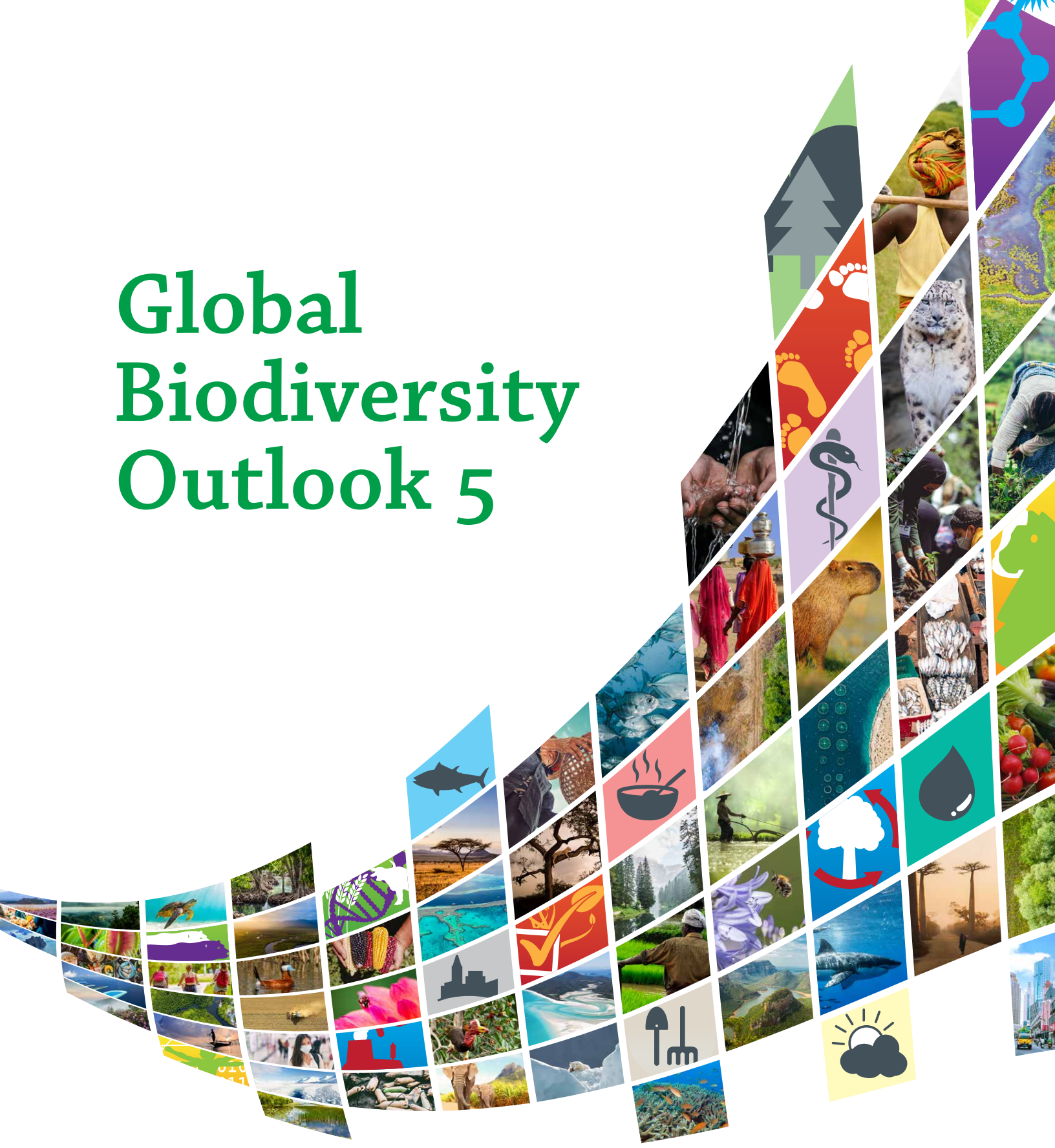
Global Biodiversity Outlook 5



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Convention on Biological Diversity

2011-2020 United Nations Decade on Biodiversity

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Forewords

Last year, United Nations Member States called for a decade of ambitious action to accelerate progress towards the achievement of the Sustainable Development Goals: 10 years to realize our shared vision to end poverty, rescue the planet and build a peaceful world for all people. Stepping up action to safeguard and restore biodiversity – the living fabric of our planet and the foundation of human life and prosperity – is an essential part of this collective effort.

During the United Nations Decade on Biodiversity 2011-2020, countries have worked to address many of the causes of biodiversity loss. However, those efforts have not been sufficient to meet most of the Aichi Biodiversity Targets established in 2010. Much greater ambition is needed.

