal et al., 2022; Mori & Mader, 2021; Natori et al., 2023). For example, efforts to more widely leverage payments for environmental services, landscape-scale finance and measures to disclose risk within financial systems and investments are some of the response options currently underway.

More radical measures are also being debated among academic and policy-making communities, such as proposals for either outright debt forgiveness or debt-for-nature swaps (Nedopil et al., 2023), which may enable increased volumes of public finances to be reallocated from debt servicing to investments in environmental protection and social well-being programmes (Chausson et al., 2023; Volz et al., 2021). The closure of persistent tax evasion loopholes, which in some cases erode the capacity of low and middle income countries to allocate finances for biodiversity protection (Dempsey et al., 2022; Hanson & McNair, 2014), can also potentially facilitate the achievement of positive synergies across nexus elements by increasing public finances available for investment. Finally, response options for extending reparative losses and damages transfers from high income countries to low and middle income countries are also being debated – particularly to account for the impacts of climate change on ecosystems – as additional mechanisms for redressing biodiversity loss and environmental degradation while facilitating climate change mitigation

(King-Okumu et al., 2021; Roe et al., 2023). These funds may enable increased volumes of public finances to be reallocated from debt servicing to investments in environmental protection and social well-being programmes (Chausson et al., 2023; Volz et al., 2021).

6.2.2 Estimates of the scale of current flows affecting biodiversity and the nexus

At the global scale, it is important to note that recent assessments of the biodiversity finance landscape vary somewhat in their estimation of present volumes of multilateral, domestic and private financing for nature, as well as how much financing also flows to other nexus elements, both individually and for financing that is more integrated. Frequently, this is due to different definitions and methodologies used for these estimations, as well as differential views on the kinds of public and private instruments that are perceived as contributing to total volumes (see **Figure 6.2, Box 6.4**). Most estimates provide a snapshot for a given time, and while estimates may be low, progress has been made. A recent OECD assessment examined biodiversity development assistance across official development finance, multilateral outflows (resources channelled through and by international financial institutions, multilateral or regional development banks, and UN institutions), private philanthropy, private finance mobilized by public interventions and other international sources (e.g., south-south / triangular co-operation) between 2011 and 2021 (OECD, 2023a). This showed an increase in flows across all sources, with official development finance and multilateral outflows the dominant sources in this data set.

Box 6.4. Challenges in estimating volumes and types of financial flows

Different sources classify types of financing in varying ways, leading to a range of estimates of both total finance and breakdowns by component sources (see **Figure 6.2**). For instance, in the UNEP *State of Finance for Nature* reports, impact investments (i.e., those coming from “a variety of thematic private equity funds, incubators, venture capital firms and exchange-traded funds” (UNEP et al., 2021)) are classified as a part of private financing towards nature-based solutions, but the OECD accounts for impact investment separately. Similarly, the *State of Finance for Nature* have at times considered climate financing as a part of biodiversity financing (e.g., in (UNEP et al., 2021), but at times excluded it (e.g., (UNEP, 2023e; UNEP & ELD, 2022)). Additionally, uncertainties in the estimated scale of biodiversity and overall nexus financing stem from a lack of available global data resulting from poor data reporting and lack of transparency of diverse public or private funds, as well as differences in data quality across countries.

As an example, recent efforts to map flows of funding for the ocean have shown that, when data is standardized and disentangled, the majority of intergovernmental funding for marine and coastal sustainability initiatives is dominated by large capital investments in Europe, predominantly in offshore renewable energy (UNEP-FI, 2021). A comparatively smaller amount reaches conservation or local sustainability initiatives in developing regions, though this has been increasing over the last decade (Shiiba et al., 2022).

Here and in other examples, however, there are also uncertainties due to potential double counting of funds, as they are often reported through multiple channels. Moreover, while

there are several efforts to quantify biodiversity finance (**Figure 6.2**) (Busch et al., 2021; Coady et al., 2017; Deutz et al., 2020; OECD, 2021; J. Reed et al., 2020; Seidl et al., 2020; UNEP, 2023e; UNEP et al., 2021; UNEP & ELD, 2022), these have often deliberately omitted other nexus elements in order to isolate biodiversity finance. A comprehensive understanding of financial flows that impact biodiversity and water, food, health and climate change alike remains an important gap.

The OECD has estimated that between 2015-2017 global biodiversity finance amounted to \$78 billion to \$91 billion/year on average (this would be \$120.8-\$133.2 billion/year including impact investment, as seen in **Figure 6.2**) (OECD, 2020a). The bulk of the biodiversity funding was from domestic public sources (\$67.8 billion), whereas international public institutions and the private sector were estimated to contribute an average of \$3.9 billion to \$9.3 billion and \$6.6 billion to \$13.6 billion per year, respectively (OECD, 2020a). A notable limitation of this data set, however, was the variable quality or level of detail in national reports submitted by member states to the CBD. This prevented the estimation of indirect flows of biodiversity finance at the domestic level for many countries, wherein indirect financial allocations are understood as flows that have biodiversity outcomes as a secondary rather than a primary or explicitly stated objective. As a result, estimation of both direct and indirect flows of domestic biodiversity finance was possible for only 25 primarily OECD or G20 countries (OECD, 2020a). This is substantial, given that domestic flows were found to constitute up to 87% of the average annual total flows of biodiversity finance between 2015-2017. On the other hand, another OECD report focused on policy guidance (rather than the estimation of financial flows), states high estimates for contributions from the private sector – mainly due to counting the value of the ecotourism market as a part of nature financing (see **Figure 6.2 C**)

Other recent analyses estimate the total volume of global biodiversity finance to be \$124 billion to \$143 billion/year (Deutz et al., 2020) and \$165 billion/year in the *State of Finance for Nature* reports (UNEP, 2023e). The Paulson Institute (Deutz et al., 2020) use a broader dataset, drawing on the Biodiversity Finance Initiative (BIOFIN) Catalogue of Finance Solutions which includes 160 different biodiversity finance mechanisms, as well as nexus-related spending on natural infrastructure and natural climate solutions, both of which contribute to biodiversity goals. The *State of Finance for Nature* reports (UNEP, 2023e; UNEP et al., 2021; UNEP & ELD, 2022) has higher estimates of total available finance (as compared to the 2020 estimates) given the recent adoption of an implicit nexus approach. This is evident insofar as these reports seek to assess the quantity of finances available for nature-based solutions (NbS) rather than biodiversity more narrowly defined (**Figure 6.3**). Financial allocations for NbS are understood as investments that support “sustainable action that enhances the resilience of ecosystems and addresses societal challenges, such as food security, climate change, water security, human health and enhanced resilience to disaster risk” (UNEP et al., 2021). This approach shares many commonalities with a nexus approach in seeking to highlight the potential for synergies across the aforementioned governance domains. Moreover, the most recent reports on the *State of Finance for Nature* (UNEP, 2023e; UNEP & ELD, 2022) now include financing estimates for the marine sector, and in 2023 – for the first time – the estimates reported for private financing have been estimated specifically per sector (as seen in **Figure 6.3**).

Overall, these estimates generally include both conventional mechanisms like carbon or biodiversity offsets and financing towards area-based conservation, as well as less traditional mechanisms such as crowd funding, lotteries and other measures including psychological nudging to raise environmental awareness (BIOFIN, 2022). The breadth of the latter mechanisms is generally positive insofar as it highlights varied opportunities for leveraging biodiversity finance, some of which may be relatively unexplored or underexplored to date. Conversely, the varied definitions of both biodiversity finance and eligible mechanisms make assessment of the total extent of currently available financial flows challenging. Directly comparing across these reports should be done with caution, while keeping in mind that most of these estimates remain a scientific research gap (as they have been sourced from grey literature), and uncertainties have rarely been quantified or even reported (see **Figure 6.2 B**). Notwithstanding these data uncertainties, it is clear that financing flowing to biodiversity specifically and the nexus elements generally remains inadequate to meet needs.

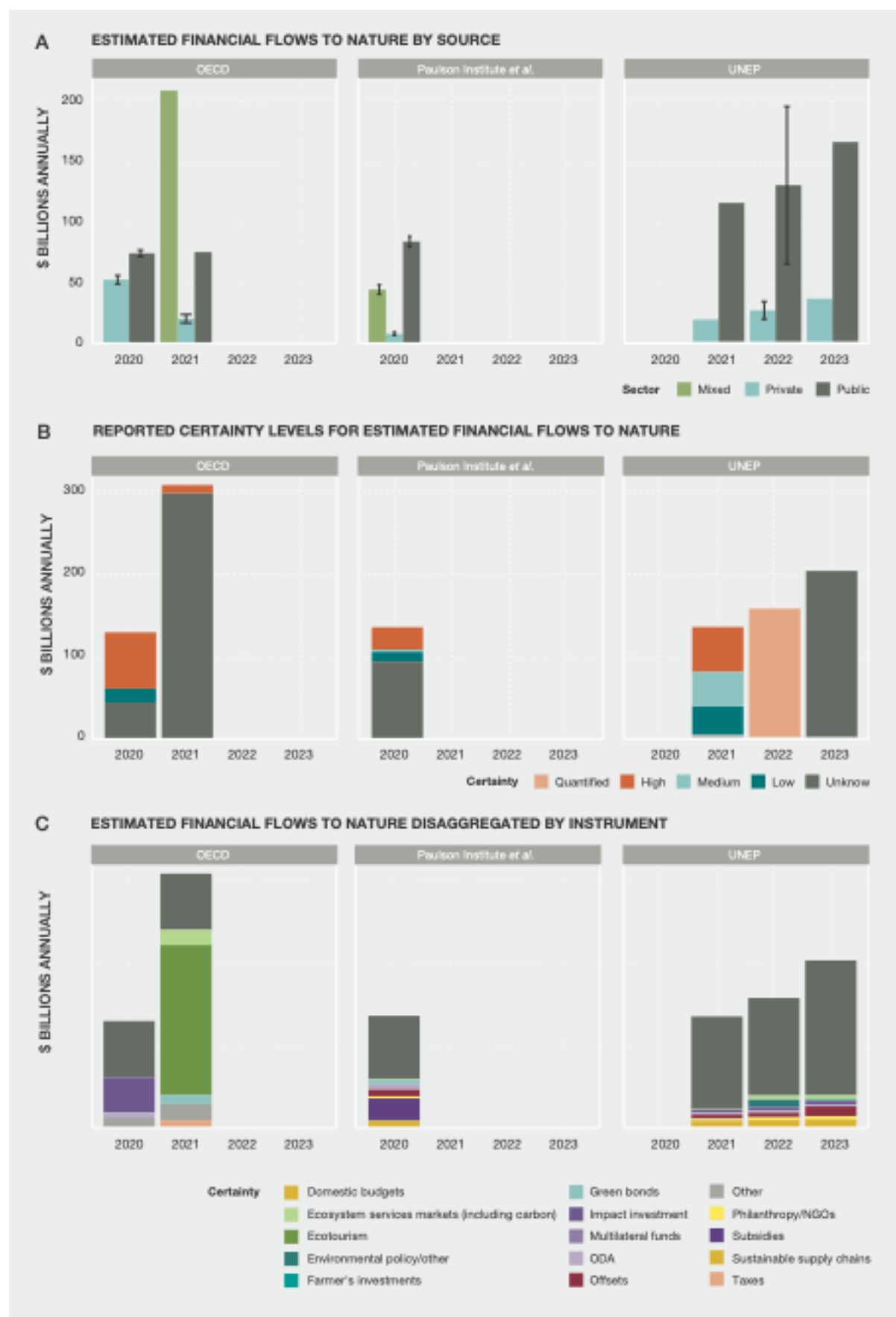


Figure 6.2. Estimated financial flows to nature varying across selected sources.

A) Estimated financial flows to nature/biodiversity by the OECD and the Paulson Institute (Deutz et al., 2020; OECD, 2020a, 2021), and towards NbS estimated by UNEP (UNEP, 2023e; UNEP et al., 2021; UNEP & ELD, 2022) are disaggregated by public, private or mixed (both public and private financing) sources, with error bars plotted wherever they were provided in the original reports, years relate to the year of publication (note, while UNEP 2023 shows error bars in their report they do not provide the underlying data). **B)** Average estimated financial flows to nature/biodiversity/NbS categorized by levels of uncertainty reported by these data sources. As shown, these sources rarely provide any statement regarding the certainty of these data, and only the UNEP’s *State of Finance for Nature* in 2022 provide upper and lower estimates for their financial flows. **C)** Average estimated financial flows to nature/biodiversity/NbS categorized by various instruments which are used to channel these flows, with ODA indicating “Official Development Assistance”. The OECD 2020 estimates shown here are higher than the headline figures for the source report - \$78-91 billion per year (OECD, 2020a), as they include approximately \$43 billion from impact investment which is estimated in the report, but not integrated into the headline results given under uncertainty on their scale and impact; they are included here to try to give a more holistic view. In this regard, how different sources have chosen to classify specific flows / instruments highly influences how much total financial flows are estimated and reported (**Box 6.4**).

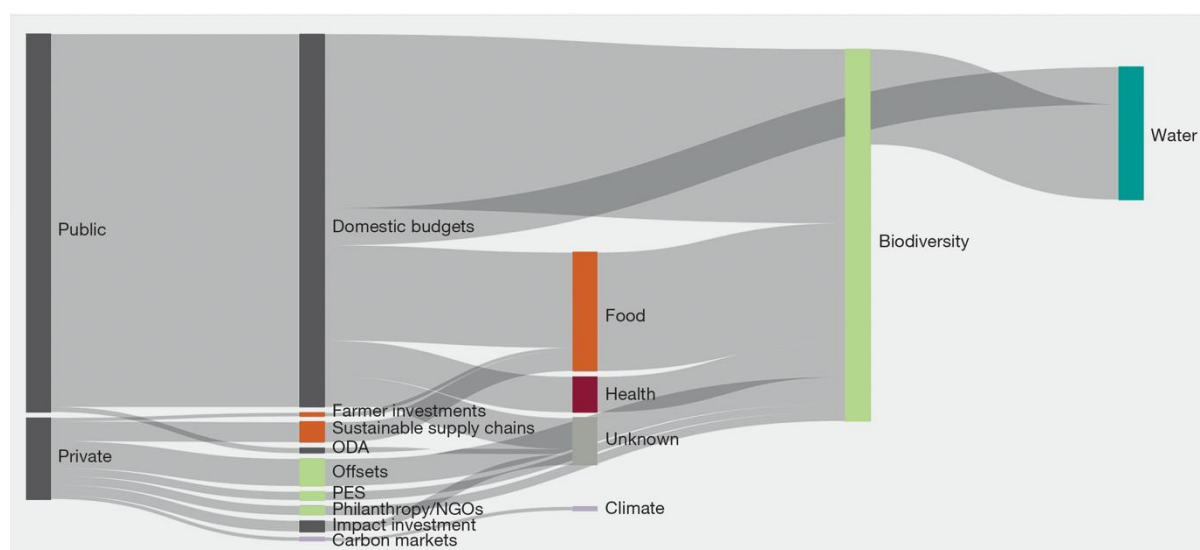


Figure 6.3. Current sources of financial flows to nature-based solutions and their likely connection to nexus elements. The most up-to-date (2022) estimation of financial flows directed towards nature-based solutions (NbS) compiled by (UNEP, 2023e) are used. The total volume of flows represented is \$200 billion, the majority of which (\$165 billion) comes from public sources. Estimates include both mainstream biodiversity/conservation finance, as well as – in seeking to assess NbS finance – capturing some finance flows which build on nexus relationships, e.g., biodiversity and water, or biodiversity and agriculture. Connections of financial flows to nexus elements are based on the documentation provided by the report; for instance, public funds that direct domestic budgets towards “sustainable agriculture, forestry and fisheries” were classified as “food”, “biodiversity” and “water”. As this figure reflects UNEP’s accounting of flows towards NbS, it does not reflect either (i) financial flows

that have a nature-negative impact; nor (ii) financial flows directed towards particular nexus elements (e.g., climate change, health) that were not considered to also have benefits for nature and therefore not identified as NbS. Note for instance that financial flows to climate change more broadly are estimated to be over \$1 trillion annually (Buchner et al., 2019), and thus much larger than represented here. An interactive version of this figure which displays the specific amounts (in billions of USD, annually) is available at: https://pacheco-andrea.github.io/finFlows_nexus/outputs/BDFin_positiveFlows.html. See the associated data management report for the methodology².

6.2.2.1 The role and relative importance of public financing

To date, the vast majority of global finance for biodiversity has been provided by public entities via domestic budgets, and to a lesser degree through bilateral and multilateral cooperation or via other environmental policy instruments (OECD, 2020a; Tobin-de la Puente & Mitchell, 2021; UNEP, 2023e; UNEP & ELD, 2022) (Figure 6.2 A, Figure 6.4). Most recently – looking at how resources are allocated to investments in nature for meeting the interrelated objectives of the CBD, UNFCCC and UN Convention on Combating Desertification (UNCCD) - public finance is estimated to represent more than 82% of total “nature-positive” flows, amounting to \$165 billion/year in aggregate (UNEP, 2023e). These can be compared to private finance, which accounts for only around 18% of overall nature-positive flows (UNEP, 2023e) (Figure 6.3).

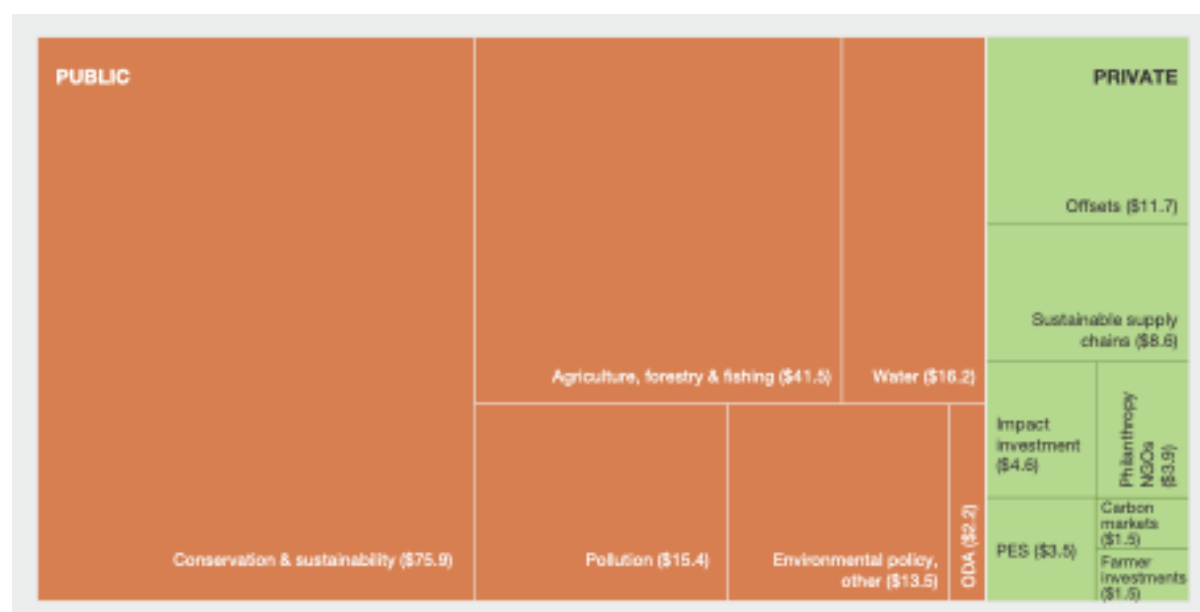


Figure 6.4. Annual public and private financial support for nature-based solutions in billions USD. Public and private sectors contribute to nature-positive activities via different instruments. Public financial support is primarily dispersed via domestic budgets for biodiversity conservation, agriculture, forestry and fisheries, water, as well as pollution, wastewater management and other environmental protection and environmental policy measures. Official development assistance accounts for a small proportion of public financial

² The data management report (IPBES NXS DMR 6.1 financial flows figure) and associated files are under restricted access in Zenodo until the assessment is approved; reviewers may request access to the report.

support (\$2.2 billion). Financial support from the private sector is dispersed via instruments such as investments in sustainable supply chains, biodiversity offsets, impact investments (financial investments that seek measurable environmental improvements alongside financial returns), other voluntary credit markets and philanthropy (UNEP, 2023e).

On one hand, the central role of public actors in biodiversity finance is largely appropriate, given that biodiversity, ecosystem services and ‘nature’ more broadly constitute public goods or shared global commons (Buchholz & Sandler, 2021; Kaul et al., 2022). Conversely, it is unlikely that public finance alone can be relied upon to close existing biodiversity and sustainable development financing gaps without contributions from other sources (Buchholz & Sandler, 2021; Kaul et al., 2022). Moreover, the private sector is more responsible for exploitative use and damage to the environment (Section 6.1.3). Thus, there is growing awareness that private actors, philanthropists, communities and NGOs will likely play a greater role in closing existing financing gaps. While it can be argued that public goods need public finance, this does not mean the public sector should compensate for damage to public goods which arise when the values of nature are not taken into account in private decisions. Instead, applying the polluter pays principle (OECD, 2008) implies a larger role for the private sector.

In developing countries, only 13% of biodiversity investments come from national budgets (Waldron et al., 2013), indicating likely shortfalls in meeting additional financing needs from the public sector. Against this backdrop, many developing countries may not be able to dedicate sufficient resources to cover the costs of conserving and sustainably using biodiversity while simultaneously sustaining domestic livelihoods (UNCCD, 2022). As highlighted in Section 6.1.4, high debt burdens and the impacts of the loss of nature on economic production can put further pressure on fiscal resources and further reduce the availability of public funds to invest in biodiversity (M. Agarwala et al., 2022; Kraemer & Volz, 2022), this is not unique to biodiversity, and has also been shown to be the case for climate change (Zucker-Marques et al., 2023).

It is important to note, that public financial support to help deliver nexus outcomes is not limited to direct expenditure on biodiversity or nexus-related projects, but can also be delivered through financial instruments (e.g. loans, grants or equity investments) and may be aimed to leverage wider investment (OECD, 2023a). Particularly since the mid-2000s, there have been numerous calls to increase the role of “blended finance”, or using public and philanthropic funding to incentivize private investment in biodiversity conservation and sustainable development (Smith et al., 2022). Such funding modalities better reflect the dependence of private sector activities on well-functioning ecosystems (Beer, 2023; Clark et al., 2018; Holmes, 2012; WEF, 2020). In addition to voluntary carbon offsetting and payment for ecosystem service initiatives intended to support climate change mitigation in agriculture, forestry and land use (Cavanagh et al., 2021; Marcelo Santos Rocha da Silva, 2022), various initiatives have emerged in biodiversity conservation to harness contributions from the private sector: for instance, incentives for profit-oriented investments in ecotourism and hybrid private/public co-management of conservation areas (Cavanagh et al., 2020; Chausson et al., 2023; Dempsey & Suarez, 2016).

The share of biodiversity development finance being delivered through multilateral development banks and funds has increased over recent years (OECD, 2023a), although starting from a low base, and has remained low in comparison to the support delivered across other issues such as climate change. Multilateral Development Banks (MDBs) have however recognized the key role they could play – as reflected in a Joint Statement on Nature, People and Planet issued on behalf by the multilateral development banks (MDBs) released at the session of the UNFCCC Conference of the Parties in 2021. Alongside committing to improving understanding of nature-related risks associated with nature loss and to develop projects, business models and/or financing instruments to support economic activity that reverses the drivers of nature loss, the MDBs committed, where possible, to support countries in developing appropriate policies and investment frameworks recognizing the potential to leverage additional private finance for ‘nature-positive’ investments (*UNFCCC COP26 MDB Joint Statement on Nature*, 2021). It has also been suggested that more fundamental reforms are needed to multilateral financial infrastructure to deliver such an agenda, including aligning mandates with tackling the planetary crisis across climate change, pollution and biodiversity loss, and focusing on more catalytic roles to drive finance to fill investment gaps especially in developing countries (PRI, 2023).

Overall, public sector finance is important for multiple reasons, ranging from direct support for the provision of public goods, through leveraging private finance, to stimulating change in how private finance acts with regard to biodiversity and achieving related sustainability objectives. Regulation and policy will also play a key role in changing private incentives to invest in biodiversity and nexus outcomes, with the need for regulatory mechanisms to ensure private investments deliver outcomes that are both socially just and environmentally effective irrespective of how they are catalyzed (Chausson et al., 2023; Kedward et al., 2023; Nykvist & Maltais, 2022).

6.2.2.2 The role of private finance

The current volume of private finance for biodiversity, including NbS, remains limited. The extent to which the finance sector might be expected to increase this can depend on how assets are managed as well as the regulatory/enabling environment in which investments are made. Financial investments with sustainability strategies lie on a spectrum: for example, some may simply screen and exclude certain types of investments with negative impacts, whereas others might actively pursue positive outcomes and potentially accept sub-market returns for environmental and social benefits (UN, 2024). Impact investing, at the end of this spectrum, focuses on delivering measurable improvements in environmental and social outcomes, yet it only constituted around 1% of total investments across this spectrum of sustainability strategies from 2016-2020 (GSIA, 2022). The balance of investments overall remains skewed away from any kind of sustainability criteria: impact investments are a minor share of investments with sustainability strategies, which are themselves in the minority with regard to total investments, highlighting the scale of the challenge in rebalancing the interests of the finance sector with the state of biodiversity and other nexus elements (Dasgupta, 2021a; Finance Watch, 2019). Nonetheless, there are still significant and growing financial resources seeking returns from sustainable financial investments. For example, the value of sustainable investment products (sustainable bonds and sustainably themed funds used in pursuing market returns while delivering resources to sectors tackling specific issues, e.g., investing in low carbon technologies) reached more than \$7 trillion in 2023 (UNCTAD,

2024); however, as sustainable finance as described here includes products with primarily social objectives, this total is not all green finance.

Private philanthropic biodiversity-related funding (i.e. private money which seeks impact, but no financial return) has increased over time with estimates increasing from \$0.50 billion per year in 2017 to \$0.68 billion per year in 2020 (OECD, 2023a) with \$5 billion over 10 years also pledged by a group of philanthropic foundations in 2021 (WWF, 2021), but is unlikely in isolation to be able to close financing gaps. The potentially catalytic role of philanthropic finance on policy highlights the importance of understanding how such resources can ensure they legitimate more equitable outcomes without reinforcing existing power imbalances (Beer, 2023; Betsill et al., 2022)

Beyond the private sector, it is also noted that the public sector (globally) also holds significant assets which can be mobilized for more sustainable investment with over \$30 trillion of assets with long-term investment horizons held in public pension funds and sovereign wealth funds (UNCTAD, 2024).