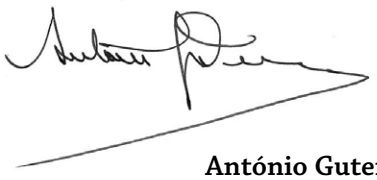
This ***Outlook*** identifies a number of transitions that will be required to set us on a path to achieve the 2050 Vision for Biodiversity. Living in harmony with nature will involve a shift in our thinking so that biodiversity is recognized as an essential element of sustainable development.

The traumatic impact of the COVID-19 pandemic holds important lessons regarding our response to the biodiversity crisis. On one hand, it has provided a shocking demonstration of the link between our treatment of the living world and the emergence of human diseases.

On the other hand, the response of governments and people around the world has demonstrated society's capacity to take previously unimaginable steps, involving huge transformations, solidarity and multilateral effort in the face of an urgent common threat. As we emerge from the immediate impacts of the pandemic, we have an unprecedented opportunity to incorporate the transitions outlined in this Outlook to put the world on track to achieve the 2050 Vision for Biodiversity.

Part of this new agenda must be to tackle the twin global challenges of climate change and biodiversity loss in a more coordinated manner, with the understanding that climate change threatens to undermine all efforts to conserve and sustainably manage biodiversity and that nature itself offers some of the most effective solutions to avert the worst impacts of a warming planet.

The detailed analysis in this Outlook shows us clearly what can and must be done within this decade of action to transform our relationship with nature in support of our broader aims for humanity and the planet. Let us seize this opportunity together.



António Guterres
Secretary-General, United Nations

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Biodiversity, and the services it provides, are essential to human wellbeing, but it has long been in decline. This is why, ten years ago, the international community adopted the Strategic Plan for Biodiversity 2011-2020. The mission of the plan, and its Aichi Biodiversity Targets, was to halt biodiversity loss and ensure that ecosystems continued to provide essential services.

Governments and wider society have acted to address the biodiversity crisis. Some nations have made much progress. However, as this edition of the Global Biodiversity Outlook demonstrates, we have not met the Aichi Biodiversity Targets. We are not on track for the 2050 Vision for Biodiversity. We are seeing the consequences of nature's decline in the COVID-19 pandemic.

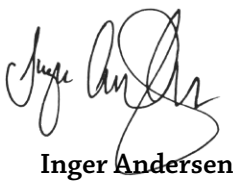
Now, we must accelerate and scale-up collaboration for nature-positive outcomes – conserving, restoring and using biodiversity fairly and sustainably. If we do not, biodiversity will continue to buckle under the weight of land- and sea-use change, overexploitation, climate change, pollution and invasive alien species. This will further damage human health, economies and societies – with particularly detrimental effects on indigenous peoples and local communities.

This Outlook provides clear evidence that can inform policy-making and guide an agenda for action. It spells out transitions that can create a society living in harmony with nature: in how we use land and forests, organize our agriculture and food supply systems, manage fisheries, use water, manage urban environments and tackle climate change.

The report contains many examples that show how the right policies can bring positive outcomes. For example, where fisheries have been regulated and reported, abundance of stocks has improved. Where coordinated action has been taken to slow deforestation, habitat loss has been controlled. Ecosystem restoration, when implemented effectively and with the support of local populations, has reversed decades of degradation of biodiversity.

To knit the global response together, the international community will soon adopt a post-2020 global biodiversity framework. In the framework, we need ambitious, clear and common targets for a nature-positive world. We need financing, capacity development, transparency and accountability. We need buy in from the sectors and groups – government, business and finance – that drive biodiversity loss.

We know what needs to be done, what works and how we can achieve good results. If we build on what has already been achieved, and place biodiversity at the heart of all our policies and decisions – including in COVID-19 recovery packages – we can ensure a better future for our societies and the planet. This Outlook is an important tool in making this vision a reality.



Inger Andersen
United Nations Under-Secretary-General and Executive Director of the UN Environment Programme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Over the ten years since the adoption of the Strategic Plan for Biodiversity 2011-2020, governments and wider society have taken significant action on many levels to address the biodiversity crisis. These actions have had meaningful impacts, and this edition of the Global Biodiversity Outlook demonstrates that the status of biodiversity would have certainly been worse without such action. However, as the Outlook also clearly demonstrates, we have not met the Aichi Biodiversity Targets, nor are we on track to reach the 2050 Vision for Biodiversity.

As we prepare for a new Global Biodiversity Framework to guide actions over the next decades, we must recommit to the Vision adopted in Nagoya in 2010, recognizing that it remains as valid as ever within the broader aspirations embodied in the Sustainable Development Goals. It also remains achievable, but only if we respond to the compelling evidence now available regarding the transformative change required.

Three key lessons emerge from this Outlook with regard to the actions that countries must take to achieve the original objectives of the Convention on Biological Diversity, more than a quarter of a century after they were adopted by the global community.

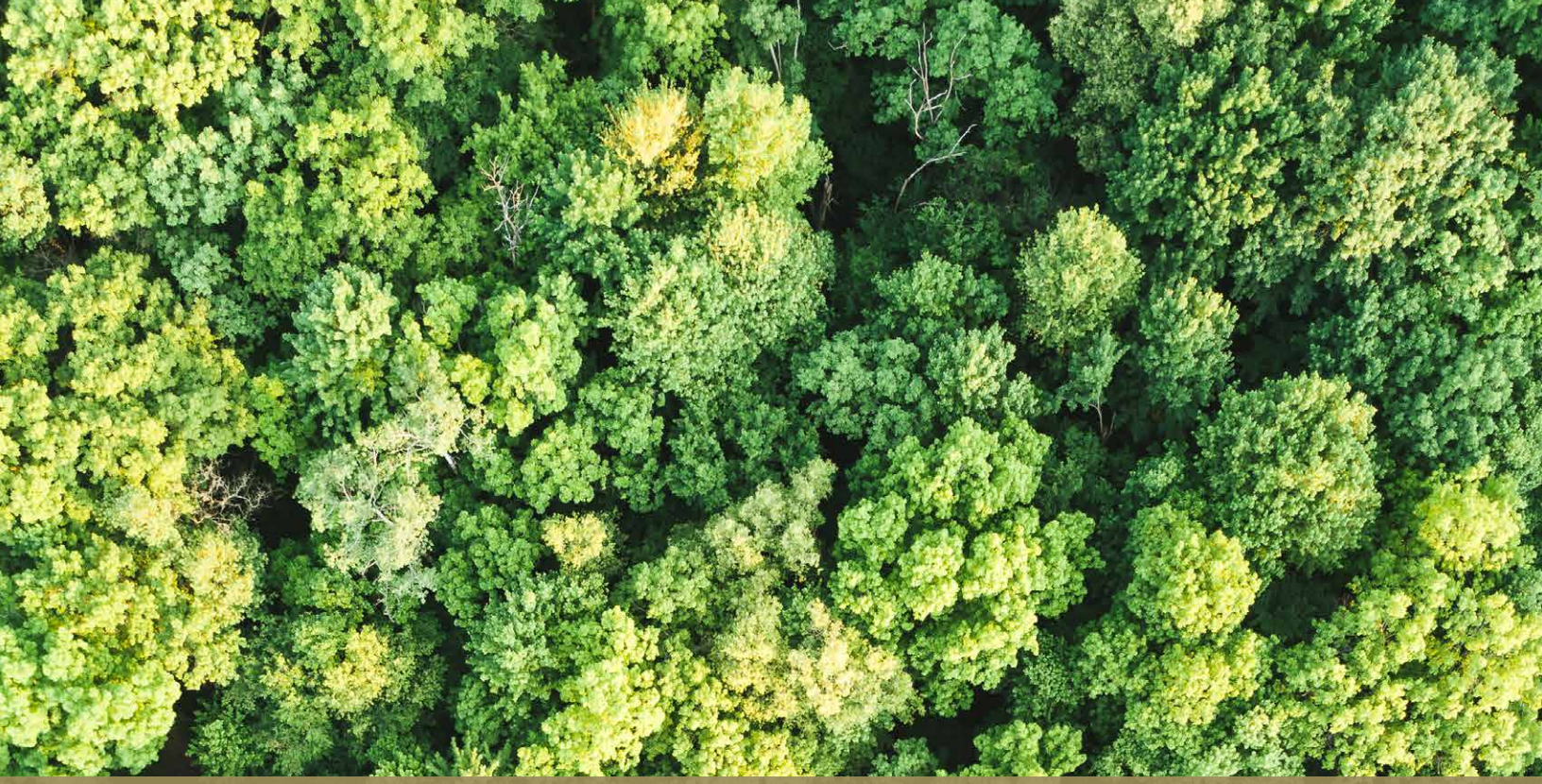
First, governments will need to scale up national ambitions in support of the new Global Biodiversity Framework and ensure that all necessary resources are mobilized and the enabling environment strengthened. Analysis of the sixth national reports reveals that few countries succeeded in meeting national targets with the same scope and ambition as the Aichi Biodiversity Targets agreed at the global level.