While higher income countries dominate statistics on sustainable bonds and funds (UN, 2024), developing economies are more visible in public pension fund and sovereign wealth fund statistics, where they hold 31% of the \$24 trillion held in the top 100 funds across these categories (UNCTAD, 2024). However, this financing does not necessarily follow through to investment in biodiversity. The World Investment Report 2023 looked at sustainable investment funds and their alignment with the SDGs, finding that only 0.8% of such funds supported biodiversity and ecosystem objectives (UNCTAD, 2023b). 15% of self-declared “green funds” also had exposure to fossil fuel assets at over 10%, raising questions around their credentials (UNCTAD, 2023b). Of the top 100 public pension and sovereign wealth funds explored, 58 reported on their sustainability performance, with the most used reporting framework that of the Taskforce on Climate Related Financial Disclosures (TCFD), indicating that environmental reporting largely focuses on climate change related impacts and risks (UNCTAD, 2024). This suggests scope and potential to increase investment in biodiversity, if mechanisms can be developed to allow funds seeking sustainable, long-term benefits to identify and recognize their potential.

Green bond issuance has increased significantly since 2018 (when it was at \$39 billion), and in spite of peaking in 2021 (at \$199 billion) and declining since, the \$109 billion issued in 2023 remained significantly higher than both 2018 and 2019 (UNCTAD, 2024). The recent decline has been associated with decline in the broader bond market due to the war in Ukraine and the general tightening of monetary policy (CBI, 2022). The popularity of green bonds has led to the development of other sustainable fixed-income instruments such as blue, transition, sustainable and social bonds, although the uptake of these products has been slower (Hand et al., 2022) and they remain niche products accounting for approximately 6% of all bonds issued, with the majority of green bonds focused on the climate transition (UNCTAD, 2024). Taken together, the total issuance of sustainability-focused bonds amounted to over \$1 trillion in 2021 (Hand et al., 2022).

Experience with green bonds is not limited to terrestrial areas, in the oceans, ‘blue bonds’ have been similarly recognized as a possible tool to meet the \$178 billion estimated global

shortfall in funding for conservation and sustainable use of marine ecosystems. The first example of the Seychelles Blue Bond project – a blended finance instrument used to draw in private resources to invest in improvements to the protection and management of marine assets – has sparked other initiatives in Fiji, Belize and the Baltic region (B. S. Thompson, 2022). While these projects have brought some local benefits as well as some controversy about the potential uses of proceeds, the complexity of bond mechanisms given the inherent difficulty in monitoring outcomes in variable ocean ecosystems, as well as the challenges in providing financial returns from non-public sources, means that a wide range of other instruments and mechanisms will remain important, including blended financing, public and private investment, philanthropic grants and local ownership models (Sumaila, Walsh, et al., 2021; B. S. Thompson, 2022).

6.2.2.3 The geographical distribution of spending on biodiversity

Available evidence shows that there is clear bias in the distribution of biodiversity finance, with much of it remaining within developed countries, particularly the United States of America, Canada, Europe and China. The picture is potentially even more imbalanced for private financial flows, as only 5.3% of private finance went to least developed countries and other low-income countries in 2017-2018 (OECD, 2020a). Another recent assessment notes that impact investing (e.g., with positive returns on social and environmental aspects) shows the same distributional bias, as most is concentrated in the United States of America and Europe and has only recently reached developing countries (BIOFIN, 2022). These patterns are also evident in financing for ocean and coastal sectors, where funding from international financial institutions is still dominated by large capital projects for European renewable marine energy projects (UNEP-FI, 2021).

Funding shortfalls for lower income countries are particularly concerning given the concept of ecological debt, which notes that historic ecological damages related to the impacts of international trade have often fallen on lower income countries, where biodiversity is also the most rich (A. Chaudhary & Brooks, 2019a; Goeminne & Paredis, 2010; Hickel, Dominguer, et al., 2022; Hickel, O'Neill, et al., 2022; R. Jones et al., 2020; Lenzen et al., 2012; UNRISD, 2023). Countering this historical financial accumulation by recalibrating the distribution of equitable financing through 'telecoupled conservation', 'connected conservation' and/or 'collaborative conservation' has been suggested as a solution that would rebalance the relationship between countries with regard to ecological and financial debt (Carmenta et al., 2023).

6.2.3 Financial flows with negative impacts on biodiversity

6.2.3.1. Traditional private investments

The total value of global financial assets is not widely estimated, and estimates depend on which assets are included, e.g., global investable assets (stocks, bonds and other investment funds) were estimated at \$250 trillion in 2020, 15% of which was estimated to be held by 60,000 ultra-high net worth individuals (BCG, 2021). An alternative exploration that looked at how global assets are managed estimated that traditional investment assets (with no clear sustainability principles) were worth approximately \$300 trillion (or ten times the value of

sustainable funds managed under ESG principles estimated in the same report) (Finance Watch, 2019), highlighting how broadly biodiversity and nexus elements are likely to be neglected in existing financial investment decisions. Reinforcing this, the Dasgupta Review (Dasgupta, 2021a) compares estimates of the 2019 levels of private finance flowing to biodiversity conservation (valued at approximately \$6.6 to \$13.6 billion) (Deutz et al., 2020; OECD, 2020a) with financial flows to sectors that are the main drivers of biodiversity and ecosystem disruption, and which were valued at \$2.6 trillion in 2019 (Portfolio Earth, 2020).

Similarly, as highlighted in **Figure 6.5**, which summarizes annual flows of private finance with negative impacts on biodiversity, impacts arise across many different sectors across the economy, including from sectors with nexus interlinkages with biodiversity such as healthcare, energy and food (which falls under consumer non-cyclicals) (UNEP, 2023e). Note, the monetary values presented in **Figure 6.5** are orders of magnitude smaller than the asset values related to global financial investment presented at the start of the prior paragraph, as they represent annual flows of finance with negative impacts as opposed to capitalized value of flows over time.

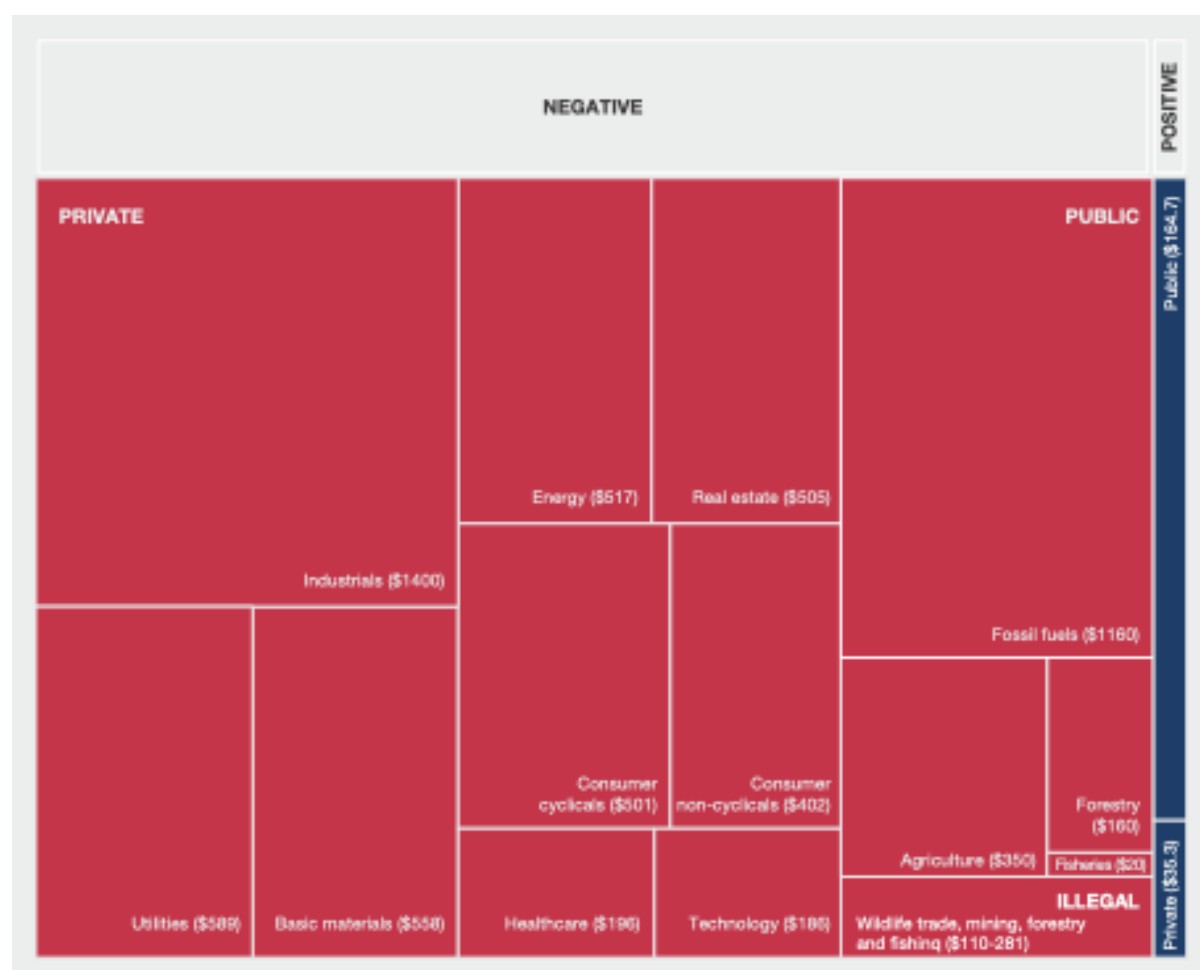


Figure 6.5. Annual public and private financial flows with direct negative impacts on nature (orange, brown and yellow) compared to finance for nature-based solution as described in figures 6.3 and 6.4 (green) in billions USD per year. Estimates are based on the latest available data (UNEP, 2023a), which estimates sector-specific private financing for

the first time. This data is supplemented with estimates of the global value of environmental crimes (illegal wildlife trade, illegal mining and extraction, and illegal forestry and fishing, shown in yellow) (OECD, 2021). Sizes of the boxes indicate the average of estimates between upper and lower ranges where provided.

In a report measuring nature-related commitments of Fortune Global 500 corporate companies, only 5% of companies had biodiversity-loss related targets, while 83% had climate related targets (mostly addressing transportation) (Claes et al., 2022). This further reinforces the fact that knowledge of biodiversity impacts are not widely demanded from corporations, and also that nexus connections are unlikely to be easily established in private financing decisions, especially based on corporate reporting. These challenges highlight not only the need to increase targeted investments to support nexus investments, but also the need to tackle the negative impacts of the large share of mainstream financial and economic activity, as noted further in Section 6.2.3.2.

6.2.3.2 The challenge of perverse subsidies that drive damages to biodiversity and the nexus elements

As highlighted in **Figure 6.5**, public subsidies create negative impacts on biodiversity and across the nexus by driving biodiversity loss through land use change, land degradation and climate change. Estimates vary for a number of reasons, including the time scale of estimates; for example, fossil fuel subsidies have increased significantly in recent years, more than doubling between 2021 and 2022 and making up nearly 70% of the direct \$1.7 trillion of harmful subsidies (UNEP, 2023e). Even prior to the energy crisis, the OECD estimated that \$500 billion per year is used by governments via subsidies or other financial mechanisms in investment areas that are directly harmful to biodiversity (OECD, 2020a). This amount was approximately five times more than the estimated positive financing flowing to biodiversity, as noted in Section 6.2.2.

To subsidize the consumption of fossil fuels, countries have spent about six times the amount they promised to mobilize each year for renewable energy and low-carbon development under the Paris Agreement; in 2015, fossil fuel subsidies were estimated to equate to roughly 6.5% of global GDP (Coady et al., 2017). Subsidies for agriculture, mining and fossil fuels have generated significant distortions in world trade and extra pressure on the ways in which natural resources are used (**Box 6.5**). Agricultural subsidies, which exceeded \$635 billion a year from 2016-2018, and have more recently been estimated at \$851 billion per year (OECD, 2023c). While some payments are designed to be environmentally beneficial, e.g., an estimated 5% of 2016-2018 totals (Gautam et al., 2022), they can lead to the excessive use of fertilizers that deteriorate soil and water and harm human health (Damania, Polasky, et al., 2023; Gautam et al., 2022). In 2021 it was estimated that 87% of agricultural support remained price distorting and environmentally and socially harmful (FAO et al., 2021). For example, subsidies for products like soybeans, palm oil and beef account for 14% of forest loss each year (Damania, Polasky, et al., 2023). However, cautionary principles should be applied when assessing the role of subsidies and their potential reform in developing countries, as while potential benefits in terms of both reduced environmental

pressures and improved equity can be readily identified (Barbier & Burgess, 2020; Gautam et al., 2022), delivering such outcomes in practice can be politically challenging and require significantly greater support to shift behaviours in a way that secure the expected benefits without imposing additional costs on, for example, low income farmers (Kishore et al., 2021).

Subsidies for fisheries (approximately \$35 billion/year), are key factors driving declining fish stocks, oversized fishing fleets and declining profitability, which has potential ramifications for food security, considering that over 1 billion of the world's poor rely on fish as their main source of protein (Damania, Polasky, et al., 2023). An estimated \$80 billion in potential profits are lost worldwide due to overfishing and overcapacity enabled by these perverse fishing subsidies (Schuhbauer et al., 2020). Additional subsidies that can be harmful to biodiversity include transfers, tax credits or other perverse incentives provided in sectors including “agriculture, fisheries, transport and infrastructure, construction, land use change, [and] forestry” (BIOFIN, 2022). Taxes on exports of grains and other raw materials generate distortions in the international market and affect farmers, increasing pressure on natural resources as farmers are pressed to secure economic returns (OECD, 2019). For example, pressures to be competitive in global trade pushes farmers to produce more in sensitive territories such as the Chaco and the Pampas (Pengue, 2017).

Fully reforming fossil fuel prices by removing explicit fuel subsidies and imposing corrective taxes such as a carbon tax is estimated to reduce global carbon dioxide (CO₂) emissions by 43% below ‘business-as-usual’ levels in 2030 (34% below 2019 levels), and would be in line with Paris Agreement goals of keeping global warming to ‘well below’ 2°C and towards 1.5°C (Black, Liu, Parry, & Vernon, 2023). A full fuel price reform would also raise substantial revenues, worth about 3.6% of global GDP. These revenues could be used to cut more burdensome taxes such as on those labour, help with debt sustainability, or fund productive investments. Indeed, for developing countries as a whole, revenue gains from full price reform exceed the estimated extra spending needed to achieve the SDGs (Black, Liu, Parry, & Vernon, 2023).

The European Green Deal, signed in 2019, seems to be an opportunity for improving EU ecosystem and human health but requires finding an environmental, economic and social balance with other countries and among European actors’ interests (Fuchs et al., 2020; Haines & Scheelbeek, 2020; Mollers, 2022). After decades of promoting high-input industrial agriculture, the government signatories of the European Green Deal are now asking for producers to turn to sustainable agricultural systems including organic farming. These include agroecology-based practices that reduce the dependence on inputs like fertilizers, creating among other implications, a lower-cost agricultural production system (**Box 6.5**). This evolution requires reforming and balancing explicit and implicit subsidies between environmental-friendly and environmental-harmful practices (Fuchs et al., 2020; Mollers, 2022; Vos et al., 2022). At the same time, high food prices (e.g., in 2022) promote lobbying pressures from farmers and agribusiness against environmental policies that they fear would reduce productivity (Vos et al., 2022).

Box 6.5. A process of distortive subsidies repurposing: Agricultural nitrogen pollution in the European Union

Since the 1960s, the EU Common Agricultural Policy has included subsidies policy reflecting different stakeholders' interests. High agricultural production in the 1980s resulted in a surplus, partly due to distortive subsidies for exporting, which generated multiple international protests from exporting countries whose economies were affected (Vos et al., 2022). Meanwhile, negative consequences also occurred in Europe, such as pollution associated with agricultural fertilizer use. Negative externalities of ammonia and nitrates pollution from agriculture in the European Union (27) (excluding costs from imported feed), were estimated in 2008 at 138 (61-215) billion € (0.5 to 1.8% of the EU GDP). Of this amount, 26-36% was associated with ammonia emissions on human health; 0-1.3% to nitrate leaching on human health; 3-4% to impacts of ammonia deposition on terrestrial ecosystems; 22-26% to ammonia deposition on aquatic ecosystems and 38-43% to impacts of N leaching and runoff on aquatic ecosystems (van Grinsven et al., 2018).

In response to nitrogen pollution, in 1985 Denmark initiated a sequential plan with midterm evaluations supported by cross-party agreement and dialogues with farmers, demonstrating how subsidy reform might be achieved. These policies would later guide the European nitrogen policy. These were the targets and actions developed (Eory & Hutchings, 2017).

- Reduction in nitrogen and phosphorous pollution (1985): maximum 2 livestock unit/ha stocking density; autumn ban on slurry spreading; manure storage measures.
- Reduce nitrogen-losses by 50% and phosphorous-losses by 80% (1987): minimum 9 months slurry storage capacity; mandatory fertilizer and crop rotation plans; minimum winter crop or cover crop.
- Reduce nitrogen-losses from agricultural fields by 100 kt nitrogen (1991): nitrogen quota at economic optimum; extended ban on slurry spreading; statutory norms on plant-available nitrogen in manure.
- Reduce nitrate losses by 62% (1998-2003): nitrogen quota 10% below economic optimum; maximum 1.7 livestock unit/ha stocking density; subsidies to artificial wetlands and afforestation; minimum catch crop (fast growing crops grown between main crop rotations or in the off season which reduce nitrate leaching amongst other benefits) planting.
- Reduce ammonia emissions by 33% (2001): animal housing and manure storage subsidies; ban on broadcast spreading of slurry; increased minimum catch crop planting.
- Reduce nitrogen-leaching by further 13% and reduce excess phosphorous by 50% by 2015 (2005-2015): further increase in minimum catch crop planting; stricter statutory norms on plant-available nitrogen in manure; tax on mineral phosphorous in livestock feed; further wetland areas and afforestation
- Reduce nitrate losses by 33 % (2010-2020): reductions in ammonia and GHG emissions and pesticides losses; increasing biodiversity by increasing organic food production; nitrogen quota 15% below economic optimum; promotion of optimized feed practice; further buffer zones up to 10 m width bordering water courses and lakes.
- In agreement with EU Commission, reduce nitrate leaching from about 57 to 42 kt nitrogen/y by 2021 (2016): nitrogen quota at economic optimum; voluntary measures but

with the governmental option to make them mandatory; subsidies for end-of-pipe nitrate leaching solutions; taking lands out of agriculture into forestry or restored wetlands.

Modelling, monitoring, and site-specific regulations were developed. By 2010 there was a 40% reduction in Denmark's nitrogen surplus and the nitrogen use efficiency was doubled (from 20 to 40%). In addition, nitrogen use dropped by 33%, ammonia emissions from agriculture reduced by 30%, ammonia deposition reduced by 20-25%, and N₂O emissions reduced by 35%, being an additional benefit contributing to GHG emissions targets (Eory & Hutchings, 2017). Even with these improvements, in 2013 Denmark's nitrogen indicators were above 15 EU countries' mean levels, and insights about policy outcomes varied among different actors. In 2016 the decision to increase the nitrogen quota while reducing nitrate leaching, was a challenge that needed more subsidies. This generated a conflict with the EU Commission making Denmark sow cover crops compulsorily with financial compensation. Political decisions to increase nitrogen regulations highlighted the trade-offs between measures for nitrogen efficiency improvement and farm profitability. Regulatory measures were accepted by farmers when efficiency savings and technology improvements occurred at a low cost or even generating savings for the farmer. Lower nitrogen quotas promoted the technological improvement in manure nitrogen utilization (Eory & Hutchings, 2017). Options to improve this example of repurposing distortive agricultural subsidies while including other environmental and health benefits could be a transition to more sustainable agriculture, a priority for Danes citizens (Eory & Hutchings, 2017). Among those options is less input-dependent agriculture like agroecology-based agriculture (see **sections 5.3.3.4, 5.3.3.5 and Box 11 in Chapter 5, section 3**).

6.2.3.3 Illegal flows of finance that drive damage to nexus elements and undermine sustainable development prospects

Well-intentioned efforts to support biodiversity conservation and the SDGs through public finance have been undermined and even overwhelmed by the rapid rise in environmental crime, which often involves coordination across transnational organized criminal networks, gangs and syndicates supported by corrupt government officials (Amerhauser & Cartwright, 2023; Gore et al., 2019; Nellemann et al., 2016). Environmental crime is a barrier to achieving biodiversity goals and the SDGs, negatively impacting development and peace initiatives, and has become a global-local security concern (Gore et al., 2019; Nellemann et al., 2014). It includes illegal activities like wildlife and timber trafficking; illegal, unreported and unregulated fishing; waste trafficking and dumping; and illegal mining and extraction and theft of oil (S. Yamaguchi, 2023), with an estimated annual value in 2018 of \$110-281 billion (**Figure 6.4**; Nellemann, C.; Henriksen, R., Pravettoni, R., et al., 2018).

Environmental crime is now one of the world's most lucrative criminal economies, but these benefits seldom go to local communities near source markets; instead, they are transferred and laundered into the global financial system. Transnational environmental crime has been identified as the largest financial driver of social conflict (Gore et al., 2019). Illegal wildlife trade alone generates annual financial flows of \$7-23 billion (UNODC & APG, 2017). Wildlife trafficking has converged with other serious organized crimes, including drug trafficking, supported by violence and corruption (Anagnostou & Doberstein, 2022; Van Uhm et al., 2021; Wrathall et al., 2020), leading to resilient and pervasive criminal networks that drive wildlife crime (Ayling, 2013; Wyatt, 2022).

Corruption also results in negative impacts on the environment. A number of sectors are particularly vulnerable to corruption, including forestry, the protection of endangered species, water supply, oil exploitation, fisheries and hazardous waste management (Branch et al., 2022; Brenton-Rule et al., 2016; C. J. Cavanagh et al., 2015). In the water sector, corruption increases the costs of building water infrastructure by as much as 40%, equating to an additional \$12 billion a year needed to provide safe drinking water and sanitation globally (UNODC 2015). Corruption may also affect environmental degradation directly by reducing the stringency of environmental regulations which can result in adverse environmental impacts and higher greenhouse gas emissions (Iheanachor et al., 2023). **Box 6.6** reveals the complex interactions between nexus elements and the drivers of illegal activities and the associated financial, justice and sustainability consequences.

Box 6.6. Blue crime, maritime piracy and sustainable ocean development: African experiences

Illegal activities at sea adversely impact human well-being and planetary health (Witbooi et al., 2020). Blue crime includes illegal, unreported and unregulated (IUU) fishing; piracy, including hijacking, robbery and kidnapping; corruption, fraud and theft in ports and at sea, including bribery, tax crimes, money laundering and smuggling; illegal dumping at sea; terrorism; and illicit trafficking of humans, wildlife, arms, narcotics and waste by sea (Sosnowski et al., 2024). The direct and indirect costs of maritime piracy from 2010-2012 ranged from \$15 to 25 billion annually (Bensassi & Martínez-Zarzoso, 2012; Galgano, 2024; S. Jones, 2014). The wide range of costs reflects changing levels of piracy over time and different approaches to estimate direct and indirect costs. The direct costs include: ransoms; stolen property; increased insurance premiums and new types of insurance (e.g., war risk, kidnap-and-ransom insurance); anti-piracy protection, security and communications equipment, including security personnel; convoy escorts; high-pressure hoses; safe rooms; loud speakers and search lights; training costs; re-routing ships, including additional fuel to bypass high-risk localities or escape at high-speed; and impacts on crew safety and livelihoods. Indirect costs include: deployment of government naval forces; shipping delays; investment losses; higher commodity prices; costs of prosecution of pirates; and costs to local, regional and global economies, including reductions in trade volume or economic impacts on local communities.

Global piracy and armed robbery incidents peaked in 2011, at about 500 attacks, and by 2023 declined to 120 incidents, three quarters of which are in the Gulf of Guinea (Zhang et al., 2024). Maritime piracy in African waters emerged in the 2000s, first centred off Somalia, and growing rapidly in the Gulf of Guinea from the 2010s (Neethling, 2011; Onuoha, 2010). Piracy off the Horn of Africa was contained by 2013-2014 but still remains severe in the Gulf of Guinea (Barla & Agarwala, 2020). Maritime piracy in both locations is driven by governance failures, political marginalization, IUU fishing, environmental destruction and criminality. This in turn disrupts global supply chains and maritime shipping, public finance, biodiversity conservation, food security, local livelihoods and geopolitical stability (Aceves-Bueno et al., 2021; Bueger & Edmunds, 2017, 2020; Desai & Shambaugh, 2021; Dua, 2013; Forster, 2014; Hamza & Priotti, 2020; Hassan & Hasan, 2017; Herbig & Fouché, 2013; Mitchell & Schmidt, 2024; Neethling, 2011; Phayal et al., 2024; Siebels, 2020; Vreĵ, 2014).

Somalia: The 1991 fall of the Somali government, violent civil war and poverty created governance failures that allow illegal dumping (Herbig & Fouché, 2013) and IUU fishing (Elmi et al., 2015; Neethling, 2011; Weir, 2009) to occur. Starving fishers became self-proclaimed ‘coastguards’ to halt illegal activities, intercepting and ‘levying a tax’ on perpetrators, and this ad hoc petty theft was transformed into well-organised crime (Barla & Agarwala, 2020). Piracy was brought under control quickly because Global North strategic and commercial interests mobilized effective responses (Alsawalqa & Venter, 2022; Biegus & Bueger, 2017). However, this semblance of maritime law and order is fragile because the root causes of piracy were not addressed and prospects remain bleak for many Somali citizens (Biegus & Bueger, 2017; Potgieter & Schofield, 2010), as insecurity on land shapes maritime insecurity (Neethling, 2011).

Gulf of Guinea: Drivers of piracy include illegal dumping at sea and IUU fishing; weak state capacity; political disenfranchisement; poverty; and oil and gas activities that displace communities, cause pollution and disrupt livelihoods, ‘pushing’ people into piracy such as stealing crude oil from tankers and pipelines (Adesanya, 2023; Denton & Harris, 2021, 2022; Neethling, 2011; Nwalozie, 2020; Onuoha, 2013; Oyewole, 2016). Some justify crime as ‘eco-justice’ but there are blurred lines between political grievances and piracy (Barla & Agarwala, 2020). As in Somalia, petty theft gave way to well-organised crime, with attacks extending farther afield and becoming increasingly violent. Regional actors have sought to contain piracy, concentrated in territorial waters, with limited success (Oyewole, 2016) as compared to efforts in international waters around the Horn of Africa (Barla & Agarwala, 2020).