Second, countries will need to redouble efforts to bring biodiversity into the mainstream of decision making, recognizing that the pressures threatening nature and its contributions to people can only be eased if biodiversity is explicitly factored into policies across the whole of government and among all economic sectors.

Finally, this Outlook offers positive and compelling messages about working with nature to address the multiple challenges of achieving sustainable development, slowing climate change and reversing biodiversity loss. It also points to the range of transitions that are needed in every aspect of people's interface with nature. There are incipient examples of these transitions taking root around the world, but they need to be further built on, scaled up and nurtured.

As we emerge from the COVID-19 crisis, the world is looking for hope that a better greener future can follow in the face of this shocking reminder of the dependency of human societies on a healthy planet to support healthy lives. The decisions facing us at the next UN Biodiversity Conference offer an opportunity to start on the road of building that better greener and sustainable future. Let us make the commitments and take the necessary actions to make our shared Vision a reality.

Elizabeth Maruma Mrema
United Nations Assistant Secretary-General
and Executive Secretary of the Convention
on Biological Diversity



Summary for Policy Makers

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OVERVIEW

Humanity stands at a crossroads with regard to the legacy it leaves to future generations. Biodiversity is declining at an unprecedented rate, and the pressures driving this decline are intensifying. None of the Aichi Biodiversity Targets will be fully met, in turn threatening the achievement of the Sustainable Development Goals and undermining efforts to address climate change. The COVID-19 pandemic has further highlighted the importance of the relationship between people and nature, and it reminds us all of the profound consequences to our own well-being and survival that can result from continued biodiversity loss and the degradation of ecosystems.

Nevertheless, reports provided by the world's governments, as well as other sources of evidence, reveal examples of progress which, if scaled up, could support the transformative changes necessary to achieve the 2050 vision of living in harmony with nature. A number of transitions pointing the way to the type of changes required are already in evidence, albeit in limited areas of activity. Examining how such incipient transitions can be replicated and built on, will be critical to using the short window available to make the collective vision of living in harmony with nature a reality.

Options are available to the global community that could simultaneously halt and ultimately reverse biodiversity loss, limit climate change and improve the capacity to adapt to it and meet other goals such as improved food security.

These pathways to a sustainable future rely on recognizing that bold, interdependent actions are needed across a number of fronts, each of which is necessary and none of which is sufficient on its own. This mix of actions includes greatly stepping up efforts to conserve and restore biodiversity, addressing climate change in ways that limit global temperature rise without imposing unintended additional pressures on biodiversity, and transforming the way in which we produce, consume and trade goods and services, most particularly food, that rely on and have an impact on biodiversity.

Navigating the available pathways to the 2050 vision involves consideration of all the multiple aspects of our relationship with nature and the importance we attach to it. Solutions need to seek an integrated approach that simultaneously address the conservation of the planet's genetic diversity, species and ecosystems, the capacity of nature to deliver material benefits to human societies, and the less tangible but highly-valued connections with nature that help to define our identities, cultures and beliefs.

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INTRODUCTION

The strategy agreed in 2010 to guide global action during the United Nations Decade on Biodiversity 2011-2020 recognized the need to address the underlying drivers that influence the direct pressures on biodiversity. The failure to tackle these underlying causes of biodiversity loss had been spelled out in the third edition of the *Global Biodiversity Outlook* as one of the factors resulting in the missing of the first global biodiversity target in 2010. Building on this analysis, the Strategic Plan for Biodiversity 2011-2020 structured the 20 Aichi Biodiversity Targets around five Strategic Goals, setting benchmarks for improvements across drivers, pressures, the state of biodiversity, the benefits derived from it and the implementation of relevant policies and enabling conditions.

The Strategic Plan for Biodiversity, formally adopted by Governments through the Convention on Biological Diversity and endorsed by other biodiversity-related conventions, was intended as a global framework for all sections of society – and its success would depend on bringing about change among a wide range of sectors and stakeholders whose decisions and actions have an impact on biodiversity.

The mid-term review of the Strategic Plan for Biodiversity 2011-2020 carried out in the fourth edition of the *Global Biodiversity Outlook* in 2014 concluded that while progress was evident for the majority of the Aichi Biodiversity Targets, at that time, it was not sufficient for the achievement of the targets by 2020. The fourth edition of the Outlook outlined potential actions in each of the target areas that, if advanced, could still result in the achievement of the goals and targets of the Strategic Plan.

Biodiversity is critical to both the 2030 Agenda for Sustainable Development and the Paris Agreement under the United Nations Framework Convention on Climate Change, each adopted in 2015. For example, around one third of the net reductions in greenhouse gas emissions required to meet the Paris Agreement's goals could come from 'nature-based solutions'. The Aichi Biodiversity Targets are reflected directly in many of the targets within the Sustainable Development Goals (SDGs). Biodiversity is explicitly highlighted in SDGs 14 (Life Below Water) and 15 (Life on Land), but also underpins a much wider set of Goals. For example, it is a key factor for the achievement of food security and improved nutrition (SDG 2) and the provision of clean water (SDG 6). All food systems depend on biodiversity and a broad range of ecosystem services that support agricultural productivity, for example through pollination, pest control and soil fertility. Healthy ecosystems also underpin delivery of water supplies and water quality, and guard against water-related hazards and disasters. The conservation and sustainable use of biodiversity may therefore be regarded as foundational to the whole 2030 Agenda.

Conversely, the achievement of the Sustainable Development Goals contributes to the conservation and sustainable use of biodiversity. For example, some Goals address the drivers of biodiversity loss, such as climate change (SDG 13), pollution (SDGs 6, 12 and 14) and overexploitation (SDGs 6, 12, 14 and 15). Others address unsustainable production and consumption, the efficient use of natural resources and reducing food waste (SDG 12). The Goals also support the underlying conditions for addressing biodiversity loss, by helping to build the necessary institutions and human capital (SDGs 3, 4. 16), enhancing gender equity (Goal 5) and reducing inequalities (SDG 10). While some potential trade-offs exist between reaching the objectives of the Convention on Biological Diversity (CBD) and attaining some of the Sustainable Development Goals, these can be avoided or minimized through coherent and integrated decision making.

PROGRESS ACHIEVED IN IMPLEMENTING THE STRATEGIC PLAN FOR BIODIVERSITY 2011-2020

The global summary of progress towards the Aichi Biodiversity Targets is based on a range of indicators, research studies and assessments (in particular the IPBES Global Assessment on

Biodiversity and Ecosystem Services), as well as the national reports provided by countries on their implementation of the CBD. The national reports provide rich information about the steps taken in countries worldwide in support of biodiversity conservation, sustainable use, and the fair and equitable sharing of benefits. This body of information provides a wealth of information on the successes and challenges in implementing the Strategic Pan for Biodiversity 2011-2020 and in reaching the Aichi Biodiversity Targets.

At the global level none of the 20 targets have been fully achieved, though six targets have been partially achieved (Targets 9, 11, 16, 17, 19 and 20). Examining the 60 specific elements of the Aichi Biodiversity Targets, seven have been achieved and 38 show progress. Thirteen elements show no progress or indicate a move away from the target, and for two elements the level of progress is unknown. The table on the following pages provides an overview of the progress made towards each of the 20 Aichi Biodiversity Targets.

The overall picture from the national reports provided by countries is also one of progress, but again at levels generally insufficient to achieve the Aichi Biodiversity Targets. On average, countries report that more than a third of all national targets are on track to be met (34%) or exceeded (3%). For another half of the national targets (51%), progress is being made but not at a rate that will allow the targets to be met. Only 11% of national targets show no significant progress, and 1% are moving in the wrong direction. However national targets are generally poorly aligned with the Aichi Biodiversity Targets, in terms of scope and the level of ambition. Fewer than a quarter (23%) of the targets are well aligned with the Aichi Targets and only about a tenth of all national targets are both similar to the Aichi Biodiversity Targets, and on track to be met. Progress is reported to have been greatest towards the national targets related to Aichi Biodiversity Targets 1, 11, 16, 17 and 19. The information from the national reports therefore suggests that there have been gaps in both the level of ambition of the commitments of countries to address the Aichi Biodiversity Targets nationally, as well as in the actions to reach these commitments.

The information in the national reports is broadly consistent with an indicator-based analysis at global level. While indicators relating to policies and actions in support of biodiversity (responses) show overwhelmingly positive trends, those relating to the drivers of biodiversity loss, and to the current state of biodiversity itself, mostly show significantly worsening trends.

Despite the limited achievement globally of the Aichi Biodiversity Targets, this Outlook has documented important examples in which actions in support of the goals and targets of the Strategic Plan for Biodiversity 2011-2020 have generated successful outcomes. Ten areas showing particular progress in the past decade can be highlighted.

Relating to the underlying causes of biodiversity loss (Goal A):

- Almost 100 countries have incorporated biodiversity values into national accounting systems (Target 2).