Overall, “blue crime” negatively impacts sustainable ocean development (Bueger & Edmunds, 2017, 2020; Triantafyllou et al., 2023) especially given hopes that the ocean is the frontier for Africa’s future development (Okafor-Yarwood & Onuoha, 2023). Building nexus governance capabilities (see **Chapter 4**) is key to realizing this potential and addressing the root causes of blue crime (Barla & Agarwala, 2020; Galgano, 2024; Neethling, 2011; Oyewole, 2016; Sosnowski et al., 2024). Examples of these nexus governance approaches include building shared understanding about the shadow blue political-economy; cooperative global and regional marine law enforcement; and community-based approaches that target criminal network supply chains supported by enabling legislation (Aceves-Bueno et al., 2021; Witbooi et al., 2020).

6.2.4 Understanding gaps in financing needs for biodiversity and the nexus

National and international efforts to preserve biodiversity and deliver positive co-benefits for people remain highly underfunded (OECD, 2023a) (**Figure 6.2**). The biodiversity “financing gap” is usually interpreted as a gap between the scale of biodiversity finance available and the scale of financial flows required to meet a pre-defined set of biodiversity-related objectives (**Table 6.2**).

Table 6.2. Recent estimates of current and required levels of spending to achieve biodiversity and wider nexus-related objectives over time.

Source	Current flows for biodiversity, nature and NbS (\$ billion/year at the time of estimation, i.e. figures have not been adjusted for inflation)	Estimated investment needed to close the financial gap (\$ billion/year)			Notes for closing the gap
		2023	2030	2050	
(OECD, 2020a)	78-91 (2015-2017 average)				
(Deutz et al., 2020)	124-143 (2019)		722-967		
(UNEP & ELD, 2022)	82.4-227 (2022)	384	484	674	To meet biodiversity, climate and land degradation targets
(GGKP, 2021)	N/A	62-621 (2021-2030)			Investment required to close the gap between the current condition of natural capital to that required to meet 9 natural capital related SDG targets

Biodiversity-related financing gaps are estimated to be in ranges of \$300 billion to \$400 billion annually (Credit Suisse et al., 2014) up to \$722 billion to \$967 billion annually (Deutz et al., 2020), relative to the roughly \$100 billion being currently spent on nature (BIOFIN, 2022; Deutz et al., 2020; OECD, 2020a) (**Table 6.2**). In addition to not meeting current needs, the scale of financing required for NbS and related initiatives supporting climate and biodiversity goals is expected to more than triple by 2030 (OECD, 2020a; UNEP et al., 2021). Overall, inaction gaps are expected to grow over time and have a high cost: a ten year delay in delivering global biodiversity goals has been estimated to double the cost of action, with wider costs across the nexus through reduced agricultural productivity and higher food prices (NHM & Vivid Economics, 2021).

Many saw the COVID-19 crises as a way to draw attention to the financing gap for biodiversity, given the link between zoonotic diseases and ecosystem change, as well as an opportunity to reset the global economy and tackle the economic drivers that cause ecological disruptions and reverse decades of biodiversity and ecosystem losses (Dinerstein et al., 2020; McElwee et al., 2020; McNeely, 2021). However, in reality, many COVID-19 economic stimulus packages enacted either failed to address climate and biodiversity goals, or worse, funded nature-negative activities (Hepburn et al., 2020; McElwee et al., 2020). Out of \$14.6 trillion that the world's 50 largest economies announced in fiscal spending in the wake of

COVID-19, just \$368 billion (2.5%) were directed towards green initiatives (UNEP et al., 2021).

The Kunming-Montreal Global Biodiversity Framework emphasizes that closing the biodiversity financing gap of \$700 billion/year will necessitate increases in biodiversity financing from all sources, including domestic and international, public and private sources (CBD, 2023). It sets a target to raise the level of biodiversity related financial resources to at least \$200 billion per year by 2030, from which at least \$30 billion is international finance coming from developed countries. Encouraging the involvement of the private sector in biodiversity financing is foreseen through leveraging private finance, blended finance, impact funds or other means. The use of innovative financial instruments such as payments for ecosystem services (PES) schemes, green bonds, biodiversity offsets and credits, and other benefit-sharing mechanisms are also encouraged, but with environmental and social safeguards. However, despite the Kunming-Montreal Global Biodiversity Framework and other calls for private finance to redress the persistent biodiversity financing gap, a growing evidence base suggests that private finance alone is unlikely to close the gap in the absence of necessary enabling conditions (Christiansen, 2021) or additional support from the public sector (Kedward et al., 2023). Public sector policy or financial support can take many forms (e.g., tax policies, subsidies, market mechanisms, grants, concessional loans and risk mitigation systems, including insurance and government guarantees) but is likely to have similar objectives – to help increase the returns to activities that can protect and restore biodiversity and wider benefits across the nexus, while reducing the returns to those which cause harm across the nexus so that financial and biodiversity objectives are better aligned (Clark et al., 2018; Nature Finance, 2023; UNEP-FI, 2023).

Additionally, IPLC organizations have highlighted that only a small fraction of biodiversity and climate financing reaches them directly, and that in general they depend on international administrators or other local fiscal management recognized by governments (Rights and Resources Initiative (RRI), 2024). Accordingly, some additional economic tools such as PES and carbon markets have been piloted with Indigenous communities to raise additional funds from culturally appropriate financing (**Box 6.7**).

Box 6.7. Case study: Indigenous fire management in northern Australia to mitigate climate change and related carbon financing

Tropical savannas in northern Australia, covering an area of 1.9 million km², are managed by applying Indigenous traditional knowledge and practices that offer special insights into how Indigenous peoples help manage the landscape, mitigate greenhouse gas (GHG) emissions, and protect biodiversity. This management takes place through a fast-emerging carbon economy worth approximately AU\$68-100 million per year as of 2024 (ICIN, n.d.; Murphy et al., 2015; Russell-Smith et al., 2009). Traditionally, Indigenous Peoples have managed the vast savannas by implementing fine-scale, mosaic and strategic burning techniques which minimize the intensity and frequency of wildfires that occur late in October-November and which emit approximately 16Mt of GHG emissions per year.

The Savanna Fire Management methodology is an incentivized public carbon credit scheme developed by the Australian Government in 2012 to mitigate wildfire-related GHG emissions

from the eligible savanna areas comprising 1.2 million km². This programme enabled Indigenous land managers to register their carbon projects with the government to abate GHG emissions and earn carbon credits in the form of marketable Australian Carbon Credit Units (1 ACCU = 1t of GHG emissions abatement; the current price is AU\$17.35) (Russell-Smith et al., 2013). These carbon credits can be sold either to the government or private businesses.

The ACCU scheme has a prime focus on mitigating climate change but has been expanded at some state/territory levels to include biodiversity and Indigenous cultural values (such as Land Restoration Fund in Queensland). The programme also indirectly results in the protection of biodiversity, water and land resources, and enhanced Indigenous well-being, including meaningful economic opportunities, improved learning “on country”, and building self-esteem and pride among the Indigenous Peoples in the region (Sangha et al., 2021). The scheme is enabled by a well-supported government-funded approach (AU\$ 2.7 billion since 2012 to date) along with establishing a centralized regulatory, accounting and verification, and support system. The programme consistently revises and develops relevant new policy instruments to ensure that incentivizing Indigenous natural resource management practices and applying culturally and scientifically appropriate tools can deliver multiple ecological, social and economic benefits.

6.2.4.1. Clarifying other funding gaps

An alternative interpretation of gaps relates to stated financial resource commitments and those actually disbursed. This gap largely relates to official development finance flows, which as noted previously are a small proportion of biodiversity finance overall. The gap between promised and delivered financial resources is perhaps most evident in the case of specific multilateral funds or international political commitments. For instance, the parties to the UNFCCC at COP15 in Copenhagen in 2009 made a commitment to provide \$100 billion/year in financing to developing countries by 2020. Between 2013 and 2019, however, actual disbursements (including multilateral, bilateral, private and export credit-related contributions) ranged from \$52.4 billion in 2013 to \$83.3 billion in 2020 (OECD, 2022). Bilateral and multilateral public finance dominate these figures (making up 82% of the 2020 total). Multilateral public finance includes both multilateral development bank and multilateral climate funds such as the Green Climate Fund (GCF).

From a nexus perspective, the potential contribution of funds such as the GCF to biodiversity finance is primarily indirect, for example in attracting investment in NbS implemented via land use, forests and ecosystems where investments are focused on climate change mitigation or adaptation outcomes with biodiversity gains as a co-benefit (see also **Chapter 5.5**). Within the established Results Framework of the GCF, ecosystems and ecosystem services are designated as an Adaptation Results Area (4), which includes natural or less intensively managed environments. Other designated thematic areas specifically address water security, agriculture and food production, and forest management. The GCF’s first progress report highlights that of \$11.4 billion of project finance allocated by the end of 2022, \$1.5 billion supported forest and land use activities aimed primarily at mitigation and \$0.8 billion supported ecosystem and ecosystem services projects in the context of adaptation (Green Climate Fund, 2023). It might be expected that if a full range of benefits across nexus elements were taken into account a greater proportion of expenditures from funds such as the

GCF would be allocated to investments in nature. Other funding sources, including the new Loss and Damage Fund of the UNFCCC, can also help increase the disbursement of resources towards climate action with wider nexus benefits (see **Box 6.8**).

Box 6.8. Case study: Financing for sustainable marine resource use and climate action in the Caribbean

Financing initiatives for the sustainable use of biodiversity has been a particularly pressing concern for Small Island Developing States – or as they might better be identified as Large Ocean States (Chan, 2018). These areas have contributed almost nothing to global climate change or large-scale overexploitation, yet they are uniquely at risk from rising sea levels, coral bleaching and rapidly shifting fish stocks that reduce local food sovereignty and security. Moreover, histories of colonialism throughout Large Ocean States have often resulted in limited financial capacity to invest in mitigating these risks or adapting to outcomes (Bordner et al., 2020; Lincoln Lenderking et al., 2021; Wilson & Forsyth, 2018).

International aid funding for ocean conservation and climate action in the Caribbean has totalled about \$385 million (Shiiba et al., 2022). A wide range of types of projects have been financed, from those focused on new technology development to the support of traditional coastal livelihoods. A set of projects financed by the Inter-American Development Bank under the Caribbean Blue Tech Challenge initiative in 2019, for example, included the development of new algae-based products in St. Lucia, market integration and traceability practices in Belize and Barbados, and the renewal of sustainable port infrastructure in the Bahamas.

Importantly, financing has also included specific efforts to support organizational alignment within Caribbean island governments so that SDGs can be co-achieved efficiently and with a grounded understanding of the institutions that must play key roles. In Aruba, for example, one such effort identified economics and public administration ministries as central and essential players, even when considering ocean-specific goals (G. G. Singh et al., 2021). These types of efforts specifically aim to join sustainable biodiversity use and targeted financing initiatives, recognizing the need for external support via engagement with multilateral institutions and shared development goals.

While these initiatives have brought substantial local benefits, the broader challenges of sustainable use given climate and ecological change will require additional increases in financing flows to the Caribbean region. With respect to climate change impacts specifically, the Loss and Damage Fund adopted under the UNFCCC could be essential in this regard (Mohan, 2023), with a current \$660 million in funding specifically slated for supporting developing states to adapt to local climate change impacts. This fund has not yet been implemented and applying it to ocean and coastal regions will require further elucidation of the attribution of climate change effects in marine ecosystems and a strong emphasis on ensuring that funding accrues to frontline communities.

6.2.4.2 Gaps related to the application and use of nexus approaches

To date, the financial landscape has tended to conform to distinct sectoral or thematic silos, often including many of the commitments made within the framework of parallel multilateral

treaties and conventions, including the UNFCCC, the UNCCD and the CBD. Adoption of a more nexus-oriented approach to financing sustainable development and achieving biodiversity policy integration (Zinngrebe, 2018) hinges on improved implementation of new mechanisms for harmonizing, monitoring and evaluating the effects of relevant financial flows across multiple sectors and world regions (Jones & Solomon, 2013; Nedopil, 2022).

Efforts to catalyze the finance system to focus on co-benefits across the nexus are increasingly prevalent. For example, finance has been flagged as crucial in the transformation of food systems for human and planetary health, as seen in the development of the Good Food Finance Network and the cases in **Box 6.9**. There have also been a number of flagship international reports which highlight the need to adapt financial institutions, align economic incentives and develop the policy enabling environment (FAO et al., 2021; UNEP, 2023c; World Bank, 2021).

Box 6.9. Finance for Indigenous Peoples and local communities' food systems to promote diverse, resilience and sustainable food systems

Despite numerous recommendations to develop diverse and resilient food systems to address food security (FAO, 2018a, 2018b), financial investment in sustainable agriculture and agroecological approaches have been limited. In contrast, most of the investment over the past century has focused on the development of industrial food systems that manipulate natural systems to maximize food production, but at significant costs to social, health, cultural and environmental values (see **Chapter 5.3**). IPLC-led food systems and related knowledges present sustainable and feasible alternatives to this model.

IPLC-led food systems hold diverse nutritional, medicinal, health, cultural, social and sacred values (including non-monetary values) that are vital for holistic human well-being (see Annex 7.1). However, traditional knowledge related to these food systems is rapidly disappearing, particularly as many IPLC food systems are undervalued in comparison to large-scale agriculture focused on a few selected grain crops (e.g., wheat, rice and maize). Yet the value of these food systems to IPLC themselves is significant. For example, Warltier et al (2021) estimated the economic value of Indigenous “country” food (defined as subsistence-focused provisioning based on hunting, fishing and collecting local wild animals and plants) for Nunavut communities in Canada at CA\$198 million/year, applying replacement cost methods just for energy and protein values (this figure excludes cultural or social values, which would raise the amount even higher). Several other such studies have highlighted the importance of local or native food systems in monetary or nutritional values (Ghosh-Jerath et al., 2015; Jackson et al., 2014; Vijayan et al., 2022). For example, Jackson et al. (2014) estimated the consumptive value of aquatic species, such as fish and turtles, for the aboriginal communities in northern Australia at AU\$36 to AU\$100 per household per fortnight.

Recognition of IPLC food systems is starting to occur, but financial investment and government support are yet to follow (International Network of Mountain Indigenous People (INMIP), 2021; von Braun et al., 2021; ILK 2023). Recently, broader investments in supporting IPLC efforts were highlighted by the United Nations Global Biodiversity Framework Fund (GBFF), ratified at the 7th Assembly of the Global Environment Facility

(GEF), which aims to invest 20% of its resources to directly support IPLC initiatives to protect and conserve biodiversity, and which may be available to fund IPLC food systems in the future. In 2022, the Rockefeller Foundation announced 10 grants, worth \$11 million, at COP27 to scale Indigenous and regenerative agriculture practices globally, mainly to mitigate climate change. However, more extensive financial support available directly for IPLC food systems is a major gap, with hardly any examples where governments and/or private investors have directly funded IPLC-led food systems. This is mainly due to the prevalent corporate culture and dominance of existing industrial food systems (Canfield et al., 2021) which operate with economies of scale and substantial subsidies, but other challenges include lack of awareness and education among the public about the importance of traditional and wild foods, lack of government support for IPLC food systems, and a disconnect between food systems, health and climate policy actions (Webb et al., 2021).

Micro-finance or social finance schemes and local community initiatives can be useful in supporting diverse IPLC food systems. For example, microfinance schemes for low-income families have been operational in the farming sector in many developing countries and supported by various governments at local or national scales (Meyer, 2013). Yet the main purpose of such initiatives has been to offer financial assistance to small-scale farmers to increase production by adopting industrial agriculture (e.g., offering loans to buy tractors, or inputs of fertilizers and pesticides) (IFAD, n.d., 2011; R. L. Meyer, 2013). Alternatives to this model, in the form of community-led initiatives such as seed banks and ‘slow food’ movements, are now growing. Seed banks are typically aimed at saving plant diversity and reducing the costs of buying commercial seed inputs, while ‘slow food’ movements promote local, authentic, and careful and conscientious production, preparation and consumption of food. For example, in India, a farmer-led local organization, Navdanya (meaning nine seeds), is actively working to preserve the biological and cultural diversity of food systems in 22 states, with more than 150 community seed banks to support the production of local, authentic/culturally relevant, and chemical free production systems (Navdanya, n.d.). Learning from these existing farmer-led models and supporting self-governed organizations and networks across scales can help foster IPLC food systems and extend them to wider scales (see **Chapter 4.4**). Such efforts help meet the SDGs by providing affordable, equitable, sustainable, economically viable, nutritious and resilient food systems.

Multilateral efforts to secure both climate and biodiversity goals have recently achieved a somewhat improved degree of harmonization by leveraging, for instance, cross-cutting mechanisms at the landscape scale, including the REDD+ mechanism and related NbS financing (Seddon et al., 2020), given widespread attention to estimates that over one third of the mitigation effort required to meet a 2°C emissions target could be delivered cost effectively through investments in natural climate solutions (Griscom et al., 2017). Yet a similar degree of harmonization of global frameworks for explicitly pursuing water, food security and health objectives remains less tangible. Furthermore, even in light of clear potential synergies at the landscape scale across climate change, land degradation and biodiversity targets, roughly only 2% of recent finance for climate change mitigation directly contributes to the simultaneous achievement of biodiversity and ecosystem conservation goals (AFD, 2020).

At a regional level, agri-environmental payment schemes are one financing mechanism that is expected to deliver multiple environmental benefits (e.g., biodiversity conservation, soil conservation and erosion control, water protection, global climate regulation). However, mismatches between policy priorities and financing allocation can occur when resources are allocated based on socio-economic context rather than areas of highest water stress, biodiversity, soil erosion or nutrient runoff (Biffi et al., 2021). Other payment schemes can also potentially have positive impacts on multiple nexus elements, especially across biodiversity, climate regulation and water related ecosystem services; examples include PES for hydrological services from Mexico's forests (Muñoz-Piña et al., 2008) or PES targeting all three in Madagascar (Wendland et al., 2010) and in Costa Rica (Pagiola, 2008). Notwithstanding these positive examples of multiple benefits, the effectiveness of PES overall has been mixed so far, indicating the importance of scheme design and contextual factors (Börner et al., 2017).

Other positive examples of emerging initiatives include the World Health Organization's One Health framework (Mwangi et al., 2016), which seeks to address interrelated challenges to human, animal and environmental health and well-being through an integrative approach (McMichael & Butler, 2011; von Schirnding, 2005). The importance of such integrative perspectives are particularly evident in the emerging aftermath of the global COVID-19 pandemic, and the possibility of future epidemics or pandemics arising from land use change and related risks of pathogen spillover events from wildlife or other non-human populations (Santini, 2021). The World Bank (World Bank, 2022b) estimates that investing in One Health approaches to reduce the risks of emerging infectious diseases and associated pandemics could cost in the order of \$10.3 billion to \$11.5 billion per year, less than 1% of the cost of responding to the COVID-19 pandemic in 2020, and have significant co-benefits in terms of supporting climate change mitigation, adaptation, improved food security and nutrition and a reduced burden of animal disease.

Whereas examples like the One Health framework highlight the need to optimize synergies from financial allocations for health, climate change and biodiversity targets simultaneously, a nexus approach also evidences social, economic and financial consequences arising from a failure to do so effectively. The World Bank's recent Global Economic Prospects report, for example, emphasizes heightened global income inequality arising from the COVID-19 pandemic, which has partially reversed "the decline [in income inequality] that was achieved over the previous two decades", thereby catalyzing "weak recoveries" in low and lower-middle income countries in particular (World Bank, 2022a). Such inequalities and divergent impacts underscore how the complications of crises in one sector (e.g., health) entail complex economic impacts that reverberate much more widely. The latter may include, for instance, the role of pandemics in restricting the availability of financial resources to address simultaneous climate change and biodiversity challenges, as well as in hampering the capacity of states or other actors to effectively implement related programmes even when financial resources are available in the necessary volumes (Stiglitz, 2020). More broadly, a nexus approach also illuminates how increased financial support for climate, biodiversity and the SDGs will have limited impact if these measures are not accompanied by a reduction of financial or other incentives that actively impede the achievement of these targets.

Other nexus elements face particular financing challenges. The first phase report of the Global Commission on the Economics of Water highlights the problems of financing green infrastructure for water in terms of distinct revenue streams and lack of assets that can be used as collateral, the need for more long-term, patient finance and investment, and importantly raises the question of who should pay (Global Commission on the Economics of Water, 2023). This reflects the need to ensure that those creating pressure on water resources (and connected nexus elements) pay their ‘fair share’ of the costs (see **Section 5.2.3.10**). Additionally, the need for new sources of financing for water improvements has led to initiatives that have relied on water’s interconnections with climate change and other nexus elements to generate revenues (**Box 6.10**).

Box 6.10. Financing improved water quality through carbon markets

Local water problems have proven hard to solve with global finance. However, climate financing, sourced from national governments, international donors and inter-government agencies can be used for restoring water security. In 2007, a team at the University of Colorado Boulder developed and implemented the first-ever United Nations Clean Development Mechanism programme for earning carbon credits for water delivery, followed in 2010 by the first-ever Gold Standard voluntary programme. Carbon credits are generated by providing water filters, which suppressed demand for fuelwood which would otherwise be required to boil water for drinking. Through these programmes, tens of millions of dollars of private financing was leveraged to deliver household water filters to millions of people in Rwanda and Kenya, with revenue from carbon credits largely re-invested into education, repairs and replacements, resulting in significant nexus benefits in health, economy, biodiversity and environment (Thomas et al., 2023). An evaluation of the design, adoption rate and impacts showed promising results. Among children under five years of age, the intervention reduced seven-day prevalence of reported diarrhoea by 29% and acute respiratory infection by 25%. Beyond the directly measured health impacts, overall programme costs and benefits were positive, with savings in fuelwood at an estimated 65,000 tons, enough to reverse deforestation in the region for a few years, and is therefore likely to have a positive impact on biodiversity (Kirby et al., 2019).

Today, hundreds of programmes are operational globally, generating earned revenue attributable to, and re-invested in, a water service with the biodiversity co-benefits of avoided deforestation. By generating carbon credits on an ongoing basis, these programmes earn revenue only upon continued delivery of a clean water service, in contrast to many donors and government supported programmes investing in water services that pay up-front for only capital investments with no direct accountability for functionality and sustainability (Thomas et al., 2023).

There is also emerging potential to apply these concepts in higher income economies. For example in the United States, where water treatment and transport accounts for 4% of electricity use, carbon credits are being explored as a source of finance to incentivize investment in green infrastructure solutions such riparian shade and improved agricultural practices to conserve water, improve watershed health and avoid the need for the

construction and operation of water treatment infrastructure with their accompanying climate change impacts (Virridy, n.d.).

6.2.5 The persistence of funding gaps: barriers to nexus financing

Global environmental and sustainable development targets remain challenging to meet, given gaps in human and technological capacity, as well as existing financial realities and mechanisms (Clark et al., 2018). The empirical evidence base for the effectiveness of different financing approaches to sustainability is still lacking in many places (Miller, 2014; Sayer et al., 2017). Important concerns also remain regarding the broader social, cultural and political effects of mainstreaming the economic valuation of biodiversity, including questions of culturally variable forms of value pluralism and particularly those values held by IPLC, which may be in opposition to attaching monetary values to nature (IPBES, 2022a; Palola et al., 2022; Spash & Aslaksen, 2015). These and other barriers to improving the nexus funding gap are indicated below.

6.2.5.1 Broad global challenges related to valuation

By monetizing nature's value in traded markets, using a system that relies on incomplete metrics like GDP, economic decisions have been a key driver of biodiversity loss and decline in natural systems (IPBES, 2022a). There is widespread agreement that GDP is a poor indicator of human well-being: it was devised as an indicator to judge the progress of economies, but on its own remains divorced from the assets which intergenerational human well-being depends upon (M. K. Agarwala et al., 2023). The UN is looking for new ways of valuation that take different perspectives into consideration, and discussions on going beyond GDP have been under way for decades. For example, the UN is considering how to “value what counts” for people, the planet and the future, anchored in the 2030 Agenda and the commitment to leave no one behind (UN, 2023). Primarily relying on GDP as a metric of progress does not accurately reflect the world as it is, nor the world that society wants future generations to inhabit (Costanza et al., 2014). Proposals to go beyond GDP imply incorporating hidden costs (externalities) and highlighting aspects that make non-monetary values equally relevant for environmental stability. The “beyond GDP” framing can allow societies to consider and measure what is truly valued/valuable, what is meant by progress and, on that basis, re-evaluate how resources are distributed to deliver this (UN, 2023).

However, current governance and institutional structures that aim to manage, protect, restore, use or exploit biodiversity and other natural resources still tend to apply individualistic rather than societal value systems (Costanza et al., 2021). The dominance of single interests in decision-making can challenge the effectiveness of investments meant to counteract the economy's negative impacts, particularly the transfer of public assets into private hands (Sovacool et al., 2015). These individual values do not suit natural resources and ecosystem services that largely belong to the ‘common pool’ (i.e., resources that are available to all), suggesting the need to develop new structures/institutions suiting these common resources, particularly from the IPLC perspective. Yet since the 1980s, the opposite has happened, as the global spread of different versions of neoliberalism has had, and continues to have, a deep and far-reaching impact on the political economy and practice of biodiversity conservation (W. Adams, 2017; Apostolopoulou, 2020; Büscher et al., 2012; Corbera et al., 2021; Igoe & Brockington, 2007; Knight-Lenihan, 2020; MacDonald, 2010; Ota et al., 2022; Sullivan,

2006; Toly, 2004) and sustainable development (E.-A. Jones & Stafford, 2021; Kumi et al., 2014). Neoliberalism is a political philosophy based on minimal government, free trade and market-led solutions for addressing societal concerns, including biodiversity and climate change. It champions the de-regulation and privatization of natural resources and ecosystems that are state-owned or deemed unowned or common property, including biodiversity and water, in particular, among nexus elements.

There is a broad literature across social science disciplines that documents the negative impact of neoliberalism on biodiversity and sustainable development. However, this literature also reveals the contested and varied character of neoliberalism in different parts of the world (Cavanagh & Benjaminsen, 2017; Holmes & Cavanagh, 2016), with many negative and some positive impacts in both rural (Hodge & Adams, 2014) and urban settings (Apostolopoulou & Adams, 2019) from Latin America (Liverman & Vilas, 2006), to East Africa (Nel, 2015) and the Barents Region (Tennberg et al., 2014). In general, the literature indicates that biodiversity and sustainable development outcomes, including community interests, justice and equity, are not well advanced by neoliberal policies and practices, especially in an increasingly de-natured and urbanized world (Apostolopoulou et al., 2014; Apostolopoulou & Adams, 2019; Sterling et al., 2017) and at times sparking resistance from communities to these neoliberal policies and practices (Krings & Schusler, 2020; Toly, 2004). However, the more common alternatives – centred on state or common ownership, government regulation and trade protections – are not necessarily a panacea in a globalized political economy. Evidence suggests that coupled social-ecological systems and sustainable livelihoods fare better when local institutions are robust, diverse and when equitable opportunities prevail, with governments providing support to secure equitable opportunities. This is especially true for marginalized and vulnerable people to meaningfully participate in economic arenas of engagement to realize just and sustainable outcomes for human and planetary well-being (Lele, 2013; Maestre-Andrés et al., 2018; Ogutu et al., 2014; Vucetich et al., 2018).