Relating to the direct pressures on biodiversity (Goal B):

- The rate of deforestation has fallen globally by about a third compared to the previous decade (Target 5).
- Where good fisheries management policies have been introduced, involving stock assessments, catch limits, and enforcement, the abundance of marine fish stocks has been maintained or rebuilt (Target 6).
- There have been an increasing number of successful cases of eradication of invasive alien species from islands, and of the targeting of priority species and pathways to avoid future invasive species introductions (Target 9).

Relating to the status of biodiversity (Goal C):

- There has been significant expansion of the protected area estate, increasing over the 2000-2020 period from about 10% to at least 15% terrestrially, and from about 3% to at least 7% in marine areas. The protection of areas of particular

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importance for biodiversity (key biodiversity areas) has also increased from 29% to 44% over the same time period (Target 11).

- Recent conservation actions have reduced the number of extinctions through a range of measures, including protected areas, hunting restrictions, the control of invasive alien species, *ex situ* conservation and re-introduction. Without such actions, extinctions of birds and mammals in the past decade would likely have been two to four times higher (Target 12).

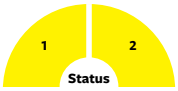
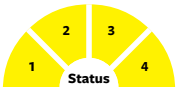
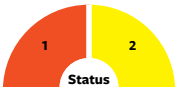
Relating to measures enabling implementation of the Strategic Plan for Biodiversity 2011-2020 (Goal E):

- The Nagoya Protocol on Access to Genetic Resources and the Fair and Equitable Sharing of Benefits Arising from their Utilization has come into force and is now fully operational in at least 87 countries and internationally (Target 16).
- National biodiversity strategies and action plans (NBSAPs) have been updated in line with the Strategic Plan for Biodiversity 2011-2020 by 170 countries, 85% of CBD Parties (Target 17).
- There has been a substantial increase in the data and information on biodiversity available to citizens, researchers and policy makers, including through the efforts of citizen science (Target 19).
- Financial resources available for biodiversity through international flows have doubled (Target 20).

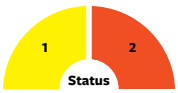
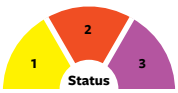
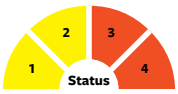
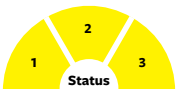
The experiences over the last decade of implementing the Strategic Plan for Biodiversity provide lessons relevant to the development of the post-2020 global biodiversity framework and in the implementation of the Convention more generally. They include:

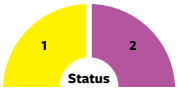
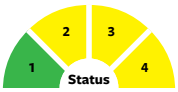
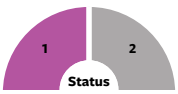
- The need for still greater efforts to address the direct and indirect drivers of biodiversity loss, including through integrated and holistic approaches to planning and implementation, and greater interaction among government ministries, economic sectors and society generally.
- The need to strengthen further the integration of gender, the role of indigenous peoples and local communities and the level of stakeholder engagement.
- The need to strengthen national biodiversity strategies and action plans, and associated planning processes, including their adoption as whole-of-government policy instruments.
- The need for well-designed goals and targets formulated with clear, and, simple language, and with quantitative elements (i.e. according to 'SMART' criteria).
- The need to reduce time lags in planning and implementation of biodiversity strategies and action plans, and to account for unavoidable time lags in implementation.
- The need for increased ambition of national commitments, and for the regular and effective review of national activities.
- The need for learning and adaptive management, including through greater efforts to facilitate technical and scientific cooperation, and to understand the reasons for the effectiveness or otherwise of policy measures.
- The need for greater attention to implementation, and sustained and targeted support to countries.

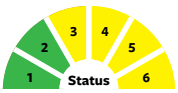
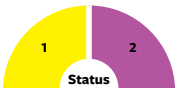
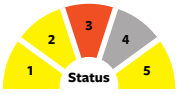
Assessment of progress towards the 20 Aichi Biodiversity Targets[1]