Furthermore, collective human and social capital as forms of non-monetary investment remains relevant for many IPLC and other cultural systems, such as economies of care which provide an invisible set of trade mechanisms and interactions that range from bartering to the exchange of favours and collective support (TEEB, 2018). Different cultures have different concepts and understandings regarding valuation, not all of which are based on market values (Pascual et al., 2023). Where values, cultures and livelihoods are strongly dependent or interlinked with the environment, conventional economic accounting and financial discussions are likely to be challenged or less appropriate (Martínez-Alier, 2002). Particularly for IPLC, the importance of nature is deeply integrated and imbued in everyday life, and reflected in languages, knowledges and value systems, including cultural respect, social and ceremonial values, territorial rights, environmental and social justice, livelihood, sacredness and ceremonial value. These values are often reflected in the diverse geographies of resistance by IPLC to commodity extractivism, corporate irresponsibility and unequal trade (Martínez-Alier, 2002).

Yet incorporating different aspects of monetary and non-monetary values into financial decision-making is challenging. Various tools are available for market values, but fewer exist for non-market values, which require a diverse and innovative set of approaches to suit local contexts. More than 50 such methods were discussed in the IPBES Methodological

Assessment on Diverse Values and Valuation of Nature (Values Assessment) (IPBES, 2022a); for example, true cost accounting (TCA) (Gemmill-Herren et al., 2021) attempts to incorporate monetary and non-monetary values for water, soil nutrients and ecosystem services when accounting for food systems.

Even as tools to account for monetary and non-monetary values of the direct and indirect contributions of nature develop that can help the private sector quantify its dependence on nature and may catalyze investment to protect biodiversity and other natural resources (Deutz et al., 2020), larger structural issues further complicate the situation, particularly the movement of natural assets and ecosystem services that are embodied in commodities in international trade. Globally traded embodied materials (such as water, energy or land footprints) are often unaccounted for and thus their costs are not incorporated into markets (Baylis et al., 2021; A. Chaudhary & Brooks, 2019a; Kastner et al., 2021; Lenzen et al., 2012; Ortiz et al., 2021; Yu et al., 2013). Moreover, this lack of accounting for the embodied costs of global goods, combined with increased consumption patterns in some economies (e.g., of meat, but also vegetables, flowers and other traded goods), has led to increased impacts on biodiversity in other economies (Chaudhary & Brooks, 2019b; Kastner et al., 2021; Marques et al., 2019). This reflects the idea that distant decision makers (whether consumers or intermediaries), who have less knowledge of local conditions and focus on securing commoditized products, can as a result fail to account for local interests such as the maintenance of ecosystem services (Brondizio et al., 2009), thereby redistributing environmental impacts through their embodiment in trade (UNEP, 2024)

6.2.5.2 Challenges for leveraging private finance

As noted previously, there are growing calls for the private sector, philanthropy and private finance to play a greater role in closing existing financing gaps, thereby complementing the allocation of funds from public sources, and also reflecting the dependence of private sector activities on well-functioning ecosystems (Beer, 2022; Clark et al., 2018; Galaz Rodriguez & Collste, 2022; Holmes, 2012; WEF, 2020a). Such engagements will necessarily entail greater transparency, accountability and strengthened regulation for global financial institutions (particularly, corporations, financial giants, governments and central banks) if the outcome of a transition to a just and sustainable world for all is to be achieved. Among other measures, this may entail the growing use of risk related disclosures and other compliance-based approaches for systematically communicating the likely impacts of private investments upon biodiversity and other nexus elements to shareholders.

From the perspective of regulating financial systems, the concept of fiduciary duty (i.e., the legal responsibility for duties of care, good faith and confidentiality in the best interests of a beneficiary) is also gradually expanding to better reflect environmental and biodiversity challenges. These include, for example, pension fund regulations, stewardship codes and corporate disclosures (UNEP, 2019). While fiduciary duty is not uniformly defined through the above policy mechanisms nor codified across regions to particularly reflect ‘nexus’ issues, corporations with highly complex supply-chain and trade networks are often impacting multiple ecosystem services and therefore, could be strategically, legally and reputationally incentivized to consider nexus issues within the realm of their fiduciary duty. Reform of the fiduciary duties with concrete performance standards have been proposed as

part of a series of reforms which could catalyse increases in responsible investment (Richardson, 2009) and could gradually expand to better reflect environmental and biodiversity challenges.

Aside from the risk of trade-offs or other negative externalities, profit-oriented forms of private biodiversity finance to date are proving difficult to scale up (Clark et al., 2018), particularly because financial returns on conservation investments still often fall below prevailing market rate expectations (e.g., Dempsey & Suarez, 2016). Disincentives for investment in ‘riskier’ nexus-oriented opportunities remain widespread, given the ease of accessibility and higher average returns yielded by conventional investment opportunities. Such higher rates of return on conventional investments are not unexpected, as market returns largely do not tend to capture many of the benefits to society associated with investments in nature. If such benefits were accounted for, nature-positive investments would likely be perceived in more positive terms (Dasgupta, 2021a).

Particularly from the 1990s onward, early attempts to financially bolster conservation efforts and to promote sustainable resource use focused on leveraging novel economic mechanisms at the protected area, landscape or regional scale, including, but not limited to, bioprospecting, trophy hunting and ecotourism (Roe, 2008). Such initiatives have often been envisaged as indicative ways through which nature might “pay its own way” (Eltringham, 1994), and thus contribute to sustainable finance for both biodiversity and local livelihoods (e.g., Adams et al., 2004). Voluntary sustainability standards and certification schemes for fair, organic and sustainable agriculture and forestry were also promoted as market-based instruments to develop biodiversity-related markets with positive interactions across the nexus (i.e., improving agricultural producers’ overall well-being while delivering benefits for nature) (Meemken et al., 2021; OECD, 2003; Tayleur et al., 2017; Tscharnkte et al., 2015).

Many of these mechanisms have had mixed results, not least due to concerns about inequalities in the distribution of conservation-related costs and benefits (Nakakaawa et al., 2015; Tumusiime & Sjaastad, 2014), neglect of important ecosystem services (Dempsey & Suarez, 2016), the burden of compliance to new standards (Meemken et al., 2021), as well as the marginalization of IPLC more broadly (C. Cavanagh & Benjaminsen, 2022; Fletcher & Neves, 2012; Koot, 2019; Neimark, 2012). Whereas proponents of “selling nature to save it” (McAfee, 1999) contend that profit-oriented forms of biodiversity conservation represent a low(er)-cost solution to ecological degradation, others view it as a largely speculative or promissory strategy with limited geographical coverage, too little impact, and minimal scope for growth and expansion relative to broader global flows of capital. Similarly, the provision of international public or private finance for biodiversity conservation can catalyse unjust outcomes (Boillat et al., 2018), particularly if accompanied by negative narratives that stigmatize local resource management practices (Cavanagh et al., 2020), or which exacerbate existing forms of marginalization and socio-cultural discrimination.

Greenwashing constitutes another key challenge in scaling biodiversity finance. As sustainable finance and ESG investing sectors have been rapidly growing, so have the incidents of finance-related greenwashing (M. A. Martin et al., 2022), highlighted as the most significant challenge to the sustainable fund market in the World Investment Report 2024 (UNCTAD, 2024). The International Organization for Standardization (ISO) *Guidance 14100*

on environmental criteria for projects, assets and activities to support the development of green finance (ISO, 2022) defines greenwashing as the practice of communicating “false or misleading information, either intentionally or inadvertently, regarding the environmental or sustainability attributes of a product, asset and activity, which can have consequences on the assessment of financial and non-financial materiality”. As such, greenwashing can undermine trust in environmental finance, lead to the misallocation of financial resources by diverting funds away from nature-positive projects and initiatives and reduce effectiveness of response options.

To mitigate the impacts of greenwashing, transparency, accountability and genuine commitment to sustainability in investment decisions and practices is essential (In & Schumacher, 2021). This genuine commitment includes valuing rigorous technical skills and biodiversity-related expertise in financial decision-making at all levels and across sectors, particularly given the recent credibility issues around corporate reporting of offsets/credits and avoided deforestation (Bager & Lambin, 2022; C. Cavanagh & Benjaminsen, 2014a; Mollers, 2022; West et al., 2023). Moreover, capacity-related concerns and the risks of overstating subject matter expertise have been identified as an increasingly material risk, as many financial institutions in charge of promoting and managing nature-related financial products often do not possess the expertise nor integrated teams consisting of financial and non-financial sustainability experts. Competence greenwashing, the practice of overstating or misrepresenting an individual’s or an organization’s environmental or sustainability-related subject matter competence, is becoming more widespread, as many organizations and financial practitioners are under pressure to scale their sustainable finance and ESG investment product and service offerings (Schumacher, 2020). For example, organizations may relabel existing job titles to sustainability-sounding positions or practitioners claim to be nature experts after completing a short certificate course on ESG, biodiversity or sustainability (Fortt, 2021). Financial regulators and assurance standard setters highlight the need for organizations to consult proper technical experts on non-financial, high complexity matters, especially in the environmental domain, including biodiversity, climate change and nature-related issues (EBA, 2021; ECB, 2020; ESMA, 2019; IAASB, 2021).

6.2.5.3. Challenges for expanding public finance

Increasing volumes of both public and private finance for conservation would likely have a positive impact on species and ecosystems (Seidl et al., 2021), as well as the potential for either synergies or trade-offs with – inter alia – rural livelihoods, food security, cultural or customary arrangements for natural resource management, and broader human health or well-being (Bluwstein & Cavanagh, 2023; Brockington & Wilkie, 2015; McElwee, 2023). A growing evidence base, for instance, highlights the potential for trade-offs as well as synergies between multiple environmental and development objectives emerging in the aftermath of both publicly and privately financed conservation initiatives (W. M. Adams, 2020; W. M. Adams & Hutton, 2007). This highlights the importance of nexus approaches that emphasize explicit inclusion of multiple stakeholders and considerations of equity in dealing with trade-offs (see **Section 4.5**). Even when finances are available, it is not always the case that relevant initiatives are implemented in an effective manner (Stadelmann & Castro, 2014).

Although there is potential for increased volumes of biodiversity finance to catalyze positive synergies between conservation and the SDGs, the successful achievement of such synergies in practice remains a challenge (Colléony & Schwartz, 2019). This is particularly the case when activities require a change or restrictions in land use and are implemented in contexts where a high share of GDP or total employment is derived from agriculture or other sectors closely tied to the natural resource base (Hurlbert et al, 2020). Importantly, such characteristics reflect the baseline predicament of many low income and lower-middle income countries at present. In such contexts, risks and potential negative consequences of biodiversity-related interventions – if they are not designed and implemented to include people as part of the ecosystem – include evictions, deprivation of customary rights to land and natural resources (such as grazing land, firewood, bush meat and medicinal plants), compromised livelihoods and lifestyles, reduced opportunities for transgenerational knowledge exchange and overall well-being, as well as job insecurity arising from volatile levels of consumer demand in the ecotourism or related industries (Vedeld et al., 2016; Wilkie et al., 2006). Such negative trade-offs can be managed with better planning processes associated with nexus governance approaches (see **Section 4.5**), but all risks may not be entirely avoidable, a point made by many in discussions of “transition risks” and the need for safety nets and alternative livelihoods for those affected.

6.2.5.4. Challenges for the financial system and institutions

A key challenge for the finance system is the contrast between the increasing scale of risks associated with the declining state of nature (Bank for International Settlements & Banque de France, 2020; Kraemer & Volz, 2022) and the multiple benefits provided by a nexus approach, and the fact that only a small proportion of these benefits can be monetized without changes in both culture and the institutional enabling environment (Chenet, 2019; Dasgupta, 2021a; UNEP, 2015; van der Hoff & Zwieten, 2022) (**Figure 6.6**). This adds to the pressure to make nature-related markets work (Nature Finance, 2023) but also to align financial interests with sustainability goals to remove the negative externalities associated with mainstream economic activity (Fortt, 2021; G20 Italian Presidency, 2021). However, choices around investment in nature are not limited only by the enabling environment in connected markets, but broader behaviours around taxation, spending, lending and borrowing which are likely to be influenced by international economic institutions as well as sovereign decisions (Bößner et al., 2020).

Another challenge relates to the interconnections between inequity and the decline in nexus elements, which the operations of finance systems may exacerbate. For example, if the economic impacts of a decline in the state of nature are concentrated in lower income countries (Johnson et al., 2021), such countries not only already face a higher cost of borrowing, but could also see this increase as a result of weaker economic performance (M. Agarwala et al., 2022) with consequent ramifications for the sustainability of debt repayments (Kraemer & Volz, 2022) and fiscal space to spend on protecting nexus elements.

This has been further exacerbated following the COVID-19 pandemic. According to the 2022 Financing for Sustainable Development Report (UN, 2022), global public debt showed rapid increases in 2021 from already unsustainably high levels, reaching around 99% of GDP in some countries in 2021. Gross public debt in developed countries, which remained

unchanged between 2012 and 2019, surged 18 percentage points reaching 122% of GDP by the end of 2021. In many developing countries, the pandemic and other related factors, including rising interest costs and slow growth, have hastened debt vulnerabilities, leading to increases in public debt by 11 and 15 percentage points of GDP in small island developing states and middle-income countries, respectively, between 2012 and 2019 (UN, 2022). Similarly, least developed countries and other low-income countries experienced a 9 percentage points increase during the same period. About 60% of least developed countries and other low-income countries are reported to be at high risk of debt burden (UN, 2022), and this is expected to worsen with added challenges related to climate change and loss of biodiversity (M. Agarwala et al., 2022; Kraemer & Volz, 2022).

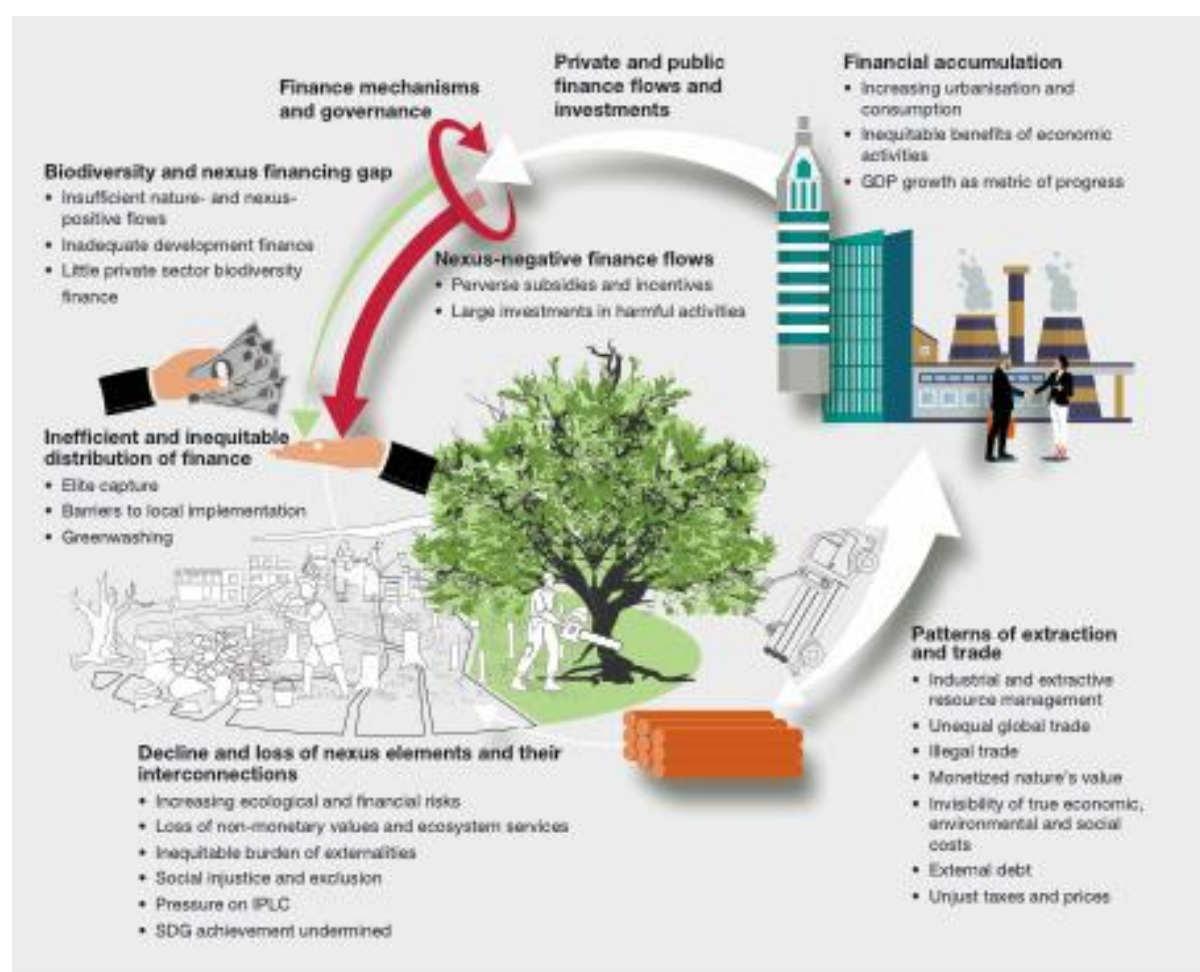


Figure 6.6. Finance and resource flows under a business-as-usual political economy generate inequitable and unsustainable pressures across the nexus elements. Under a business-as-usual political economy, there are multiple extractive flows of resources from societies and ecosystems concentrating wealth in particular areas and among some groups and leading to ecological damage (often expressed as externalities) and social injustices. Only a small portion of finance flows support people and nature, due to a combination of factors including inadequate environmental and development finance; predominance of nature-negative investments; and inequitable relations and siloed forms of governance.

6.2.6 Response options for financial actors

Given the complexity of economic and financial systems and current pressures on nature and the nexus elements from the economy, financial response options to improve this situation need to be viewed from two perspectives. One is the context in which response options have largely been evolving as mechanisms to help rebalance the relationship between the economy and nature and the other to assess the ways in which response options take into account (or could further evolve to take into account) nexus interactions.

With the large range of different financial flows concerned and the range of different decision-makers with different roles in impacting how these finances flow, this assessment cannot provide a detailed assessment of all potential options available to policymakers. Instead, three general categories of action for the financial sector are presented where progress is needed to enable financial flows to be better aligned with protection and restoration of biodiversity and with associated benefits across the nexus. These three categories include response options aimed at:

- Improving accessibility and availability of information and knowledge to allow financial and economic decision-makers to understand their impacts and dependencies across nexus elements;
- Increasing the use of (and capacity to use) financial and economic instruments to increase availability of resources to invest in protection and restoration of nexus elements; and
- Addressing the negative incentives that damage biodiversity which can arise as a result of the ways other social and economic objectives are pursued.

There is some overlap between these groupings (e.g., efforts to reduce subsidies that have negative impacts across the nexus could also increase the availability of public sector resources to invest in restoring nexus benefits). However, progress across the three areas aims to reduce knowledge/data and institutional barriers that can prevent allocating resources to protection and/or restoration of nature, while at the same time creating an enabling environment that incentivizes investments which consciously account for trade-offs and synergies across nexus elements. This is in contrast to business-as-usual in which choices tend to unconsciously neglect biodiversity loss and generate negative impacts. To internalize environmental costs and promote sustainable investments, combining different response options (such as natural capital accounting with payments for ecosystem services, water pricing and green bonds) may be required. This requirement for progress across multiple policy areas in parallel is reflected in guidance developed for finance, economic and environment ministers, which advocates the use of regulatory, economic and information instruments in conjunction (OECD, 2021).

6.2.6.1. Improving accessibility and availability of information and knowledge

Efforts to improve access to knowledge and information around the status and trends of nexus elements and how they relate to the objectives of decision-makers in the economic and financial system can ensure choices are made with adequate knowledge of their impacts.

While this may not be sufficient to deliver change if incentive structures remain the same, current existing absences of information can be a barrier to improved decision-making. Examples of response options in this category across different actors are presented below.

Natural capital accounting: Natural capital accounting is mostly used in public sector decision-making as a mainstreaming tool to highlight connections between the state of the environment and other objectives, including across nexus elements. Initial interest in environmental accounting was catalysed by a call in Agenda 21 (M. Vardon et al., 2023) with interest in natural capital accounts, and ecosystem accounts in particular, accelerating in conjunction with the agreement of the Aichi Targets under the CBD in 2010 (Rode et al., 2012). There is now an agreed international statistical standard for biophysical ecosystem accounts, including ecosystem services, under the UN System of Environmental Economic Accounts (SEEA). Natural capital accounts (which may be broader than ecosystem accounts by capturing other natural resources, such as water) can allow policymakers to assess changes in, for example, the state of ecosystems within the same economic system under which GDP is measured (the UN System of National Accounts) (M. J. Vardon et al., 2021). In parallel, based on similar underlying data, measures such as Gross Ecosystem Product have also been developed and piloted, especially in China, in an effort to understand how nature contributes to economic activity (Hao et al., 2022; Ouyang et al., 2020). In this context accounts can help reveal whether economic growth has been accompanied by degradation or restoration of ecosystems and the benefits that people derive from them.

Application of natural capital accounting is reasonably widespread; in 2023, the UN Statistics Division reported that, of the 152 Member States and territories that responded to their survey, 90 were implementing some element of the SEEA framework, with 66 countries now regularly collating and disseminating accounts (UNSD, 2023). Within this the number of countries compiling ecosystem accounts has increased from 34 to 41 since 2020 (UNSD, 2023). Most countries reported using SEEA for climate (84%), biodiversity (46%) and green/circular economy/resource management policies (43-46%) (UNSD, 2023). Where ecosystem accounts have been implemented, among the 5 most commonly examined ecosystem services were crop provisioning services (49%), global climate regulation (46%) and water supply (29%) (UNSD, 2023), implying that accounts can and are being used to highlight nexus connections with potential to integrate them into relevant policy areas.

There are a range of pathways through which the information contained in accounting can support policy decisions (M. Vardon et al., 2023) and a range of ways policy choices can influence financial flows, directly through public spending or indirectly through altering the enabling environment in which business and financial institutions make their choices. To extend the impact of accounts beyond sectoral policies and understanding of two-way nexus relationships, there are clear arguments in favour of increasing uptake in macroeconomic planning (Dasgupta, 2021a; M. J. Vardon et al., 2021; Zenghelis et al., 2020), as well as by private sector entities (Barker & Mayer, 2017).

Assessing nature-related financial risk (in the public sector): Natural capital accounts as described above are backward looking; if collated regularly, they provide a record of how the extent and condition of ecosystems have changed over time, but they do not provide forecasts of the future. As identified in Section 6.1, concerns are rising about the cumulative impacts of

the loss of biodiversity and growing pressures on the biosphere and how these create systemic risk that will feed through to financial and economic stability (**Box 6.3**). This means that financial regulators and supervisory bodies are increasingly interested in understanding potential threats. While efforts to quantify such risks are in their infancy, there are an increasing number of examples which look at both risks associated with the biophysical impact of the decline of nature (Calice et al., 2021; Svartzman, R. et al., 2021; van Toor et al., 2020; World Bank & Bank Negara Malaysia (BNM), 2022) but also, more recently, transition risks, i.e., risks related to the costs that especially high biodiversity impact sectors will face as policy responses increase to prevent biodiversity loss and/or expand restoration (including the implementation of the Kunming-Montreal Global Biodiversity Framework) (Boldrini et al., 2023; Ceglar et al., 2023).

Understanding the transmission mechanisms through which nature-related risks – when realized – will impact economic and financial stability is complex (N. Ranger et al., 2023), however such mechanisms often relate to nexus interlinkages between economic activity and the state of nature. Early estimates of the potential magnitude of exposure to risks and the impact of risks where realized are both large and transcend national boundaries due to connections through trade and financial investments. Understanding of the importance of both recognizing and addressing risks associated with changes in the state of nature are reflected in the efforts to provide guidance on the topic for central banks and financial supervisors (NGFS-INSPIRE, 2022; OECD, 2023b). These actors can help catalyze effort to protect and restore nexus elements through increased efforts to address these growing nature-related risks.

Improved transparency and reporting: In recent years, private sector-led initiatives have been emerging to better capture the risks of the continued loss of nature and its ramifications on businesses. These include, for example, the Taskforce on Nature-related Financial Disclosures (TNFD), which aims to encourage institutions to implement a risk management and disclosure framework on their impacts on the natural environment. The rationale behind the TNFD is that increasing transparency of nature-related disclosures will lead market participants to punish or reward institutions and therefore the ‘invisible hand’ of the market will gradually reverse the entrenched flows of finance away from nature-negative outcomes towards nature-positive outcomes. Towards this end, the TNFD recommends to quantify the effect of an organization on natural capital through what is termed ‘impact drivers’; for example, the input of forest trees and the output of greenhouse gas emissions from a manufacturing process and its associated impact(s) on nature, including cumulative, direct or indirect changes to the capacity of nature for supplying a particular or multiple ecosystem services (TNFD, 2023). These recommendations are aimed to guide investors, lenders and other stakeholders in financial institutions to better reflect nature-related factors in their financial and asset allocation strategies. It is important to note that in future updates of the TNFD framework, guidance by specific sector and biome are to be further developed.

While the TNFD does not directly address all nexus issues, the initiative has included the climate-nature nexus as one of its core principles. Specifically, the TNFD recognizes the overlaps and feedback loops between climate change and nature-related risks by referring disclosure recommendation on climate-related risks to the older and more established Taskforce on Climate-related Financial Disclosures. While both of these initiatives are

frameworks and not standards, they are intended to align with other existing corporate reporting standards and jurisdictions, e.g., International Sustainability Standards Board, the Global Reporting Initiative and the European Financial Reporting Advisory Group (European Commission, n.d.). In addition to the inherent complexities for alignment with other existing standards, the TNFD has been criticized for being market-led and voluntary. Specifically, as the TNFD governance is dominated by corporate executives, financial institutions and market service providers, the initiative has been criticized for not engaging a wider group of stakeholders (e.g., Indigenous Peoples, rights holders, local communities and environmental activists) and thus it has faced criticism for its alleged susceptibility to greenwashing and ‘corporate capture’ (Birss et al, 2022; Hawkes, 2022). Furthermore, the initiative has been criticized for relying primarily on the market to solve entrenched problems in finance that are not only difficult to find solutions from a scientific perspective (e.g., uncertainties surrounding the quantification of nature and anthropogenic drivers), but also politically difficult decisions that may require fundamental changes to the psychology and behaviour of societies (Linsley et al., 2023).