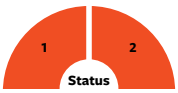
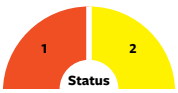
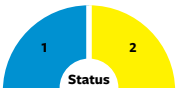
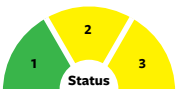
AICHI BIODIVERSITY TARGET	ASSESSMENT OF PROGRESS	SUMMARY OF PROGRESS
 By 2020, at the latest, people are aware of the values of biodiversity (**1**) and the steps they can take to conserve and use it sustainably (**2**).		There has been an apparent increase in the past decade in the proportion of people who have heard of biodiversity and who understand the concept. Understanding of biodiversity appears to be increasing more rapidly among younger people. A recent survey suggested that more than one third of people in the most biodiverse countries have high awareness both of the values of biodiversity and the steps required for its conservation and sustainable use. ***The target has not been achieved*** (low confidence).
 By 2020, at the latest, biodiversity values have been integrated into national and local development and poverty reduction strategies (**1**) and planning processes (**2**) and are being incorporated into national accounting (**3**), as appropriate, and reporting systems (**4**).		Many countries report examples of incorporating biodiversity into various planning and development processes. There has been a steady upward trend of countries incorporating biodiversity values into national accounting and reporting systems. At the same time, there is less evidence that biodiversity has been truly integrated into development and poverty reduction planning as required by the target. ***The target has not been achieved*** (medium confidence).
 By 2020, at the latest, incentives, including subsidies, harmful to biodiversity are eliminated, phased out or reformed in order to minimize or avoid negative impacts (**1**), and positive incentives for the conservation and sustainable use of biodiversity are developed and applied (**2**), consistent and in harmony with the Convention and other relevant international obligations, taking into account national socio economic conditions.		Overall, little progress has been made over the past decade in eliminating, phasing out or reforming subsidies and other incentives potentially harmful to biodiversity, and in developing positive incentives for biodiversity conservation and sustainable use. Relatively few countries have taken steps even to identify incentives that harm biodiversity, and harmful subsidies far outweigh positive incentives in areas such as fisheries and the control of deforestation. ***The target has not been achieved*** (medium confidence).

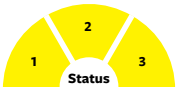
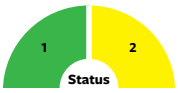
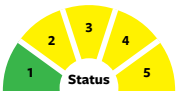
1. Assessment of progress towards the 20 Aichi Biodiversity Targets and the elements contained in their wording. The progress towards each element has been depicted graphically in the half circle icons in the table. Each segment represents an element, and the number of the segment corresponds to the number shown in parentheses in the wording of each target. Blue indicates that the element has been exceeded, green indicates the element has been or is likely to be achieved by 2020, yellow indicates that progress has been made towards the element but that it has not been achieved, red indicates no significant change in the element, and purple indicates that the trends are moving away from achieving the element. In cases where the element could not be assessed, the segment is grey. For an Aichi Target to be achieved overall, all of the segments would be blue or green. A target is assessed as partially achieved when at least one of its elements has been achieved. If none of the elements has been achieved, the Aichi Target is assessed as not achieved. The confidence levels are explained in endnotes referred to in each target summary in Part II of the full report.

AICHI BIODIVERSITY TARGET	ASSESSMENT OF PROGRESS	SUMMARY OF PROGRESS
By 2020, at the latest, Governments, business and stakeholders at all levels have taken steps to achieve or have implemented plans for sustainable production and consumption (**1**) and have kept the impacts of use of natural resources well within safe ecological limits (**2**).		While an increasing number of governments and businesses are developing plans for more sustainable production and consumption, these are not being implemented on a scale that eliminates the negative impact of unsustainable human activities on biodiversity. While natural resources are being used more efficiently, the aggregated demand for resources continues to increase, and therefore the impacts of their use remain well above safe ecological limits. ***The target has not been achieved*** (high confidence).
By 2020, the rate of loss of all natural habitats (**2**), including forests (**1**), is at least halved and where feasible brought close to zero, and degradation and fragmentation is significantly reduced (**3**).		The recent rate of deforestation is lower than that of the previous decade, but only by about one third, and deforestation may be accelerating again in some areas. Loss, degradation and fragmentation of habitats remains high in forest and other biomes, especially in the most biodiversity-rich ecosystems in tropical regions. Wilderness areas and global wetlands continue to decline. Fragmentation of rivers remains a critical threat to freshwater biodiversity. ***The target has not been achieved*** (high confidence).
By 2020 all fish and invertebrate stocks and aquatic plants are managed and harvested sustainably (**1**), legally and applying ecosystem based approaches, so that overfishing is avoided, recovery plans and measures are in place for all depleted species (**2**), fisheries have no significant adverse impacts on threatened species and vulnerable ecosystems (**3**) and the impacts of fisheries on stocks, species and ecosystems are within safe ecological limits (**4**).		While there has been substantial progress towards this target in some countries and regions, a third of marine fish stocks are overfished, a higher proportion than ten years ago. Many fisheries are still causing unsustainable levels of bycatch of non-target species and are damaging marine habitats. ***The target has not been achieved*** (high confidence).
By 2020 areas under agriculture (**1**), aquaculture (**2**) and forestry (**3**) are managed sustainably, ensuring conservation of biodiversity.		There has been a substantial expansion of efforts to promote sustainable agriculture, forestry and aquaculture over recent years, including through farmer-led agroecological approaches. The use of fertilizers and pesticides has stabilized globally, though at high levels. Despite such progress, biodiversity continues to decline in landscapes used to produce food and timber; and food and agricultural production remains among the main drivers of global biodiversity loss. ***The target has not been achieved*** (high confidence).