Another widely recognized private sector-led framework for the accounting and valuation of nature has been the Natural Capital Protocol, a standardized framework utilizing systems thinking, used to aid organizations in evaluating their dependency and impact on natural capital, environment and society (Capitals Coalition, 2021; Whitaker, 2018). This framework is intended to not only capture ‘externalities’ but also create visible business cases for the protection and resilience of the natural capital which it depends on. A key strength of the framework is that it considers natural capital to not only encompass economic but also social, cultural and even spiritual value. Furthermore, given the particular context of the business, its stakeholders and the capital, the framework permits values to be expressed in either qualitative or quantitative terms. This methodological flexibility in conjugation with systems thinking allows organizations, and specifically businesses, to better understand the integrated outcomes and emergent properties of their decisions across capitals and through their supply chains. The Natural Capital Protocol is broken down into four iterative stages (why, what, how and what next) that position its organizational users to better integrate the value and impact of natural capital into their processes (Capitals Coalition, 2020, 2021; Ovando, 2021; Whitaker, 2018). While the Protocol’s simplicity, system thinking approach and its holistic definition of valuation of nature in both qualitative and quantitative terms is attractive for organizations, it is only designed to guide internal decision-making and reporting and it does not offer a standardized methodology or benchmark, therefore its utilization as an external reporting tool may be limited.

Green taxonomies: Green financial taxonomies serve as structured frameworks, classifying economic activities based on their impact on sustainable development. They are pivotal for guiding investors, corporations and governments towards investments that yield sustainable outcomes by offering clear, standardized criteria. This aids in informed decision-making, prevents greenwashing and aligns investments with global sustainability goals. Several regions, including the European Union, United Kingdom and Colombia, have established their green financial taxonomies, each mirroring their respective developmental priorities, laws and regulations (UNEP, 2023b). While fundamentally all taxonomies are similar in nature, i.e., they include goals of climate change adaptation and mitigation and a ‘do no

significant harm' criteria, some taxonomies include additional objectives such as biodiversity conservation and social issues, such as compliance with human rights.

The proliferation of tailored green taxonomies signifies a global commitment to environmentally friendly investments but also presents interoperability challenges due to regional discrepancies in what is considered 'green'. While there is a growing number of green taxonomies throughout the world, they are quite often tailored to the local context. Many companies operate internationally, and discrepancies in what is recognized as 'green' in one jurisdiction may pose substantial challenges in another where the same activity is not deemed sustainable. For example, in the European Union taxonomy, energy transition activities, e.g., nuclear energy, are included, and in Australia and Chile heavy mining industries are also considered as 'green' as they support the green transition to carbon neutral energy systems (EU, 2020). Similarly, Colombia's green taxonomy prioritizes economic sectors with intensive land use activities, e.g., agriculture and livestock, as these sectors contribute the majority of Colombia's greenhouse gas emissions (Gobierno de Colombia, 2021).

Increased regional initiatives aimed at resolving such disparities include regional taxonomy classifications led by the Association of Southeast Asian Nations, the Latin America and the Caribbean taxonomy, and the International Platform on Sustainable Finance to establish shared reference frameworks (CCAP & GIZ, 2022; UNEP, 2023b). These initiatives are crucial as they facilitate the harmonization of green taxonomies across jurisdictions, promoting a unified approach to sustainable development and investment, thereby mitigating the risk of conflicts and misunderstandings in international sustainability standards. Looking forward, such endeavours may pave the way for green taxonomies to specifically concentrate on nexus finance, expanding the scope and enhancing the precision of sustainable financial practices.

Coordinating landscape-scale finance flows: A potential application of improved knowledge in investment/development planning is in the context of landscape-scale approaches from an economic and development perspective. This has the potential for greater engagement of local communities to understand the pros and cons of different activities within a highly interconnected system (Arts et al., 2017). From a financial perspective, they also offer the potential of coordinating different sources of financing with difference nexus interests (M. S. Reed et al., 2022) but there are likely to remain significant information gaps, especially for private sector actors thinking about investments in nature with benefits beyond carbon (Scriven et al., 2022).

To date, one of the most important cross-cutting mechanisms at the landscape scale has been the Reducing Emissions from Deforestation and Forest Degradation and Enhancement of Forest Carbon Stocks in Developing Countries (REDD+) initiative, initially conceived in 2005 as a market-based mechanism to provide economic value to standing forests (Arts et al., 2019), and to simultaneously address climate change, biodiversity loss, land degradation and other deleterious environmental change processes (IPCC, 2019; Pörtner et al., 2021). Various state and non-state actors are implementing REDD+ projects at global, national and sub-national levels based on a diversity of ideas and perspectives of what constitutes REDD+, although the same actors continue to negotiate its design (Vijge et al., 2016). Yet despite high

expectations of the public financial investments in REDD+, evidence of effectiveness remains limited due to implementation issues, lack of effective and transparent delivery mechanisms, governance and equity challenges (e.g., land tenure, elite capture of incentives, and recipients of payments and beneficiaries of ecosystem services), as well as unclear conditionality rules and negative externalities (Börner et al., 2020; C. J. Cavanagh et al., 2015; Fletcher & Büscher, 2017; Larson et al., 2013) (**Box 6.11**).

The rise of landscape-scale or jurisdictional (integrated landscape management across entire political territories) REDD+ programmes can be understood as a response to the perceived failures or injustices of older, project-based REDD+ initiatives, which have often been found to be ineffective (Börner et al., 2020; West et al., 2020), to entail negative socioeconomic externalities or to suffer from leakage (Seddon et al., 2021). Although much of the funding for such recent landscape and jurisdictional initiatives still comes from multilateral and bilateral public sources, the mid-2000s also saw the rise of calls to increase the role of “blended finance” (Smith et al., 2022). Blended finance has recently been used to subsidize and de-risk private capital investments and improve the risk-return profile of investments, with 14 deals implemented to finance land- and sea-based capital assets across continents (Africa, Asia, Europe, Latin America and Caribbean and Australia) (Flammer et al., 2023). The objective of the initiatives was to advance more contributions from the private sector, especially in the form of incentives for biodiversity conservation and NbS.

Box 6.11. Can REDD+ finance drive equitable and sustainable transformations in forest governance in the tropical Global South?

REDD+ ‘readiness’ activities and initiatives are generally funded by multilateral and bilateral public finance aligned with the UNFCCC, while the private sector finances investment into carbon offsets and for voluntary carbon markets (Angelsen et al., 2018; Morita & Matsumoto, 2023). This diversity has created a highly fragmented and complex web of initiatives and governance structures. As such, a critical debate in REDD+ is that of benefit sharing, defined as the ‘distribution of indirect and direct net gains from the implementation of REDD+’ (Luttrell et al., 2013, p. 54), and ensuring multi-dimensional equity (Dunlop & Corbera, 2016; G. Y. Wong et al., 2019). The prevalent rationales on equity in REDD+ range from arguing that benefits should go to those with legal rights over the forest, to forest stewards who have been managing forests, and to those incurring costs as a consequence of REDD+ (Luttrell et al., 2013). In practice, these rationales interweave in ways that reflect sociopolitical values and current policy objectives (G. Y. Wong et al., 2019). Equity and justice concerns centre around participation, contestations around formal and informal rights, and recognition of ILK (Airey & Krause, 2017; Cole et al., 2017; Fisher et al., 2018; Larson et al., 2013; Milne et al., 2019; Myers et al., 2015).

As Angelsen et al. (2018, p. 3) state, “As an idea, REDD+ is a success story ... Yet a decade after being launched in the Bali Action Plan (UNFCCC 2007), broad consensus is that, in practice, REDD+ has not met the world’s high expectations”. These high expectations were to reduce the rate of deforestation and to create transformative forest governance towards addressing the nexus goals of biodiversity, climate change mitigation and generating co-benefits of poverty reduction. Since 2008, \$2.8 billion has been dedicated to REDD+ (C. Watson & Schalteck, 2021), but this is dwarfed by the \$21.5 billion of foreign credit invested

into deforestation-driving activities of soy and beef companies in the Brazil Amazon alone over a similar timeframe (Galaz Rodriguez & Collste, 2022). In addition, while REDD+ is a potential mechanism to redirect economic flows into developing countries, the initiative has had only modest impacts on poverty reduction in local communities (Duchelle et al., 2018; Hajjar et al., 2021; Turnhout et al., 2016).

The tendency of REDD+ problem framing at the local level has persisted in forestry governance since colonial times. By avoiding actions on large-scale deforestation drivers with high (political) costs in favour of less conflictive interventions on local smallholders, REDD+ can contribute to entrenched interests and fail to address transformative change in the forest sector (Brockhaus et al., 2014; Delabre et al., 2020). There have also been recent concerns about local social inequity outcomes and accounts of systemic social abuse (Hengeveld, 2023), pointing out that finance alone, while necessary, is an incomplete solution to achieving sustainability goals. Complex equity dimensions are deeply embedded within the local and global political economy and in how risks and benefits are shared between different stakeholder groups, as well as in political will to address powerful drivers of deforestation and degradation.

Exploiting synergies to increase efficiency in multilateral financing: Over the last two decades, the rise of the climate agenda has shifted attention to mobilizing funds at the multilateral level for interrelated climate action, biodiversity conservation and progress on the SDGs. Globally, important multilateral funds for achieving climate, biodiversity and related objectives include – inter alia – the GCF, the Global Environment Facility (GEF), the Adaptation Fund (AF) and the Climate Investment Fund (CIF). Alongside these institutions and instruments, several OECD nations and other countries also implement bilateral financial arrangements in pursuit of congruent objectives by leveraging existing flows of ODA. The present contribution of the ODA allocations to biodiversity is variable, however, with the OECD estimating that only between 3 to 7% of these flows were perceptibly biodiversity-related in the period 2015-2017 (OECD, 2020a). Thus, there is high potential for more biodiversity-focused, synergistic financing that supports climate objectives and the SDGs. There is emerging evidence that climate-related finance supporting environmental management grounded in plural values and knowledges, such as IPLC ecological knowledge, can advance multiple social and ecological goals and nexus outcomes (see **Box 6.6**).

Improving appraisal of public sector spending and policy decisions: On average, central government expenditure represented almost 32% of GDP in 2022 (Our World in Data, 2024), highlighting that direct public sector spending as well as policy choices can significantly impact the relationship between the economy, biodiversity and nexus elements. In large part this is the rationale behind the BIOFIN Initiative at UNDP, which as one of its first steps carries out a biodiversity expenditure review, exploring where in the economy financial flows which have positive and negative impacts on biodiversity are generated in order to assess how these could be re-balanced and made more coherent (UNDP, 2018).

Various explorations of public sector policy and spending evaluation methods have indicated that existing approaches struggle to integrate biodiversity and other impacts across nexus elements; for example, in reviewing the development and use of cost benefit analysis, the OECD has highlighted persisting challenges in capturing the range of benefits of biodiversity

and ecosystem services and linking them to other benefits such as human health (OECD, 2018). UNEP, in assessing global practice in Strategic Environmental Assessments, shows increasing focus on climate change and health but confirms the need for widespread improvements in the measurement of ecosystem services (UNEP, 2018). Likewise, while traditional approaches to public procurement have focused on factors such as price, quality and timely delivery over sustainability criteria, this is beginning to change with 19% of governments having some sustainable public procurement regulations (Dimand et al., 2023; UNEP, 2022a), but with climate change mitigation remaining the most dominant of nexus issues addressed in these policies (UNEP, 2022a).

The Dasgupta Review suggests that, in principle, to align public sector appraisal with an objective of sustainable increases in human well-being, appraisals must aim to understand how the value of all assets (whether human, social or natural) are changing to identify policies and investments that will add to a country's stock of inclusive wealth, rather than targeting growth in measures such as GDP (Dasgupta, 2021a). While methods to deliver this in practice are still evolving (R. Yamaguchi et al., 2023) as with the other cases above, this highlights the need for better mechanisms to capture the values of ecosystems and impacts across nexus elements and integrate them into the tools that are used to inform decision making.

6.2.6.2 Increasing the use of, and capacity to use, financial and economic instruments to increase the availability of resources

Innovative approaches to dealing with the biodiversity financing gap may need to consider not only increasing private funding sources, but also addressing the determinants of public under-investment, particularly outside of the OECD and other high-income countries. Such innovative measures may include, for instance: pursuing interrelated forms of both debt justice and tax justice (Dempsey et al., 2022), by reducing tax evasion and tax avoidance (Alstadsæter et al., 2022, 2023) - not least by confronting the role of tax havens in undermining public revenues (Galaz et al., 2018) and curbing profit shifting in developing countries to avoid local taxes (Lord & Ingram, 2021); reversing lobbyist influences in securing low corporate tax rates (Bigger et al., 2021); reconceptualizing sovereign wealth funds to include various forms of natural capital or ecosystem services (Niles & Moore, 2021); and/or reforming bilateral or multilateral debt conditionalities. Some progress has been made in closing tax loop holes, with the OECD estimating that introduction of a global minimum level of corporate income tax will increase global tax revenues by \$220 billion once implemented (OECD, 2023d), which more than 140 countries have now committed to do (WEF, 2024). Countries, especially in the tropics, also miss out on significant tax revenues through illegal trade: the forgone tax revenues associated with illegal logging and fishing for example, are estimated in the range of \$6 billion to \$11 billion per year (World Bank, 2019). Another source of environmental financing currently being promoted has included tax increases for the super-rich class and the use of these taxes for their application to environmental protection and safeguarding nature (Gill, 2024; Neate, 2022, 2024).

Potential instruments to increase the availability of access to financial resource to meet nexus finance needs are not independent of wider action in the finance space; for example, green bonds or microfinance can be used to bring forward investment but can only do so if there is

a secure revenue stream to pay the yield on the bond or interest on the loan. This could be generated through increased public sector or charitable resources and/or realizing a market value associated with the investment, but this may require advances in knowledge, skills or in the regulatory environment to both create a pipeline of investments and willing investors (WWF, 2020). In other words, policy action is likely required even if the intention is to leverage more private resources (Kedward et al., 2023).

Green bonds / Green Sukuk: Green bonds are a financial mechanism to bring forward environmental investments; as a debt instrument, they pay interest and return the value of the investment at a defined time in the future, while the “green” definition relates to the use of bond. Green Sukuk are an Islamic equivalent which does not pay interest, but generates a return on investment (Utermarck et al., 2024). Both green bonds and green sukuk issuance have been increasing in recent years both in terms of the financial values issued (with a slight dip after 2021 for green bonds) and proportion of total issuances (HLWG, 2023; UN, 2024). Sustainable bonds/sukuk as a broader category of bonds including additional uses for social objectives equated to 10% of privately issued bonds in 2023 (OECD, 2024) and 6.8% of total sukuk issuance in 2022 (HLWG, 2023). The picture is more mixed across official sectors (e.g., agencies and local governments, central governments and multilateral institutions), but sustainability-linked bonds remain a very limited source of funding for central governments, representing just 0.4% of total sovereign bonds issued in 2023 (OECD, 2024). \$946 billion of sustainable bonds were issued in 2023 (UN, 2024), with \$10.1 billion of green sukuk issued in the first 9 months of the same year (more than in 2022 as a whole) (HLWG, 2023). Green bonds represented 74% of corporate sustainability bonds issued in 2023, with a smaller proportion for the official sector, around 45% on a three year average (OECD, 2024). In Indonesia, the green sukuk made up 36.3% of ESG-oriented sukuk in 2022 and 55.8% in the first 9 months of 2023 (HLWG, 2023).

In terms of the use of proceeds, data available for green bonds highlight the dominant use is to fund the low carbon transition (UN, 2024): around 60% of the use of sustainable bonds issued between 2014–2023 in the corporate sector and 25–36% in official sectors. Green bonds are used in connection to other nexus elements (water, biodiversity and agriculture as well as adaptation to climate change) but significantly smaller proportions (6% or lower for water, 1% or less for agriculture). There is one exception to this – 19% of central government sustainable bonds issued were linked to biodiversity conservation, although as noted above, the proportion of central government funding linked to sustainable bond issuance is very small (OECD, 2024).

While use of sustainability linked bonds has increased, overall they remain only 6% of all bonds issued, and significant scaling challenges remain – including the weak information infrastructure, greenwashing and lack of global standards/frameworks discussed in previous sections (UN, 2024), but also the systemic barriers around the rewards to traditional investments which do not incorporate the costs of the externalities they generated. While experience in green bonds is visible in all world regions (Dembele et al., 2021) and has extended with the parallel development of green sukuk (HLWG, 2023), bond use remains concentrated in developed countries, with only 13% issued in developing countries in 2022 (or 5% in developing countries excluding China) (UN, 2024). One key constraint that has been highlighted is the need to build capacity and develop the policy enabling environment to

help increase the supply of projects that could be funded through green bonds (Dembelle et al., 2021). Average oversubscription of green bonds has been universally higher than for conventional bonds every year between 2014 and 2022 (OECD, 2024).

The use of green bonds for biodiversity specific outcomes has developed in recent years with the issuance of a \$150 million, 5-year Wildlife Conservation Bond (or “rhino bond”) in South Africa in 2022 (IIED & GEF, 2023). In this model, the interest payment or coupon on the bond funds conservation effort rather than being returned to the investor, with the principal investment and a variable payout dependent on the growth rate of the black rhino population in two target areas of South Africa (covered by the GEF) (GFI, 2023). Bonds are also often used to enable debt-for-nature swaps (TNC, 2022). For bonds to have broader nexus objectives, they would need to report across a wider range of key performance indicators and performance targets across nexus elements, as well as ways and means for progress to be monitored and assured which, while possible, could reinforce knowledge, data and capacity barriers.

Microfinance: Green microfinance is targeted at empowering local communities by providing them with the financial means to enhance their livelihoods in a manner that supports sustainability at the intersection of environmental and economic domains (Atahau et al., 2021). In the realm of sustainable finance, increasing the availability of targeted financial resources for elements of the nexus, particularly water, energy and food systems, integrates closely with biodiversity and climate change considerations (see **Box 6.12**). The expansion of microfinance into green microfinance exemplifies this strategy, supporting underserved communities through investments in renewable energy and sustainable agriculture. This approach not only aids in economic development and environmental protection but also mitigates risks and diversifies assets for low-income households, facilitating the adoption of sustainable technologies (Brears, 2022; Dorfleitner et al., 2020). The actors involved and the typology of financial flows are varied: these include finances aimed at directly improving biodiversity, financial flows that address other aspects of the nexus but simultaneously deliver co-benefits for biodiversity conservation, and, conversely, financial flows that might inadvertently neglect the crucial interdependencies of the nexus, including biodiversity (Huybrechts et al., 2019).

At the local level, where the tangible impacts of the nexus are most directly felt, the importance of these financial strategies becomes evident (Box 6.12). Here, the relationships between nexus elements are not only observable but also actionable. Access to microfinance can thus play a pivotal role, enabling local individuals and communities to invest in more sustainable, nexus-oriented livelihoods (Gatto & Sadik-Zada, 2022). This localized financing approach not only supports direct environmental benefits but also fosters broader socioeconomic stability by integrating sustainable practices into everyday community and economic activities (Huybrechts et al., 2019).

Box 6.12. Inclusive nature finance: The impact of microfinance institutions
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Green microfinance is expanding globally, illustrated by initiatives in East Sumba, Indonesia, where microfinance institutions (MFIs) support eco-friendly projects like biogas and micro-hydropower through favorable green loan terms (Atahau et al., 2021). In Selva Lacandona, Chiapas, Mexico, payments for ecosystem services (PES) and conditional cash transfer (CCT) programmes similarly aim to achieve environmental conservation and poverty alleviation (Cook et al., 2023). These programmes provide reliable household income, with PES funds often invested in community services like schools and clinics (Izquierdo-Tort, 2020).

MFIs play a vital role in promoting climate change adaptation and ecosystem regeneration, particularly under climate stress. They address financial barriers that often hinder small agricultural producers from adapting to climate change and enhancing land productivity. By managing numerous small-scale transactions, MFIs drive significant environmental changes. In drought-prone Northwest Bangladesh, ecosystem-based adaptation (EbA) strategies, supported by MFIs, are crucial for farming communities to mitigate climate change impacts. These strategies include growing drought-tolerant crop varieties, practicing crop rotation and integrating fruit trees with other crops (Sultana et al., 2023). MFIs provide financial resources that enable farmers to adopt these practices, build irrigation facilities and harvest rainwater. Government and local organizations also promote these efforts through training and development projects. Despite these initiatives, challenges remain in ensuring equitable access to resources and integrating EbA into broader agricultural policies for enhanced resilience and sustainable development (UNDP, 2020).

Creating market values and/or financial returns across nexus elements: Where finance flows are driven by market returns, directing more (private) resources towards investments in biodiversity and wider nexus outcomes can be delivered if business-as-usual investment becomes less beneficial or more costly with changes in the enabling environment, or because investments which consider impacts across the nexus become less costly or more beneficial in financial terms. Generating market returns can increase the benefits of investments that take into account rather than neglect their impacts across the nexus elements. The examples below focus on economic instruments used to increase the value of investments that can increase nexus benefits. Like other response options they are not independent of actions elsewhere, as the enabling environment will influence how such options can be used (Nature Finance, 2023). It is also important for some country contexts and worldviews to reflect that the source of finance does not necessarily need to be private markets, and the monetary valuation of nature is often not a necessity, as programmes can also be developed using fiscal reforms and tax revenues. In either context, institutions and safeguards are likely to be key to ensuring that the outcomes that are sought for people and nature are delivered (Farooqui & Schultz, 2012).

Payments for ecosystem services (PES): A global review of PES highlighted that by 2018 there were 550 active programmes generating annual payments estimated at \$36-42 billion (Salzman et al., 2018). The same review highlighted the nexus connections currently exploited by PES, with applications focusing on biodiversity as well as two-way nexus connections with both water and carbon storage, with water being most dominant, largely as a result of large government-financed programmes in China (Salzman et al., 2018). Sixty-two countries had water-related PES schemes, 67 countries were linked to land-use or forest

carbon payments, largely due to REDD+, and at least 33 countries had biodiversity schemes. Reviews also highlight that there are a distinct group or category of PES which are implemented in an agricultural context (Ezzine-de-Blas et al., 2016) reflecting the connection to food dimensions of the nexus and efforts to reduce trade-offs between food production and other ecosystem services.

There is a broad literature on the effectiveness of PES which is not reviewed in depth here. However, the overall conclusions in review and synthesis articles seem to indicate that PES programmes are likely to deliver environmental benefits, but with wider questions about the cost effectiveness of that delivery, alongside questions raised about the delivery of social and livelihood co-benefits, with consistently significant issues raised about weakness of the evidence base (Blundo-Canto et al., 2018; Börner et al., 2017; Le et al., 2024; Salzman et al., 2018; Samii et al., 2014; Wunder et al., 2020) (**Box 6.13**).

Establishing PES that consider a wider range of nexus interlinkages across elements is discussed in the literature under the topics of “stacking” and “bundling” ecosystem services: bundling of services aims to generate payment for a basket of services that are jointly provided, whereas stacking focuses on generating payments for a number of individual services (von Hase & Cassin, 2018; WRI, 2009). Looking at the bundles of services (or range of benefits produced across nexus elements in this context) in an integrated approach has been highlighted as a mechanism to deliver more effective PES schemes at ecologically relevant scales (Deal et al., 2012). The choice of whether to attempt to deliver this through bundled or stacked payments is likely to be context specific (Duguma et al., 2018), and either way, developing structures that reward multiple benefits is expected to change how the investments catalyzed by PES schemes are delivered on the ground as they blend a wider set of interests (M. S. Reed et al., 2017, 2022). Beyond biophysical outputs of land and seascapes, assessments suggest that PES schemes can fail to consider the diverse values of nature, but likewise that integrating diverse values (alongside substantive decision-making by local communities) can improve social and environmental outcomes. (Bremer et al., 2023; Kolinjivadi et al., 2023).

Box 6.13. Finance for response options in the Central American Dry Corridor

The Dry Corridor of Central America covers most of Guatemala, Honduras, El Salvador and Nicaragua, and Costa Rica. It is an important ecosystem in the region because of its characteristics, agricultural production, and vulnerability to climate impacts which affect a significant portion of the region’s population. While Panama is not part of the Central American Dry Corridor, it has made strides in establishing PES schemes and city water funds, together with Guatemala and Costa Rica. Panama’s Colmena Plan focuses on reducing poverty and improving living conditions in extreme poverty areas, indirectly supporting nexus objectives through forest conservation, water harvesting, reforestation and protected area management. Costa Rica has proposed a unified Financial Strategy for the Central American Integration System (SICA) through the Central American Commission for Environment and Development (CCAD), leveraging natural capital accounting to accelerate PES and microfinance initiatives.

Experience suggests that combining natural capital accounting, payments for ecosystem services, water pricing and green bonds can internalize environmental costs and promote sustainable investments (**Table 6.3**). However, inadequate legal and policy support continuously reduces the ability of communities to adapt to environmental, social and economic pressures and conflicts (Bolaños-Guerra & Calderón-Contreras, 2021; Huber et al., 2023; Reichman, 2022; Unfried et al., 2022).

Table 6.3. Country-specific insights on payment for environmental services.

Country	PES challenges	PES successes	References
Costa Rica	<ul style="list-style-type: none"> - Ensuring long-term funding - Addressing socio-economic disparities among participants 	<ul style="list-style-type: none"> - Pioneering PES in forest conservation, biodiversity protection and carbon sequestration 	(Allen & Colson, 2019; Arriagada et al., 2015; Blackman & Woodward, 2010; Daniels et al., 2010; Kosoy et al., 2007; Le Coq et al., 2015; Molina Murillo et al., 2014; Pagiola et al., 2010, 2020; Sánchez-Azofeifa et al., 2007; Sophie et al., 2021; Wallbott et al., 2019; Zbinden & Lee, 2005)
Guatemala	<ul style="list-style-type: none"> - Limited financial resources and institutional support - Land tenure issues - Need for capacity-building among local communities 	<ul style="list-style-type: none"> - Community-based PES projects focusing on forest conservation and water resource management - Active participation of Indigenous communities 	(Aguilar-Støen, 2018; Amaechina et al., 2020; Amaro, 2018; Galloway & Stoian, 2007; Haggard et al., 2013; Kaimowitz, 2005; Liagre et al., 2021; M. Máñez Costa, 2011; M. A. Máñez Costa & Renner, 2005; M. A. Máñez Costa & Zeller, 2005; Pagiola et al., 2010; Patrick et al., 2023; Southgate et al., 2010; Vásquez, 2014; vonHedemann, 2020)
El Salvador	<ul style="list-style-type: none"> - High levels of violence and migration complicating implementation and sustainability of PES projects 	<ul style="list-style-type: none"> - Integration of PES with broader climate resilience and restoration projects such as the RECLIMA project, which combines agroforestry practices with ecosystem restoration 	(Gobbi, 2000; Herrador & Dimas, 2000; Kearney et al., 2017, 2019; Monro et al., 2006).
Honduras	<ul style="list-style-type: none"> - Political instability and land conflicts, particularly in regions like Bajo Aguán, hindering the effectiveness of PES initiative 	<ul style="list-style-type: none"> - Linking PES projects to sustainable agricultural practices and water conservation, benefiting smallholder farmers and contributing to biodiversity conservation 	(Alberto & Elvir, 2008; Ballesteros & Rodríguez, 2008; de Anguita et al., 2011; Rendon et al., 2016)

Nicaragua	<ul style="list-style-type: none"> - Limited institutional capacity and financial resources - Need for more robust legal frameworks to support PES 	<ul style="list-style-type: none"> - Implementation of agroecological technologies and the biointensive method - Successful integration of PES into community-driven conservation efforts 	(Aguilar-Støen, 2015; Ibrahim et al., 2011; Merlet et al., 2018, 2018; Montagnini et al., 2013; Montagnini & Finney, 2011; Pagiola et al., 2005, 2007, 2008, 2020; Rios & Pagiola, 2010; Van Hecken et al., 2012, 2015, 2019, 2021; Van Hecken & Bastiaensen, 2010)
Panama	<ul style="list-style-type: none"> - Climate variability affecting the stability and predictability of PES outcomes 	<ul style="list-style-type: none"> - Recent initiatives focused on integrating PES with watershed management and climate adaptation strategies, enhancing the resilience of local communities to climate change impacts 	(Adamowicz et al., 2019; Duke et al., 2014; Fenichel et al., 2019; Gentry et al., 2021; Mosquera et al., 2023; Paquette et al., 2009)

Biodiversity credits: Interest in biodiversity credit markets (\$1-2 billion in 2021) has been growing in the wake of carbon credit markets, where compliance and voluntary markets were estimated at \$850 billion, and both expected to grow significantly in the future (BloombergNEF, 2022). However, biodiversity credits face significant challenges to ensure they do not replicate the problems currently being experienced with nature-based carbon credits (Box 6.14). These challenges are made more complex given issues around how to quantify the biodiversity units for measurement for credits, measurement of the baseline and tracing additionality, as well as ensuring that transaction costs and power imbalances do not prevent finance from credits reaching those generating them, especially IPLC (Ducros & Steele, 2022). There is a need for credits to find high-integrity sources of demand that are willing and able to pay an adequate price that equitably rewards all involved (Nature Finance & Carbone 4, 2023). In terms of the use of credits to catalyze consideration of values across nexus elements, questions similar to those for PES arise, in this case whether biodiversity benefits might be part of a bundle of benefits that are paid for or if biodiversity credit markets fund the biodiversity element within a stack of services / benefits.

Box 6.14. Biodiversity credits risk emulating nature-based carbon credit risks

Like many carbon credit projects involving nature-based assets, biodiversity credits have come under increased scrutiny in recent years. While biodiversity credit markets still remain comparatively small against the much larger voluntary carbon credit markets (VCMs), several stakeholders, including the European Union, have expressed caution (ESMA, 2023a), primarily given the complexity of the subject matter and the lack of technical expertise and measurement, reporting and verification (MRV) capacities of many of the involved credit-related stakeholders (ESMA, 2023b).

Given that the ongoing shortcomings in terms of corporate and finance sector-level sustainability-related disclosures, and the lack of independent scientific review, numerous

claims about the additionality of biodiversity credits or nature-based carbon credits remain hard to verify (Schumacher, 2020). Recent studies have illustrated how challenging adequately monitoring claims in the biodiversity credit and nature-based carbon credit spaces remains (zu Ermgassen et al., 2023). Many carbon credit providers and credit registries, such as Verra, Gold Standard and the American Carbon Registry, have come under increasing pressure for outdated, inconsistent and inadequate credit issuance frameworks that enable over-issuance of credits coupled with lax or insufficient independent oversight and project monitoring (Haya et al., 2023). The main criticisms pertain to either massive unjustified credit over-issuance, for example in the case of the Kariba project in Zimbabwe by Swiss-based carbon credit provider South Pole (Pande, 2024), or the overstating of deforestation reductions in the Amazon (West et al., 2020) and 26 other project sites in countries across three continents (West et al., 2023).

Improving finance for nature-based solutions (NbS): If properly planned and implemented, it has been suggested that NbS can enable synergies and minimize trade-offs across nexus elements (Seddon et al., 2021). Beneficial investments in nature to meet wider societal challenges are readily identified in theory; for example, modelling exercises show that potentially one in six cities benefits financially in terms of reduced water treatment costs through conservation action upstream, the wider benefits of which would also be captured if impacts across the nexus were taken into account (e.g., benefits for climate change adaptation and mitigation as well as biodiversity) (TNC, 2017). More broadly, looking across infrastructure needs for coastal protection, energy and transport – in addition to water supply and investments to increase the resilience of current infrastructure – it has been estimated that green infrastructure could replace much grey infrastructure with potentially lower costs and higher benefits across nexus elements (Bassi et al., 2021; Feagin et al., 2021) (see also **Section 5.1.3.2**).

Some focus has been placed on identifying ways in which a pipeline of bankable projects (leveraging private resources) could be generated, with various solutions oriented around the role of the public sector as a catalyst, whether through providing financial resources to reduce the risk of the project as perceived by private funders, funding a proportion of activity to cover the generation of public benefits which do not generate private returns, or establishing proof-of-concept projects (WWF, 2020). Important roles are also identified for coordination, either pooling a portfolio of projects to reduce exposure to risk if a single project fails, or coordinating financial interests where there are multiple benefits and multiple beneficiaries, as well as in terms of understanding and monitoring outcome (den Heijer & Coppens, 2023; Plantinga et al., 2023; A. Thompson et al., 2023; WWF, 2020).

However, important caveats remain, both around current applications of NbS and the use of financial and market mechanisms to scale NbS. For example, with respect to carbon sequestration benefits, there are concerns around the NbS being used as an excuse to continue with business-as-usual consumption of non-renewable energy sources including fossil fuels (Anderson et al., 2019). It has also been reported that NbS are being implemented without taking into account impacts across nexus elements, for example, focusing on tree planting as an NbS measure (for climate change mitigation) at the expense of the urgent need to protect and nurture rapidly dwindling intact natural ecosystems (Solan et al., 2020; J. E. M. Watson et al., 2018). There are also concerns NbS is increasingly being implemented in the absence

of community consent with possible rights infringements leading to low success and sustainability of interventions (Ramprasad et al., 2020; Scheidel & Work, 2018; Vidal et al., 2014). Such concerns are highlighted in the UN Environment Assembly Resolution on the topic from 2022 which reflect the need for NbS to respect social and environmental as well as highlighting the potential to contribute to challenges across a range of issues related to nexus element (including biodiversity loss, land degradation, food security and human health, as well as climate change) (UNEP, 2022b).

With respect to concerns around the use of financial and market mechanisms to scale investment in NbS specifically, these include practical limits to the replicability of solutions which necessarily vary with communities and places concerned and risks that they reinforce power imbalances across the globe (Chausson et al., 2023). In this context, the same authors highlight the need to recognize alternative sources of finance beyond innovative instruments to stimulate private finance, which include repurposing harmful subsidies, taxing environmentally harmful activities, direct funding, decolonial finance mechanisms including unconditional cash transfers or debt relief schemes to relieve the burden of debt on low income countries (Chausson et al., 2023). Models of direct public funding can also include approaches such as ecological fiscal transfers, which are used to transfer public revenues between regions within a country to help compensate subnational governments for costs (including foregone development) for ecological protection which may deliver benefits for the country more widely; such flows were estimated globally at \$23 billion in 2020 (Busch et al., 2021).

6.2.6.3 Actions to address the negative incentives to damage biodiversity

Taxes and regulations: While previous sections highlight the role of general taxation in increasing the availability of public financial resources, taxation, regulation and economic instruments can also be used to create disincentives to carry out activities that have negative impacts on biodiversity, ensuring that the true costs of economic activities are better reflected (OECD, 2021). This could include taxes on inputs such as pesticides, requirements for biodiversity offsetting where impacts cannot be compensated or fees and charges to limit over-use of natural resources (OECD, 2020b). It has been suggested that both environmental taxes and biodiversity-related taxes are underutilized (5.1% of total OECD tax revenue, and 0.9% OECD environmental tax revenue respectively), as well as other instruments such as fees, charges, tradable permits and offset schemes – highlighting potential increases in both for raising revenue, internalizing externalities and encouraging sustainable use (OECD, 2021). From a nexus perspective, the information requirements become significant, as for example a desirable tax rate related to impacts on biodiversity and across nexus elements may be likely to vary both over space and time, and also implies a degree to which losses may be accepted, hence setting limits on resource extraction and use is likely to be required in parallel (OECD, 2021).

Safeguards and standards: The previous section focuses on drawing in and making finance across biodiversity and nexus element more accessible. However, even if successful, there will remain a significant majority of financial investments that are not made with sustainability concerns in mind. Thus, safeguards and standards that reduce the potential for such investments to cause harm will also be important. Global reviews suggest there is

considerable room for improvement: for example, of 155 banks identified as likely investors in large infrastructure / private sector development projects and holding assets over \$500 billion, only 42% had biodiversity safeguards. Of this number, 86% were harmonized with performance standard 6 of the International Finance Corporation (IFC), highlighting the powerful role of this institution and standard (Narain et al., 2023). While IFC performance standard 6 references the management of ecosystem services and links these to their beneficiaries, and especially affected communities, it is focused on reducing trade-offs where impacts arise, rather than identifying alternative investments (IFC, 2012).

Tackling debt in lower income countries: The COVID-19 pandemic has catalyzed renewed interest in tackling global debt. While across the world debt has started to fall since 2020, in low-income countries, debt has not fallen and in 2022 was over 10% higher as a proportion of GDP than it was in 2019 (IMF, 2023). More than half of low-income developing countries are in or at high risk of debt distress, and about one fifth of emerging markets have sovereign bonds trading at distressed levels. In this context and given the higher cost of borrowing faced by lower income countries, momentum for change may be building, with the Stockholm+50 international meeting followed by the launch of the Bridgetown Initiative and subsequent Summit for a New Global Financial Pact held in Paris in June 2023. The need to re-examine the international financial system and its role in stopping as opposed to accelerating progress towards sustainable development is also captured in the preparatory materials for the UN Summit of the Future held in September 2024.

The increasing burden of debt has reignited interest in contingent debt swaps such debt for land restoration (Global Mechanism of the UNCCD, 2022) and debt for nature swaps (Losos et al., 2024), with deals being agreed by Belize, Barbados and Ecuador among others in the aftermath of the pandemic. The scope for these swaps can be significant: a study of 67 countries in debt distress showed that they covered 22% of global biodiversity priority areas, 83% of which were not protected, indicating clear scope for debt alleviation to make a difference to biodiversity on the ground (Nedopil et al., 2023). However, such deals are not without costs, as while these are aimed to create fiscal space for investment in conservation (by restructuring debt) they can also have significant transaction costs (e.g., an estimated 23% of Belize's 2021 \$364 million debt for nature swap) which may be captured by banks and knowledge brokers outside of the country (Kedward et al., 2023). In the past they have also been associated with sovereignty infringements as they require the allocation of national resources to nature; however, there is less conflict where the country considering debt conversion has a sustainability strategy aligned to the interest of the swap (Booth & Brooks, 2023).

In addition, there is a link between external financial debt, structural adjustment programmes and ecological debt generated in international borrowing economies (Goeminne & Paredis, 2010; *The Ecological Debt*, 2002). Structural adjustment programmes (SAPs) linked to external indebtedness promote, on the one hand, the flow of financial capital and, on the other, the exploitation of basic natural resources (Givens et al., 2019), such as the intensification of agriculture, mining, oil exploitation and hydroelectric power, often without considering the social and environmental costs. SAPs have implied substantial transformations in quality of life, access to health, education and retirement in emerging economies, and a virtual opening up of the exploitation of natural resources (land, water,

energy and genetic resources) to the international market (Srinivasan et al., 2008) as countries are urged to pay the interest on the external debt by exporting more raw materials with little added value, maintaining a vicious circle that affects their environment, society, economy and democratic systems (Pengue, 2023). The transformation of the financial system incorporating the values presented previously would contribute to resolving the effects of the overexploitation of natural resources under pressure by the SAPs.

6.3 Finance and economic sectors as enablers of change

6.3.1 Introduction

Current finance flows entrench risks across nexus elements and ignore the interconnected nature of social-ecological systems and emergent systemic, compound and cascading crises. Yet transformative societal change and sustainable development outcomes can be enabled to address these nexus interlinkages, particularly by transforming development practices and their underlying ideologies and structures. As defined by the IPBES Thematic Assessment of the Underlying Causes of Biodiversity Loss, Determinants of Transformative Change and Options for Achieving the 2050 Vision for Biodiversity (Transformative Change Assessment), transformation consists of fundamental, system-wide shifts across views, structures and practices. When such shifts address the underlying causes of biodiversity loss and nature's decline, transformational change contributes to a just and sustainable world. This involves transforming not only economic response options and the prevailing political economy, but also governance more broadly, the values underpinning decision-making and nature-people relationships to enhance nexus outcomes. Against this background, public finance is identified by the Intergovernmental Panel on Climate Change (IPCC) as a key enabler of climate-resilient development to advance sustainable development for all (IPCC, 2023).

The IPCC Sixth Assessment Cycle defined system transitions as “the process of changing (the system in focus) from one state or condition to another in a given period of time” (de Coninck et al., 2018; IPCC, 2022). For climate change response options, system transitions concern integrating mitigation, adaptation and sustainable development actions (**Chapter 5.5**). Response options, once implemented, do not function in isolation as there are synergies and trade-offs between them (de Coninck et al., 2018; IPCC, 2018, 2022) (**Section 5.6.4**). These interactions take place both between response options within a system transition and between system transitions. IPCC's Working Group II identified five system transitions: land, marine and coastal ecosystems; urban and infrastructure; energy; industry; and societal (**Section 5.5.3**), the latter of which is key to shaping pathways and where actors interact within arenas of engagement (**Section 4.5.1**). Nexus elements are present in all the different system transitions. For example, water is one of the main elements that link all system transitions, and is evident in the interaction between biodiversity, food, health and climate change (Caretta et al., 2022; de Coninck et al., 2018).

In taking a system transitions approach, interactions between sectors can be enabled that would otherwise tend to function as independent siloes, creating a barrier to nexus approaches. These system transitions and societal transformations are ultimately foundational

for acknowledging nexus interconnections and improving sustainable development prospects (see **Figure 6.10**). They are facilitated by inclusive and enabling participation by all governance actors in diverse arenas of engagement as described in **Section 4.5**.

Transformative decision-making within financial and economic arenas of engagement can shift systems and development trajectories by restructuring financial flows and the overall political economy, simultaneously transforming decision-making and action in other arenas of engagement, be it political, ecological, community, socio-cultural or knowledge-technology (see **Figure 6.11**). By shifting development pathways away from business-as-usual values, structures and decision-making, in contrast transformative, just and interconnected response options implemented early can enhance current and future development opportunities and options for action. Hence, attention to the actors and arenas in which they interact is a fundamental part of enabling sustainability transitions and transformative societal change.

6.3.2 Future scenarios on financial systems and economic models

Scenarios aim to broaden our understanding of how different paradigms might evolve to support sustainability and well-being, providing a framework for exploring how ecological values may be integrated into decision-making processes. The six nexus scenario archetypes in **Chapter 3 (Section 3.7.1)** provide insight into economic characteristics and their consequences for financial decision-making. For instance, scenarios that follow a business-as-usual approach typically show declines across nexus elements (i.e., nexus scenario archetypes *food first* and *nature overexploitation*). However, when improvements are noted across nexus elements, they are generally linked to economic and lifestyle and consumption changes that reduce environmental pressures and material use (e.g., nexus scenario archetypes *nature-positive nexus*, *balanced nexus* and *biodiversity first*).

The Nature Futures Framework (NFF) developed by the IPBES task force on scenarios and models offers additional insights in how economic and trade systems that prioritize environmental and societal well-being could be shaped (Durán et al., 2023; Pereira et al., 2020). The NFF illustrates diverse, non-exclusive ways people, institutions and cultures might relate to and value nature: nature for nature (emphasizing the intrinsic value of nature), nature for society (emphasizing instrumental values such as those associated with nature's contributions to people), and nature as culture/one with nature (emphasizing relational values between people and nature) (**Figure 6.7**).

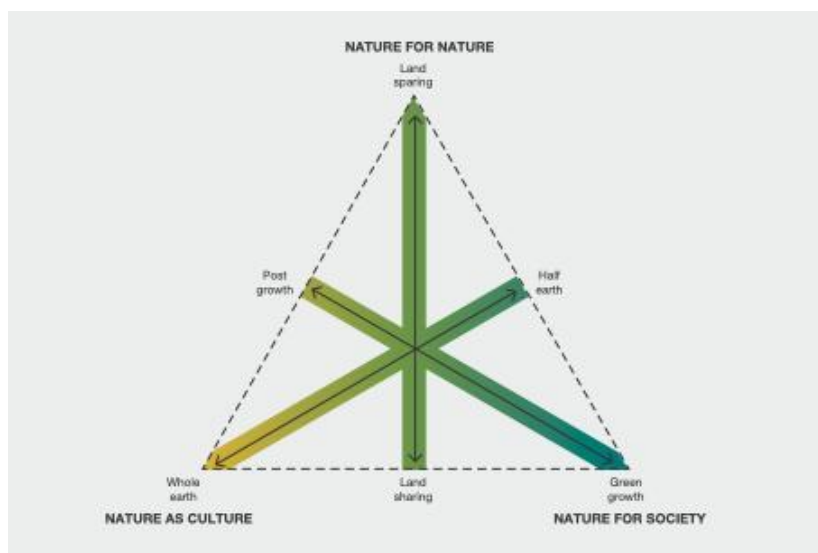


Figure 6.7. The three value perspectives of nature (corners of the triangle) in the Nature Futures Framework, represented through three gradients that reflect key transformative change debates: (1) land sparing vs. land sharing; (2) half Earth vs. whole Earth conservation; and (3) green growth vs. post-growth economic development (Durán et al., 2023; IPBES, 2022b).

The NFF also provides insights into the economic, financial and trade implications of varying conservation and growth scenarios. For example, the "green growth to post-growth" gradient in **Figure 6.7** examines the transition from an economy that aims for sustainable growth within 'safe' environmental limits, where GDP growth is still pursued (UNEP, 2011), to one where ecological sustainability and social well-being are prioritized over economic growth. This green growth gradient aligns with the concepts of doughnut economics, planetary boundaries and the steady state economy, all of which restrict growth within strict environmental limits (Durán et al., 2023). In the post-growth gradient, economic and trade systems evolve to de-emphasize GDP as the primary success metric, instead focusing on alternative indicators that reflect environmental health and societal well-being, such as those proposed in the "well-being economy" (Dixson-Declève et al., 2022). Post-growth narratives also prioritize technological advancements optimizing efficiency of consumption and transitions from circular to steady-state economies (Schulz & Bailey, 2014). This shift may lead to more integrated approaches to societal sustainability, reducing negative trade-offs between environmental preservation and societal needs (D'Alessandro et al., 2020; Slameršak et al., 2024) and aligning economic practices with societal values and well-being (Paulson & Büchs, 2022).

The "half Earth to whole Earth" gradient in **Figure 6.7** examines the economic effects of conservation strategies ranging from strict protection to integrated approaches with land use policies and sectors such as agriculture and real estate. The "land sharing to land sparing" gradient explores agricultural and land use strategies that integrate conservation into productive landscapes or separate intensive agriculture from high-conservation areas, influencing global supply chains and agricultural trade policies. These scenarios implicitly reflect the diffusion of innovative financing and policy instruments, especially natural capital accounting, to integrate ecological values into economic decision-making and redistribute the

economic and social benefits of conservation and sustainability derived from ecosystem services. They also respect local and indigenous knowledge systems, reflecting community-specific cultures and values as shown in the narrative of the “Reciprocal Stewardship” NFF scenario from (Durán et al., 2023).

The gradients also envision adjustments in global trade to minimize environmental impacts or to optimize trade systems to support ecological principles, provisioning services and local production strategies. Other scenario narratives have also championed sustainability and equity, advocating for self-sufficiency and bolstering local and regional trade (Fioramonti, 2024). For example, some green growth scenarios suggest more regional and modular trade, particularly in agriculture and energy systems, as seen in the “sustainability” scenario of the shared socioeconomic pathways (SSP1) developed for the IPCC (van Vuuren et al., 2017). This approach aligns with economic paradigms such as the blue-green economy, which focuses on the sustainable use of land and ocean resources. While these scenarios typically assume that substantial investments and advancements can account for and separate economic growth, trade and finance from environmental impacts, effectively realizing this decoupling remains a significant challenge (Antal & Van Den Bergh, 2016; Hickel & Kallis, 2020; Otero et al., 2020).

6.3.3 Enabling transformative response options and change

Chapter 4 describes the need for engaging with the nexus challenges of complexity, values, financing, scaling and governance as critical to supporting sustainable and just outcomes (**Section 1.1.2**; **Section 4.3**). This may require transforming prevailing practice and interactions within diverse arenas of engagement, as interactions between governance actors in these arenas advance or constrain nexus governance efforts (**Section 4.5.4**). This section builds on **Chapter 4** to assess what characterizes the types of interactions between diverse civil society, government, science, IPLC and private sector actors that enable economic and financial choices and actions that could cumulatively transform development trajectories towards sustainable and just futures (see **Figures 6.8, 6.9, 6.10**).

“Arenas of engagement” are described as “the settings, places and spaces in which societal actors interact to influence the nature and course of development” (E. L. F. Schipper et al., 2022) (see also **Section 4.5.1**). The ways diverse actors interact in these economic and financial, political, ecological, socio-cultural, knowledge-technology and community arenas can either generate change or entrench business-as-usual development pathways. These arenas can be temporary or enduring in nature, with interactions spanning local to global scales. Economic and financial arenas in particular are wide ranging and can include local markets for forest products, village-level planning committees, community forestry, conservation or rural development project meetings, corporate boardrooms, organized criminal networks, biodiversity policy and planning processes, negotiation meetings in international environmental agreements and conventions, and international forums for trade and public finance decisions (Adeniyi, 2023; Bakhtary et al., 2020; S. Chaudhary et al., 2018; Nelson et al., 2021a) (see also chapter case study boxes).

Key actors interacting in economic and financial arenas include not only economists, financiers, bankers and others who hold formal positions in economics and finance but also diverse actors in civil society and from IPLC, government and science (see **Section 6.1** and

Figure 6.8). The nature of engagement by these diverse actors shapes resistance or receptivity to the system transitions necessary to improve development outcomes for the nexus. For example, interactions across science, policy and politics by critical action intellectuals, along with social movements, macroeconomic processes or technological breakthroughs, can drive transformation in environmental governance to address climate change, biodiversity loss, social inequality and livelihood insecurity (Ojha et al., 2022). The quality of interactions between governance actors in economic and financial arenas plays an especially important role in opening-up or closing-down biodiversity and sustainability prospects because of the predominant influence of economics and finance in societal decision-making. For example, privilege and injustice in participation and decision-making processes can lead to uneven outcomes (S. Chaudhary et al., 2018). More transformative economic and financial response options would catalyze and support decision-making that addresses trade-offs across nexus elements and better promotes synergies between them, as well as shifting system goals towards sustainability and equity objectives beyond financial returns (Section 6.2, **Figure 6.8**, **Figure 6.11**).

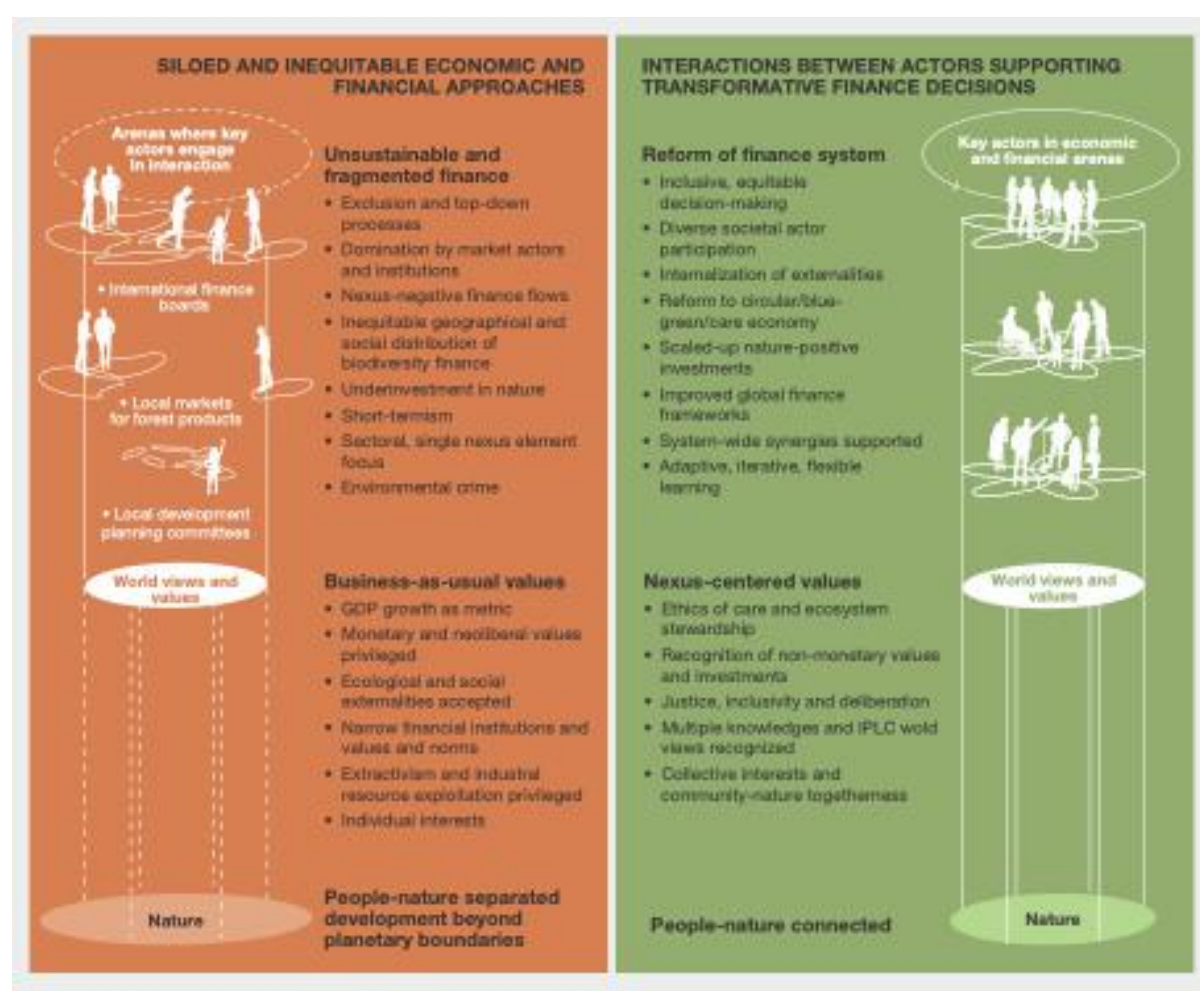


Figure 6.8. Decision-making interactions between diverse actors in economic and financial arenas can lead to transformative finance response options. Financial and economic arenas of engagement encompass decisions taking place through interactions between diverse actors at different scales. In business-as-usual arenas of engagement (left), interactions and decisions are characterized by domination by some actors, knowledge

systems and values as well as weak collaboration, leading to fragmented and unsustainable actions. The quality of interactions that enable transformative financial decisions are exemplified on the right. These actions are embedded in nature-society connectedness and bounded by holistic values, ethics and worldviews. Decisions made through these interactions can cumulatively lead to finance and political economy outcomes that transform development to advance more just and sustainable futures.

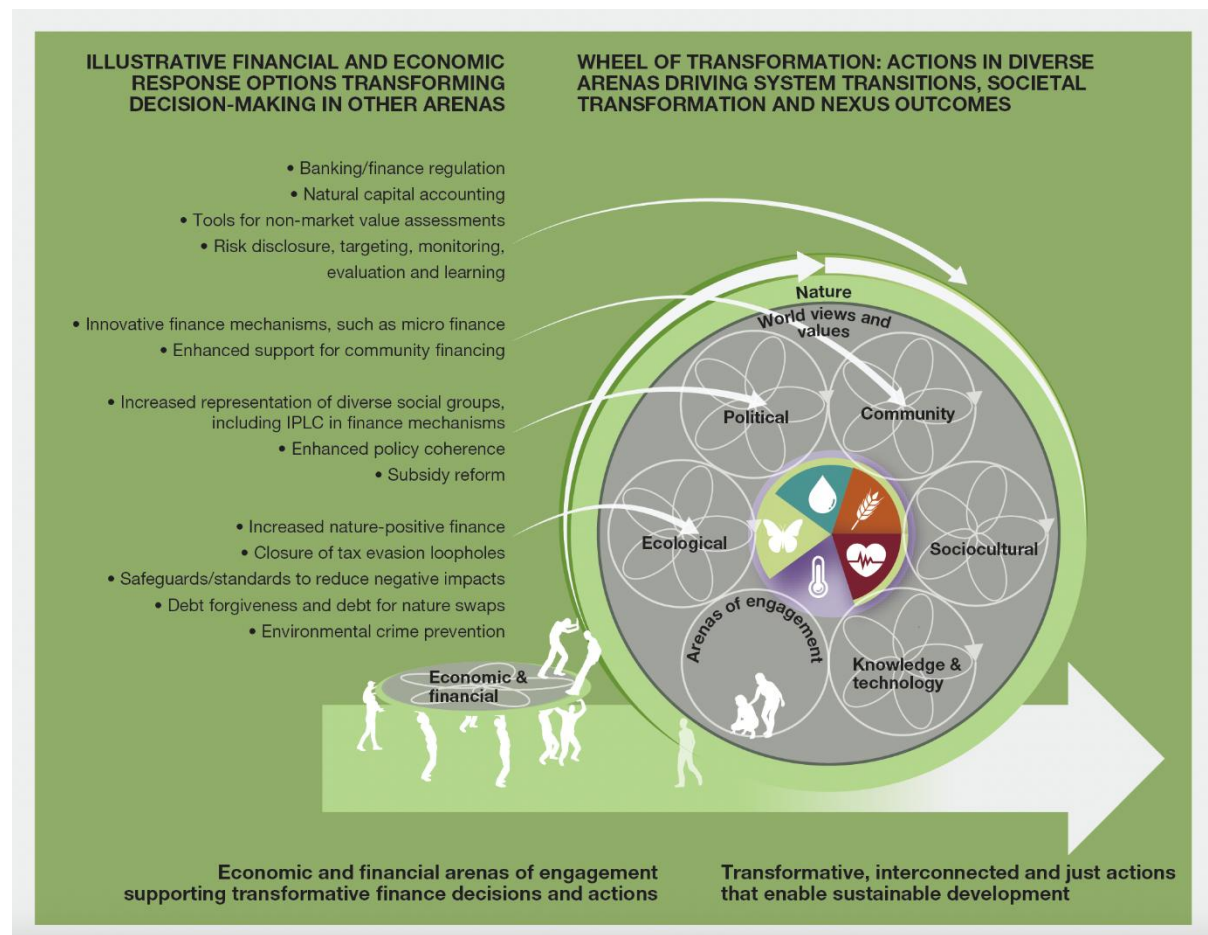


Figure 6.9. Transformative decision-making in economic and financial arenas of engagement can transform practice and interactions in other arenas, together enabling societal transformation to enhance nexus outcomes. Economic and financial arenas support response options (illustrated on the left-hand side, see Section 6.2) that can drive transformative, just and interconnected action within the political, community, socio-cultural, ecological and knowledge-technology arenas of engagement.

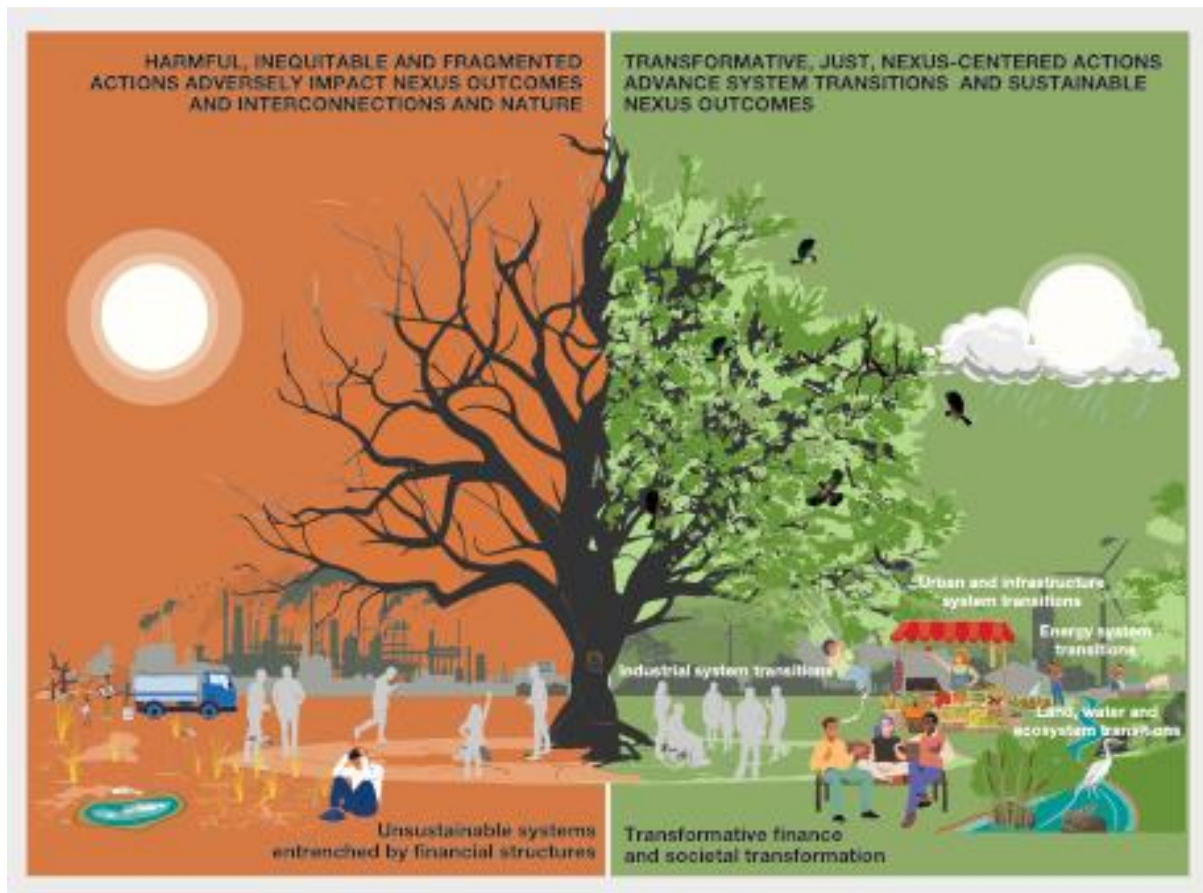


Figure 6.10. Transformative finance and societal transformation enable interconnected system transitions and help build resilient societies. Business-as-usual financial structures and harmful, inequitable and fragmented actions entrench unsustainable economic and societal systems (Section 6.1 and 6.2) (left panel). Transformative finance and societal transformation drive system transitions within industrial, energy, urban and infrastructure and land, water and ecosystems (right panel). Such interconnected system transitions support sustainable outcomes including strengthened biodiversity, water and food security, health and well-being and reduced climate risk (**Chapter 5**).

6.3.3.1 System entrenchment and societal transformation

Power and politics characterize interactions within arenas of engagement, with varying levels of inclusion and equity and uneven power relations shaping struggles between actors over influence. Current interactions in many economic and financial arenas privilege more powerful interests and voices over others, resulting in inequitable access to and benefits from public and private finance. For example, where neoliberal logics pervade blended finance, debt-based finance or interactions among a diversity of finance providers, power tends to shift to market actors and financial fund managers (Bracking & Leffel, 2021). There is also growing evidence of some so-called environmental finance supporting social and environmental extractivism that concentrates resource control and benefits in the hands of a few actors, perpetuates uneven global development, and has negative implications for livelihoods, local resource rights and the state of nature (Bruna, 2022; Ye et al., 2020). Elite capture of finance occurs where elites take disproportionate advantage of interventions at the

expense of vulnerable groups by exerting influence over how funding is directed. This exacerbates skewed power relations and inequities and often results in narrow monetary values framing environmental management and undermining sustainability outcomes (Artur & Hilhorst, 2012; Benjaminsen & Kaarhus, 2018; Camargo & Ojeda, 2017). These practices and outcomes are exacerbated by a lack of inclusive decision-making processes, reliance on singular expert/elite vulnerability understandings in programming, top-down approaches, short-term project imperatives, and often narrow and dualistic understandings of people and nature relationships (Barrett, 2014; Benjaminsen & Kaarhus, 2018; Coolsaet et al., 2020; S. Eriksen et al., 2021; Muyengwa et al., 2014; Omukuti, 2020; S. Wong, 2013).

Inequitable interactions between governance actors also take place across scales between funding agencies, corporations, government organizations, non-governmental organizations and local populations to entrench unsustainable development trajectories. Inequalities created and reinforced by business-as-usual finance have led to (historical and) ever-widening disparities in ecological impacts and resource access both between, and within, nations (Galaz Rodriguez & Collste, 2022; Hamann et al., 2018; Hickel, Dorninger, et al., 2022; Hickel, O'Neill, et al., 2022; Sovacool et al., 2021). For example, global injustices in the form of growing funding gaps for both biodiversity and climate change, in particular to developing countries, compound increasingly adverse impacts and challenges to decision-making at the local level. For instance, climate change leads to rising costs of adaptation for terrestrial and marine biodiversity and ecosystem services, including protected areas; for flood management, coastal management, early warning and infrastructure; for agriculture, fisheries and aquaculture (as flows to forests and ecosystems make up a very small percentage of adaptation finance); and for health (S. Eriksen et al., 2021; Nightingale et al., 2020; UNEP, 2023a). Remittances and finance for small and medium-sized enterprises are other forms of finance that can help bridge this adaptation funding gap, yet the insufficiency of international public funding cannot be made up for through domestic budgets and private finance (UNEP, 2023a).

Previous sections have highlighted the risks and trade-offs that can occur when business-as-usual economic growth is pursued at the expense of biodiversity, nature and justice goals, exacerbating inequalities. However, an increase in financial flows may not lead to desired outcomes without institutional transformation. Institutions can be difficult to change, particularly when interests of the few dominate plural values and profits prevail over human well-being and planetary health (Boettke et al., 2008; Brockhaus et al., 2021; Delabre et al., 2020; G. Y. Wong et al., 2022). A recent example is in the concept of “building back better” from the COVID-19 pandemic. Despite promises of green investments, G20 countries have still directed \$300 billion of new funds towards fossil fuel activities (SEI et al., 2021). And of the \$3.38 trillion proposed longer-term post-COVID recovery investments, only 15% is considered “green” (with limited sectoral focus on cutting greenhouse gas emissions or air pollution) and only 3% directed towards goals in line with improving nexus elements (Rockström et al., 2021).

Decisions emerging from economic and financial arenas of engagement intersect with other arenas of engagement and hold the potential to trigger societal transformations. Urgent transformation of the diverse arenas where governance actors interact to make decisions that shape the character and trajectories of development is required to enable progress across the

nexus elements. Transformation in finance and economic arenas of engagement and resulting response options can enable change in other political, socio-cultural, knowledge-technology, community and socio-cultural arenas of engagement (see **Figure 6.9**, **Figure 6.10**). For example, decision-making in financial and economic arenas of engagement can drive change in community forestry, an ecological arena of engagement (S. Chaudhary et al., 2018). **Table 6.4** examines two response options assessed in **Chapter 5.3** to illustrate how they interact across ecological, knowledge-technology, socio-cultural and political arenas and relate to progress towards sustainability transitions in land, water and ecosystems more widely.

Table 6.4 How economic and financial response options drive change in diverse arenas of engagement, exemplified for two response options drawn from **Section 5.3.3** on food-related response options.

Response option	Reform public spending (F13; Chapter 5.3.3.13)	Foster gender transformative approaches (F14; Chapter 5.5.3.14)
<i>Description</i>	Redirecting subsidies towards public goods, incentivizing environmentally friendly practices, reducing harmful production and increasing healthy food. Dependent on finance, ethics, cultural patterns, effective institutions and complementary measures.	Financial inclusion programmes, credit schemes and cash/in-kind transfers aimed at women, combined with access to land, information and government services. Financial inclusion needs to be combined with economic inclusion, including social safety nets, livelihoods, inclusion in value chains, market access and labour conditions.
<i>Transformation required in interactions between governance actors</i>	Equitable power relations between actors support effectiveness and fairness. Strengthened role of community-based decisions. Improved relationships between rural producer and urban consumer communities. Collaborative networks among farmers to share experiences and innovations. Space for contesting unsustainability through scientist concerns and urban dwellers protests.	Networks for bottom-up knowledge and innovation co-creation between women's initiatives (e.g., women food entrepreneurs), science and the private sector. Strengthened collective role of female traders in markets through forming market traders' groups and establishing links with other women's groups, private business and local government. Shifted gender norms and women's empowerment in economic decision-making.
<i>Key economic and financial arenas of engagement</i>	Urban and rural markets. Grassroot organizations and mobilization. Farmer and women's groups/networks. Micro-credit schemes decision-making. Household livelihood and mobility decision-making. Government decision-making regarding subsidies. Governmental and non-governmental finance mechanisms.	
<i>Influence on other arenas of engagement</i>	Political arenas: More equitable power relations among civil society-government-farmers-companies. Community arenas: Enhanced role in decision-making processes of IPLC, grassroots actors and marginalized groups. Knowledge-technology arenas: New arenas strengthening co-creation relationships between researchers/science, IPLC and community organizations.	

	<p>Ecological arenas: Institutional, ecosystem and value changes enabling sustainable and just farming practices and resource rights.</p> <p>Socio-cultural arenas: Household/community practices enacting the cultural value of food and food production.</p>
<i>Societal transformation and system transition</i>	<p>Improved inclusion and equity (distributional and procedural).</p> <p>Transition to healthy, sustainable and just food systems, supporting land, water and ecosystem transitions.</p> <p>Reframing from food as commodity to multiple values (human right, common good, identity and culture, links to nature, etc; see Chapter 5.3, Table 5.3.1).</p> <p>Enhanced transformative change potential of actions:</p> <ul style="list-style-type: none"> - Social, cultural and technical innovation; - Structure and institutions; - Views and values.
<i>Nexus element outcomes</i>	<p>Improved state and function of biodiversity; water for ecosystems and humans; access to healthy food; increased environmental performance of food production; increased food availability and production; access to quality healthcare; reduced burden of disease; increased well-being; actions for climate change adaptation and mitigation.</p>

6.3.3.2 Strengthening equity and inclusivity in decision-making

Reforming economic and financial systems to advance transformative societal change requires a diversity of voices and actors and changes in goals and values. Equity, inclusivity, multiple values and knowledge and deliberative interactions are qualities associated with nexus governance that can help deal with complexity and contestation and enable transformative finance response options (**Figure 6.10**). Space for contestations over visions for the future across diverse interests, in particular the inclusion of groups that are often marginalized in such debates, are seen as important for building collective resilience and sustainability, and leveraging equity to enable system transitions (S. H. Eriksen, 2022; Görgens & Ziervogel, 2019; Nightingale et al., 2020; Roberts et al., 2020; Solecki et al., 2018; Ziervogel et al., 2022). The importance of civil society in these interactions is increasingly emphasized, including both formal organizations (e.g., community-based organizations and NGOs, environmental groups, village associations and bodies representing the interests of youth, women, farmers, labour, disabled, etc.) as well as informal groups of citizens who may convene around a matter of common concern and seek redress or collective remedies. Emergent groupings can become a social movement to take organized collective action to achieve an outcome of civic concern, e.g., to address women's rights or environmental or labour concerns, as these actors often hold shared understanding of rights and justice (Gready & Robins, 2017). For example, the Occupy Wall Street movement is an example of citizens mobilizing and taking action to address social and economic inequity as well as the prevalence of greed and corruption and the undue influence of corporations on governments (Calhoun, 2013; Gitlin, 2013). Key enabling characteristics of more deliberative arenas of engagement include: (i) a 'safe space' to have a voice in public decision-making; (ii) an authentic opportunity to express one's views, taking into account how different values, worldviews, cultures and institutional structures and processes open-up or close-down different voices (e.g., ensuring space for IPLC knowledges); (iii) where less privileged voices are listened to and heard by a receptive audience; and (iv) where these voices are acted upon. The role of equitable and just interactions in enabling transformative change is further exemplified in **Box 6.15**.

Economic and financial arenas of engagement that are inclusive and deliberative requires an increased focus within funding mechanisms on quality of project processes and institutional capacity rather than material project outcomes (Cornwall, 2002; Gaventa, 2006; Larson et al., 2022; Nightingale et al., 2020; Taylor et al., 2022; Ziervogel et al., 2022). In turn, increasing finance flows to developing countries, as well as reforming the finance system and instituting gender equality and social inclusion requirements for responsive finance, can help facilitate the creation of these arenas (UNEP, 2023a). For example, more equitable engagement of IPLC with other actors, including addressing chronic underfunding of such groups, has been identified as particularly important. Only 1.4% of total public climate finance in 2019-20 was targeted toward IPLC needs, and only 3% of the financial need for transformational tenure reform is being met annually (Forest Declaration Assessment Partners, 2022). Inclusivity in governance and civil society affairs are essential qualities characterizing such interactions (Larson et al., 2022). Strengthening the role of IPLC in knowledge-technology arenas of engagement can help include IPLC understandings into definitions of sustainability and transformation within science and policy processes (Lam et al., 2020; Virtanen et al., 2020), and advance collective efforts across IPLC and civil society (e.g., stopping mining or protecting farming rights) (Hall et al., 2015; Reuters, 2022).

Box 6.15. Ensuring finance advances social justice: local climate finance and the inclusion of persons with disabilities in East Africa

The inclusion of persons with disabilities in local climate finance provides lessons for how economic and financial response options can deliver social justice and the challenges such efforts must overcome. Despite constituting 16% of the world's population, persons with disabilities are seldom included in climate nor environmental decision-making, and are largely ignored in the distribution of benefits from such measures (Abbott & Porter, 2013; Jodoin et al., 2021; Kosanic et al., 2022; P. J. S. Stein & Stein, 2022). In rural East Africa, PWDs are often dependent on natural resources for their livelihoods. Their ability to ensure water, health and food in the context of climate change is shaped by current patterns of injustice and exclusion (NUDIPU, 2022), with prejudice and stigma in some contexts extending to PWDs being denounced by their families or killed (Ingstad & Grut, 2007; NUDIPU, 2022; Nyamu, 2020; Tambala-Kaliati et al., 2021). Persons with disabilities, particularly children, those with more complex disabilities or sensory or intellectual disabilities, are exposed to various forms of violence, including gender-based violence (Chirwa et al., 2020; Ingstad & Grut, 2007; Lee & Massah, 2020; Namatovu et al., 2018; Winters et al., 2017), a risk that increases during emergencies (UNFPA and Women Enabled International, 2021).

Globally, social isolation and challenges with accessing early warning systems, evacuation information, relocation sites, transportation and emergency shelters all contribute to persons with disabilities having two to four times higher risk of death and injury due to climate emergencies such as heatwaves, hurricanes and floods (P. Stein et al., 2023). Disabilities are diverse and intersect with other social dimensions, leading to differentiated vulnerability situations, knowledges and capacities (Kosanic et al., 2022). Some persons with disabilities are particularly exposed to UV radiation or heat stress, others particularly exposed to infections and diseases, while many are reliant for their well-being on medication or medical equipment prone to disruption during climatic events (Likumbo et al., 2021; Nyamu, 2020;

Tambala-Kaliati et al., 2021; United Nations International Strategy for Disaster Reduction, 2023).

Local climate finance approaches hold the potential to address climate change in ways that enhance nexus outcomes through action that specifically provides for the inclusion of persons with disabilities. Various mechanisms are emerging to channel finance for adaptation and climate resilient development to local levels, placing social justice and ecosystem stewardship at the centre of interventions (IPCC, 2022, 2023; Rahman et al., 2023; Simpson et al., 2023; Soanes et al., 2021), such as through environmental management, livelihood diversification and ecosystems-based adaptation (Songwe et al., 2022). Channelling at least 70% of funding to local levels of governance, such finance focuses on holistic, locally contextualized measures to support climate-resilient people and landscapes and can be convergent with nexus approaches. For example, the Least Developed Countries Initiative for Effective Adaptation and Resilience (LIFE-AR) Partnership Compact encompasses 16 least developed countries and developed countries, under which Uganda has developed a devolved climate finance mechanism (DCF Alliance, 2019; IIED, 2022; LIFE-AR, 2019). In Uganda, climate actions are implemented through existing local structures for planning, involving locally elected representatives of persons with disabilities. Another example of local climate finance is Kenya's 'Financing Locally-Led Climate Action' programme that channels \$250 million in funding (Adeniyi, 2023; Arnold & Soikan, 2021; The World Bank, 2021a). Participatory planning is implemented through climate committees that include membership by persons with disabilities, youth and women (Arnold & Soikan, 2021; The World Bank, 2021b, 2021a).

Uganda and Kenya exemplify that climate finance can open up arenas of engagement, such as local climate action committees, to more diverse actors. Financial and economic response options crucially influence inclusivity of decision-making processes (Bracking & Leffel, 2021; Mfitumukiza et al., 2020; Omari-Motsumi et al., 2019) in intersecting arenas of engagement (e.g., political arenas of development policy-making and ecological arenas of natural resource management for forests, water and agriculture). Improvements in social justice across social groups have been observed where persons with disabilities have been given central expert roles within disaster risk reduction planning. The lived experience of disability foregrounds interdependence between people and with nature, places deep relations and values across nexus elements at the centre of action and strengthens collective resilience (Abbott & Porter, 2013; S. Chaudhary et al., 2018; Görgens & Ziervogel, 2019; Ingstad & Grut, 2007; Kosanic et al., 2023; Pertiwi et al., 2022). However, the success of disability-inclusive climate action will depend on shifts in attitudes towards persons with disabilities. Ensuring meaningful participation in practice in arenas where they engage in decision-making requires meeting venues, capacity building and delivery of information, inputs and aid that are accessible to persons with physical and cognitive disabilities and visual and hearing impairments (Ingstad & Grut, 2007; NUDIPU, 2022; P. Stein et al., 2023; Yore et al., 2023).

6.3.3.3 Building sustainability coalitions and initiatives

Numerous sustainability coalitions and initiatives have proliferated in the financial sector over the last decade, indicative of deepening and expanding financial arenas of engagement, such as the Networking for Greening the Financial System, the Coalition for Climate

Resilient Investment, and the Natural Capital and the Social and Human Capital Coalition (McDermott et al., 2022). These rapidly evolving financial arenas of engagement highlight growing interest in blending public and private finance to support sustainability transitions, with new initiatives that are being led or championed by diverse and non-traditional actors such as central bankers, finance ministers, institutional investors, asset managers and broad international coalitions. While these coalitions may in theory provide opportunities for more ethical and just governance of finance for nexus-related goals, there remains insufficient evidence thus far and their success will require an architecture of governance and reporting. Some global civil society and activist actors are more skeptical and have called for a highly cautious approach to blended finance and public-private partnerships, arguing that these approaches tend to socialize losses and privatize gains (Third World Network, 2021) and that previous experiences of such partnerships have promised false solutions through greenwashing or unverified benefits (Friends of the Earth International, 2022; Global Forest Coalition, 2022).

Nonetheless, blended sustainability finance is now increasingly seen as a solution. Thus, it is critical in this context that policymakers and governance institutions understand the demands (or gains) that must be met to satisfy the sources of such capital and be equipped to deal with the potential impacts of volatile markets and turbulent events. Blended capital plays different roles in the complex political and economic drivers that undermine the protection and stewardship of ecosystems and biodiversity, through perverse subsidies, tax avoidance and evasion, and driving ecosystem and biodiversity loss (Bigger et al., 2021; Dempsey et al., 2022; Galaz Rodriguez & Collste, 2022; Galaz et al., 2018). As an example, (Galaz et al., 2018) found that the institutions financing the top ten deforestation-driving companies in the Brazilian Amazon through equity and credit also have significant ownership in sectors connected to the sustainability of the Amazon and boreal forests through their investments in ESG indices. This challenging set of drivers of negative financial flows and practices is compounded by the prevalence and extent of illegal and illicit flows of finance and associated criminal activities (Section 6.2.3.3, **Box 6.6**).

6.3.3.4 Safeguards, accountability, standards, regulation and reporting

For many investors, ESG reporting is synonymous with sustainable investing, although as highlighted in Section 6.2.2.2 it is only one point on a spectrum of sustainability strategies, many of which may have more stringent demands. There are however limitations in metrics defining ESG, as ESG rating providers are almost all private sector-led initiatives (Eaglesham, J., 2022), and the current absence of regulation and standards within ESG investments risks opportunities for positive impacts (Crona et al., 2021). There is a growing portfolio of sustainable investment initiatives (including ESG investments and green bonds) over the past 5 years with assessment tools, benchmarks and actions/commitments, e.g., the Climate Action 100+, World Benchmarking Alliance's Nature Benchmark, and the Taskforce on Nature-related Financial Disclosures (TNFD). Central banks are also beginning to evaluate the economic, financial and reputational vulnerability of banks to biodiversity and nature-related risks (**Box 6.3**), and driving policy discussions on the links between nature and financial practices in the Netherlands (Kingdom of the), Malaysia and Brazil (Calice et al., 2021; van Toor et al., 2020; World Bank & Bank Negara Malaysia (BNM), 2022). A

systematic stock-taking will be critical to understand what policies and which governance mechanisms are effective.

Various studies have identified potential enablers for transformative finance, including the need for multi-level transparency, safeguard and accountability mechanisms (Crona et al., 2021; Galaz et al., 2018). (Muller & Robins, 2022) propose four distinct levers for financial institutions to support a ‘just nature transition’ at the interface of climate change and biodiversity: 1) strategy and leadership to embed a just transition in corporate strategies; 2) corporate engagement to integrate the just transition in their equity and debt engagement with business, requiring disclosure and performance in line with global standards; 3) capital allocation to companies that are committed to positive social impact and delivery of climate and biodiversity goals; and 4) public sector engagement with governments and advocacy for finance priorities towards a just transition.

Pension funds, private equity firms, commercial banks, multilateral development banks, insurance companies, financial regulators, central banks and shareholders are centrally placed actors whose decisions within diverse economic and financial arenas shape markets in ways that have deep impacts on nature. Hence, they all have agency to affect change, and many can enable others to act in nature-positive ways (Galaz Rodriguez & Collste, 2022). For example, during the UNFCCC COP26 in Glasgow in 2021, over 30 asset managers with more than \$8.7 trillion in assets pledged to tackle agricultural commodity-driven deforestation. However, there is still a systematic lack of policies within these financial institutions relating to engagement in deforestation risks (Bakhtary et al., 2020), and monitoring is required to establish the extent to which different initiatives and pledges are meeting their responsibility towards sustainable and just futures.

Still other studies have called for more drastic actions to move beyond market-based and voluntary efforts to build “strong state and multilateral action to regulate and redirect those flows of biodiversity and community-degrading finance, and a reasserted emphasis on shoring up public and multilateral institutions capable of rectifying past and present global inequalities” (Bigger et al., 2021). A just and sustainable transformation will require financial institutions and financing decisions to include people and nature across the nexus elements, account for environmental justice, and in particular address systemic risks to IPLC (Fisher et al., 2018; Galaz Rodriguez & Collste, 2022; Gupta et al., 2023; Perry, 2021; Third World Network, 2021). Other studies have highlighted that biodiversity and nexus financing cannot be truly transformative without addressing some of the fundamental deficits of a growth-based economy. Similarly, (Gupta et al., 2023) posit that just transformations will necessarily have to challenge power politics, which are often based on vested interests, and the economics of cost-effectiveness and cost-recovery principles. As such, transformations in financing and institutions would have to place people and nature, not profits, at the center of decisions.

6.3.3.5 Enabling transformative change in the financial system and development pathways

There is limited but emerging evidence of how governance structures and practices and response options can enable just nature transitions, that is, transitions in land, water and

ecosystems as intersecting with other system transitions. Scholarship is expanding regarding sustainability finance, as well as regarding the constraints that the current financial system poses to sustainability transitions and societal transformation. There is increasing policy and research attention paid to action within the financial system required to support just transitions to net-zero and resilient societies (Robins, 2020). However, more research is needed regarding the transformations of the financial system required to accelerate interconnected system transitions (Steffen & Schmidt, 2021). There is emerging evidence that collaboration between private and public actors along with civil society is important in enabling systemic change. For example, in a study of finance actors in Sweden, (Nykqvist & Maltais, 2022) find that transition in finance requires intervention from government actors, such as in implementing CO₂ taxes, in order to mitigate risk. Similarly, involvement of civil society, and public and private actors together is required to shift finance systems towards supporting food system transitions (Diaz-Bonilla et al., 2023; UNEP, 2023c). An enhanced transformational focus including system-level constraints, rather than only a general increase in investments, is required to foster larger scale changes, changes in the policy and economic environments, and more systemic societal transformations (Xu & Gallagher, 2022). (Huybrechts et al., 2019) argue that a systemic and power-sensitive approach can help shift the individualistic economic framings that often dominate in green microfinance, and hence enable this mechanism to effectively contribute to transformations to sustainability.

Transformational development that addresses all nexus elements would comprise interactions between different systems transitions and be embedded within and manifest in the outcomes of development pathways that yield positive and synergistic outcomes. Siloed approaches towards system transitions that are carried out with little consideration of social justice and deeper societal transformation, such as urban system transitions focusing primarily on greening or energy transitions that only focus on shifting to low carbon sources, can contribute to dispossession, gentrification and other processes of exclusion (Cucca et al., 2023; C. Stein & McKendry, 2023; Tirado-Herrero & Fuller, 2021). In contrast, embedding system transitions in justice provides opportunities for deeper structural transformations to advance ecosystem integrity and human-well-being goals, such as through centering transitions among the poor, shifting governance systems, collaborative urban planning and combining greening of cities with social housing policies (Cucca et al., 2023; C. Stein & McKendry, 2023; Tirado-Herrero & Fuller, 2021; Ulsrud et al., 2018).

New ways of knowing and inclusion of diverse values and interests have been found to contribute to the governance of both urban and rural sustainability transitions and societal transformation. For example, the city can be seen as a knowledge-technology arena in and of itself, where experimentation takes place, driving change across energy, water, industrial, infrastructural, urban and ecological systems (Cashmore, 2018; Cashmore et al., 2018; Simpson et al., 2023; Solecki et al., 2018; Ürges-Vorsatz et al., 2018). Space for contestations over visions for the future and diverse interests, in particular the inclusion of groups that are often marginalized in such debates, are seen as important for building collective resilience and sustainability and leveraging equity to enable system transitions and transformational development pathways (S. H. Eriksen, 2022; Görgens & Ziervogel, 2019; Nightingale et al., 2020; Roberts et al., 2020; Solecki et al., 2018; Ziervogel et al., 2022).

Enabling transformative change in the financial system and prevailing development pathways is hampered by illegal flows of finance and environmental crime that drive unjust and unsustainable development, with severe negative outcomes for nexus elements (Section 6.2.3.3). Enablers that address the root causes and drivers of these practices expose and address inequity, poverty and environmentally unsustainable practices. These complex interactions are examined in **Box 6.16** focusing on rhino poaching in southern Africa to reveal complex interconnections between rural development, biodiversity and other nexus elements. This case study identifies key lessons that inform transformational development pathways.

Box 6.16. Enabling transformative change using nexus approaches to tackle rhino poaching in southern Africa

Conservation and rural development imperatives are difficult to reconcile, despite long-standing community-based conservation efforts in southern Africa (Child & Barnes, 2010; Cock & Fig, 2000; Galvin et al., 2018; Heffernan, 2022; Nelson et al., 2021b; Neumann, 2002; Salerno et al., 2021). These efforts reveal relevant lessons for nexus governance to transform coupled conservation-development pathways to address the economic and financing challenges (Child, 2008b, 2008a; Fabricius et al., n.d.; Madden & McQuinn, 2014; Maxwell et al., 2020; M. Meyer & Börner, 2022; Rodary, 2009):

- Maintain a diverse and flexible range of livelihood options, recognizing the comparative advantage of wildlife over conventional livestock monocultures in southern Africa, especially in dryland settings.
- Maintain or improve the productive potential of the resource base, recognizing the comparative economic advantage of wildlife often outweighs financial disadvantages.
- Develop robust local institutions and governance that devolve resource rights to local people and internalize wildlife costs and benefits locally so that people are incentivized to act as wildlife custodians, while promoting community norms and customs along with gender equity and the voice of disadvantaged groups.
- Improve compliance and enforcement through enabling formal and informal institutions at and beyond the local level.
- Build community-based capabilities with appropriate support to enable local people to exercise their rights effectively.
- Promote authentic rural democratization, including local choice and accountability, to enable inclusive community-based conservation.
- Institutionalize social learning, experimentation, and innovation to support fit-for-purpose diffusion of local lessons across southern Africa.

Translating these lessons into practice is fraught, as revealed by the rhino poaching crisis that has swept southern Africa in recent years. Much poaching and wildlife trade is driven by transnational organized criminal networks. Wildlife and forest crime is valued at about \$7-23 billion/year– the fourth most lucrative transnational crime after trafficking in narcotics, humans, and armaments (Environmental Investigation Agency, 2021; Milliken, 2014). Over 7.5 tonnes of rhino horn were seized between 2012 and 2021, and gross illicit income from wholesale trade in raw rhino horn in this period was \$874-1,130 million (Wildlife Justice

Commission, 2022). Poaching has decimated rhino populations (Ferreira et al., 2015; Nhleko et al., 2022), with losses likely under-estimated (Shrader, 2022).

Rhino conservation efforts have been refocused to counter poaching and deadly threats to conservators. The poaching onslaught and militarized response is described as a ‘war’ (Hanks, 2015; Jooste & Park, 2022; Rademeyer, 2012) that may be unwinnable (Rademeyer, 2018). Some argue that militarized anti-poaching is the most effective strategy to prevent rhino extinction (Gustafson et al., 2018). Others counter that many African national parks have normalized the use of deadly violence and human rights abuses in defence of biodiversity (Neumann, 2004). The paradox of ‘green violence’ is seldom recognized (Büscher & Ramutsindela, 2015). Over-simplistic framing of the drivers of poaching coupled with militarized anti-poaching hamper well-intentioned conservation and community development efforts (Anneck & Masubelele, 2016; Hübschle, 2017; Massé, 2019).

Poverty and inequity, dismal opportunities, and livelihood fragility ‘push’ young men into poaching (Lunstrum et al., 2023), while neoliberalized conservation negatively impacts local communities (Holmes & Cavanagh, 2016b). Some advocate for ‘legal and sustainably harvested’ rhino horn (Ferreira et al., 2014), while others argue that legal trade in rhino horn will not halt the crisis (Crookes & Blignaut, 2015). Luxury tourism as a solution has limits and contradictions (Koot, 2021). Rhino bonds (Section 6.2.6.2) can be an important mechanism for securing funds for rhino conservation but fail to address the drivers of poaching.

The drivers of wildlife crime are complex, systemic, and intertwined. Extreme poverty and inequity, and the erosion of community values and norms, are coupled with unemployment, exclusion from the formal economy, low education levels, inadequate public services, and a breakdown in family and community life and traditional institutions. The social cost of conservation crime to rural communities and the political economy are immense (Minnaar & Herbig, 2018) and compounded by the resilience of illegal activities and criminal networks (Ayling, 2013). Many poached animals and abandoned offspring suffer terribly, and conservation needs to preserve species *and* the quality of animal life (Sekar & Shiller, 2020). Hence, the need for holistic or nexus approaches (Schmitz et al., 2017). These approaches go beyond transferring financial benefits to local communities, as they also advance development goals like justice, equity, and human rights and account for nature’s intrinsic value. Translating the above lessons into practice involves working across arenas of engagement in inclusive and deliberative ways to address the root causes and drivers of poverty, inequity, and environmental crime like rhino poaching.

6.3.3.6 The role of values in enabling transformative societal change

Enablers of transformation can not only embed sustainability into processes, structures, practices, values and worldviews but also foster synergistic interactions across biodiversity, water, food, health and climate change. Yet business-as-usual development exacerbates nexus challenges by promoting value systems that facilitate separation of people and nature, inequitable finance flows and political economy, growth economies, harmful incentives, individualism and self-sufficiency, and even criminality (IPBES, 2022a). Prevailing development pathways often exacerbate social divides through siloed responses, policy

fragmentation and negative trade-offs. More transformational development involves bold and early choices which can be unlocked by shifting value systems towards sustainability-aligned values (Horcea-Milcu et al., 2019; Ives et al., 2020; McAlpine et al., 2015; Woiwode et al., 2021). Such value shifts can help facilitate the restructuring of financial flows, incentives and the political economy, mainstream sustainability and justice into processes, structures and practices, create opportunities for system transitions, restore land and resource rights to IPLC and support higher order nexus relationships.

Understanding diverse values is critical to inform and transform the current economic and financial system, as people's values and value systems (worldviews, ethics and other cultural/religious values and norms) frame and influence the character of the political economy and financial systems in which they operate (IPBES, 2022a). They originate from diverse knowledge systems, languages, cultural practices and norms, and perspectives about human-nature relations. Worldviews influence foundational values (such as prosperity, freedom, justice, health, responsibility, stewardship or beauty) and provide guiding principles on ways of living, such as prosperity being related to financial wealth (as in much of current society), or instead as access and ability to look after land. For example, IPLC value systems that acknowledge the diversity and complexity of people-nature connections are unique and different than the predominant Western values and value systems (IPBES, 2022a) (see **Section 1.2.1** and **Figure 1.4**).

The IPBES Values Assessment identified three main categories of specific values: intrinsic (values of natural entities as ends in and of themselves), relational (value of meaningful relations between people and natural entities as well as among people through nature), and instrumental (value of natural entities as a means to human ends or to satisfy human preferences). The idea of life frames (living from, in, with and as nature) also assists in understanding how people value nature. Across these values, different indicators can be used to measure and value nature and nature's contributions to people across biophysical, socio-cultural and monetary indicators using different method families: nature-based, behaviour-based, statement-based and integrated methods (IPBES, 2022a). The IPBES Values Assessment concluded that in current decision-making a narrow range of marketed instrumental values of nature is primarily used, often at the expense of other instrumental values as well as intrinsic and relational values of nature which do not appear in market transactions. This has resulted in skewed financial mechanisms that focus on the production of commodities for enhancing utilitarian values while often ignoring or devaluing the contributions of natural systems (IPBES, 2019; TEEB, 2015, 2018; TEEB for Business Coalition, 2013). The assessment called for acknowledging pluralistic values and valuation techniques, including those associated with Indigenous worldviews and knowledge systems. Pluralistic values can show where monetary framing could be replaced by other investments, such as in time, in exchange of work, in care or in other types of support, which is often the case for IPLC, where social dedication to the care of the elderly and the underprivileged is not measured in terms of money but is a reflection of a relevant value for the sustainability of that society.

The assessment of potential future post-growth scenarios (Section 6.3.2) reveals a range of parameters for aligning economic and trade systems with different environmental, societal and cultural well-being values (A. Martin et al., 2022). These range from open and closed

natural resource flow strategies (e.g., 'spaceship' living and self-sufficiency) to governance structures that integrate various levels and combinations of cultural, natural and societal values in their resource trade and economic systems. Enablers for inclusive, equitable and sustainable actions in post-growth realities rely on the integration of multiple worldviews and values in decision-making (including intrinsic and relational values), and collaborative learning that bridges diverse knowledge systems, from ILK to technological innovation, to revitalizing cultural landscapes, traditional practices and intricate human-nature relationships.

6.4 Knowledge gaps and data constraints

Biodiversity data, alongside knowledge and monitoring of nexus interlinkages, is essential in re-directing finance, in particular private finance (e.g., for NbS (IADB, 2019)). However, it is a substantial challenge to capture the full range of interactions and trade-offs across the nexus associated with financial decisions, as it requires collating information from public institutions, private citizens and corporate actors. This collation, in turn, is contingent upon responsible collection. While international standards have been developed for biophysical ecosystem extent and condition accounts, and ecosystem service and use accounts under the UN System of Environmental Economic Accounts, these tend to be applied at a national level. They may help identify needs for investment in ecosystems and provide a framework for monitoring, but such frameworks do not yet exist to support investments at a smaller scale. Key remaining data gaps include:

- Aggregated data on national-level spending on biodiversity and the nexus, including aggregate spending on different response options across the nexus
- Metrics and/or methods that enable comparison of the quality and quantity of finance for biodiversity and the nexus, for example, finding a common denominator that allows comparative analysis. This includes approaches for monitoring and evaluation of budget performance across different sectors using metrics that account for nexus interactions and outcomes

Understanding the risks of current economic and financial decision-making, and of inaction, also remains a gap. As this chapter has noted, there have been key advances in modelling potentials for physical, transition and reputation risks for both central banks and financial institutions as well as private companies. Key information areas that remain needed include:

- Comprehensive valuation of the damages of prevailing economic systems to biodiversity and other nexus elements
- Information and improved understanding of subsidies that have the potential to harm other nexus elements or trade-off against other response options
- Information on the costs of inaction in monetised terms (e.g., USD) arising from negative impacts (losses/damages) to nature and society
- Studies to improve understanding of the risks from siloed governance and development for the financial system

- Studies to gain a better understanding about direct and indirect drivers of illegal/illicit activities that impact biodiversity and the nexus (e.g., poaching, illegal fishing, illegal mining)

To close these data gaps, the Taskforce for Nature Related Financial Disclosure has launched a Nature-Related Data Catalyst (TNFD, 2021), which aims to help provide high-quality, trusted, decision-useful information and data on nature-related risks and opportunities. Likewise, the European Union is sponsoring projects such as the Align project which aims to co-develop recommendations for a standard on biodiversity measurements and valuation (*Align Project - Recommendations for a Standard on Corporate Biodiversity Measurement and Valuation* | *Knowledge for Policy*, n.d.). However, any new data standards will require institutional support for measurements to be accurate, as well as equally and fairly distributed across the globe (Schmeller et al., 2017). Moreover, it is essential to consistently evaluate the impact of these financing decisions on biodiversity outcomes through impact assessments.

Another important gap exists in accurately and consistently assessing and understanding the impacts of investments, both from the public and private sectors, towards biodiversity, health, water and other nexus elements, both individually and integratively. To date, current global financial assessments have measured investments in nature differently, some focusing on biodiversity, others on climate change, without any consistent approach (e.g., State of Finance for Nature reports by the UNEP, and others). There is a need to develop consistent methodologies to precisely measure these investments in nature. Furthermore, more research is required to understand the ways in which transformations of the financial system can accelerate interconnected system transitions. Key gaps include:

- Studies on how to integrate nexus benefits in financial decision-making and asset pricing, including how to scale-up and amplify public-private investment and financing in synergistic outcomes among nexus elements
- Studies to improve understanding of barriers and enablers for establishing robust regulatory systems and appropriate instruments to enable financing with nexus-wide benefits
- Innovative tools to improve understanding of the barriers and enablers for realizing the transformative potential of nexus-positive financial mechanisms, including consideration of both monetary and non-monetary values in nexus investment and financing
- Empirical evidence and understanding of the scale and distribution of financial flows impacting nexus elements and interlinkages among them, including invisible / unreported financial flows in the Global South.
- Studies to improve understanding of finance mechanisms that enable system transitions

Currently, despite the increasing use of impact evaluation methods and techniques in biodiversity (Wauchope et al., 2021) (e.g., impact evaluations on different deforestation-preventing mechanisms (Börner et al., 2020)), the evaluation of corporate financing volumes

and instruments is still nascent, and is often based on modelled impacts on biodiversity (Finance and Biodiversity Community & Finance for Biodiversity Foundation, 2022; Waldron et al., 2017). Evidence and knowledge on the role of business in spearheading nexus response options and reducing existing trade-offs remains low. Moreover, identifying causal effects remains a challenge (zu Ermgassen et al., 2023). Future evaluations should incorporate actual impacts, improve information from the marine realm, and include a wider set of financing mechanisms in assessments (e.g., impacts of green bonds). Key gaps include:

- Case studies of implementation of financial response options that have nexus-wide benefits, for example, removal of fossil fuel subsidies
- Evidence / scenarios on the impact of financial system transformations (with regard to changing values like short termism, or increasing fiduciary duties beyond shareholders) on nature and equity
- Studies of the spatial distribution of drivers of sustainable investments/ disinvestments and the impacts on biodiversity and the other nexus elements, including their ability to reduce inefficiencies in resource management and outcomes
- Improved knowledge on the nexus benefits of anti-tax evasion measures and initiatives to improve governance/ transparency of offshore financial centres

6.5 Conclusions

This assessment shows the urgency of shifting away from current trajectories leading to declining outcomes across biodiversity, water, food, health and climate change. It also shows the instrumental role of the financial system in engendering a shift towards more sustainable development pathways. Enabling transformative, just and interconnected response options is urgent because current trajectories are closing down opportunities for sustainable development outcomes for current and future generations (**Figure 6.11**).

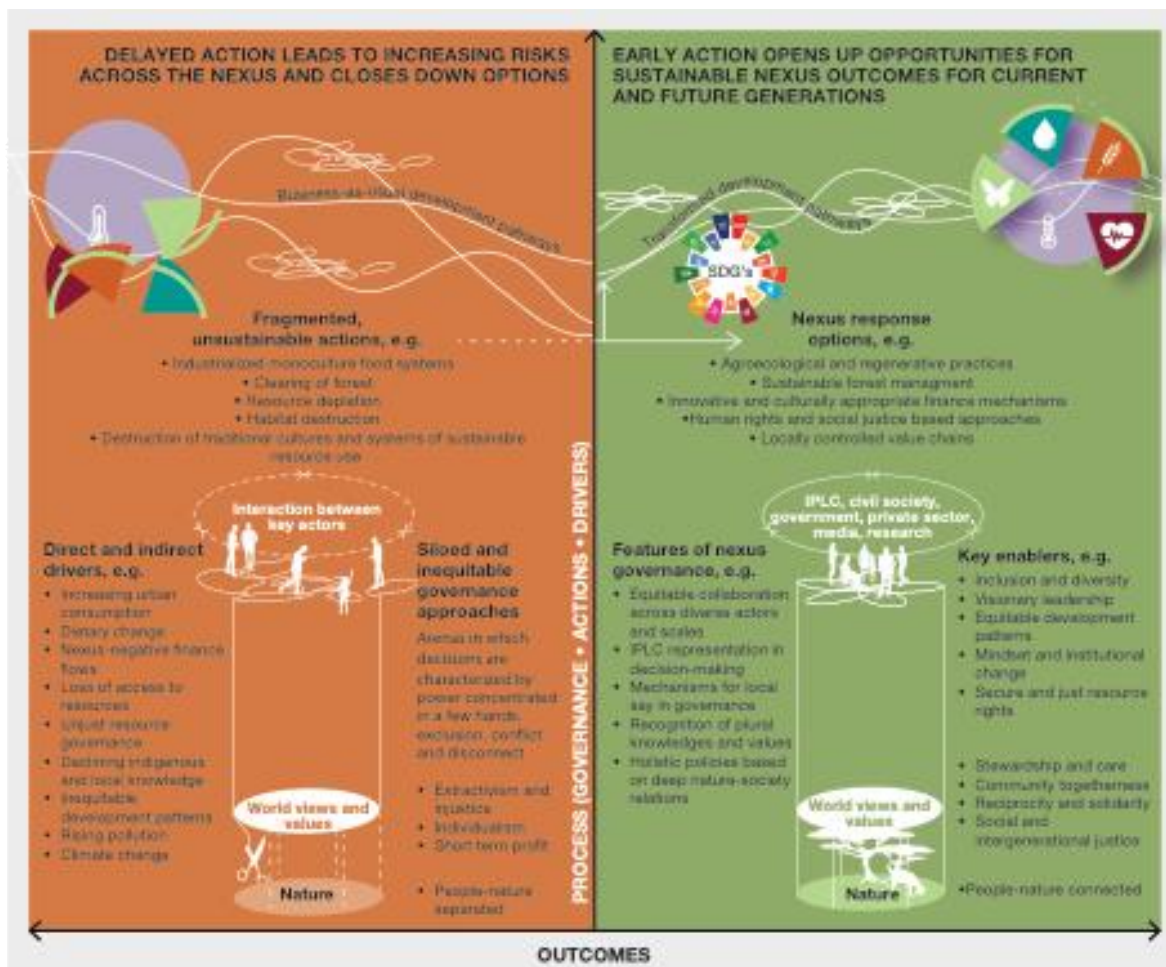


Figure 6.11. Transformative, interconnected and just response options are urgently needed. The left panel exemplifies (from the bottom to the top) people-nature separation and values underpinning siloed and inequitable governance approaches. Such governance interacts with drivers of change and fragmented, unsustainable actions to produce negative trends, adverse outcomes and increasing risks across the nexus elements that together constrain future response options. The right panel exemplifies (from the bottom to the top) people-nature connected and related values and worldviews that underpin nexus governance and equitable response options. Such transformative values, governance and response options can advance nexus interlinkages and outcomes and enable human well-being and planetary health.

Prevailing financial and economic flows represent unsustainable nature-society-economy relationships that lead to decision-making approaches that create unjust social and environmental externalities (Section 6.1). They also entrench systems (industrial, urban and infrastructure, energy, land, water and ecosystems, as well as societal systems) that produce harmful outcomes for biodiversity, water, food, health and climate change. The large investments in, and incentives and subsidies for, activities that adversely impact the state of nature across the nexus elements also combine with the existing gaps in finance for biodiversity and other nexus elements (Section 6.2). Increasing risks resulting from decline in these nexus elements as well as increasing debt burdens further serve to prevent more positive investments in nature, increase the cost of future response options, and create

vulnerabilities to systemic financial risks. Business-as-usual interactions are bound by the prevailing political economy and the structures and processes that privilege the few with power and influence over the needs, interests and freedoms of communities and collectives from the local to global level. Moreover, business-as-usual ignores the intrinsic and relational values of nature. The result is pervasive injustice and inequity in the flow and distribution of money and resources. As such, business-as-usual interactions and development pathways run counter to nexus outcomes.

However, a reformed financial system can be pivotal in shifting views, structures and practices for transformative societal change. Just, interconnected and transformative actions, such as shifts toward nature-people connectedness and drawing on diverse worldviews like IPLC perspectives of community-nature togetherness, can counter the prevailing disconnect that underpins extractivist and unsustainable resource use. Transformed finance flows – which consider impacts across nexus elements – can drive system transitions, with improved nexus decision-making processes and outcomes iteratively shifting society towards more transformational development pathways. Diverse and inclusive economic and financial arenas of engagement are key to shaping interactions between governance actors and the direction of resulting development pathways. Including diverse knowledges, strengthening deliberative and inclusive processes, understanding the long-term costs of inaction, combatting environmental crime, and supporting plural visions and pathways for transformative change are thus critical to addressing power imbalances and inequities.

Transforming financial and economic arenas of engagement through the values, goals, interactions and governance taking place within them can drive transformative change across all arenas in society and address the underlying drivers perpetuating business-as-usual unsustainable development pathways. Transformational change across economic and financial arenas necessitates enabling interactions among governance actors that privilege collective (public) over individual (private) interests; system-wide synergies over sector- or compartmentalized interests; the long-term (including future generations) over the short-term; human-in-nature connections over anthropocentrism; and justice and equity over privilege and domination. Transformation of the political economy and economic and financial systems is therefore urgent and compelling, and all governance actors have a role to play in enabling transformative change.

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