AICHI BIODIVERSITY TARGET	ASSESSMENT OF PROGRESS	SUMMARY OF PROGRESS
By 2020, pollution (**1**), including from excess nutrients (**2**), has been brought to levels that are not detrimental to ecosystem function and biodiversity.		Pollution, including from excess nutrients, pesticides, plastics and other waste, continues to be a major driver of biodiversity loss. Despite increasing efforts to improve the use of fertilizers, nutrient levels continue to be detrimental to ecosystem function and biodiversity. Plastic pollution is accumulating in the oceans, with severe impacts on marine ecosystems, and in other ecosystems with still largely unknown implications. Actions taken in many countries to minimize plastic waste have not been sufficient to reduce this source of pollution. ***The target has not been achieved*** (medium confidence).
By 2020, invasive alien species (**1**) and pathways (**2**) are identified and prioritized, priority species are controlled or eradicated (**3**) and measures are in place to manage pathways (**4**) to prevent their introduction and establishment.		Good progress has been made during the past decade on identifying and prioritizing invasive alien species in terms of the risk they present, as well as in the feasibility of managing them. Successful programmes to eradicate invasive alien species, especially invasive mammals on islands, have benefited native species. However, these successes represent only a small proportion of all occurrences of invasive species. There is no evidence of a slowing down in the number of new introductions of alien species. ***The target has been partially achieved*** (medium confidence).
By 2015, the multiple anthropogenic pressures on coral reefs (**1**), and other vulnerable ecosystems (**2**) impacted by climate change or ocean acidification are minimized, so as to maintain their integrity and functioning.		Multiple threats continue to affect coral reefs and other vulnerable ecosystems impacted by climate change and ocean acidification. Overfishing, nutrient pollution and coastal development compound the effects of coral bleaching. Corals have shown the most rapid increase in extinction risk of all assessed groups. Hard coral cover has declined significantly in some regions, and there has been a shift towards coral species less able to support diverse reef habitats. Other ecosystems especially in mountains and polar regions have experienced significant impacts from climate change, compounded by other pressures. ***The target was missed by the stated date of 2015, and it has not been achieved by 2020*** (high confidence).

AICHI BIODIVERSITY TARGET	ASSESSMENT OF PROGRESS	SUMMARY OF PROGRESS
 By 2020, at least 17 per cent of terrestrial and inland water areas (**1**) and 10 per cent of coastal and marine areas (**2**), especially areas of particular importance for biodiversity and ecosystem services (**3**), are conserved through effectively and equitably managed (**4**), ecologically representative (**5**) and well-connected systems of protected areas and other effective area-based conservation measures, and integrated into the wider landscape and seascape (**6**)		The proportion of the planet's land and oceans designated as protected areas is likely to reach the targets for 2020 and may be exceeded when other effective area-based conservation measures and future national commitments are taken into account. However, progress has been more modest in ensuring that protected areas safeguard the most important areas for biodiversity, are ecologically representative, connected to one another as well as to the wider landscape and seascape and are equitably and effectively managed. ***The target has been partially achieved*** (high confidence).
 By 2020 the extinction of known threatened species has been prevented (**1**) and their conservation status, particularly of those most in decline, has been improved and sustained (**2**).		Species continue to move, on average, closer to extinction. However, the number of extinctions of birds and mammals would likely have been at least two to four times higher without conservation actions over the past decade. Among well-assessed taxonomic groups, nearly one quarter (23.7%) of species are threatened with extinction unless the drivers of biodiversity loss are drastically reduced, with an estimated total of one million threatened species across all groups. Wild animal populations have fallen by more than two-thirds since 1970, and have continued to decline since 2010. ***The target has not been achieved*** (high confidence).
 By 2020, the genetic diversity of cultivated plants (**1**) and farmed and domesticated animals (**2**) and of wild relatives (**3**), including other socio-economically as well as culturally valuable species (**4**), is maintained, and strategies have been developed and implemented for minimizing genetic erosion and safeguarding their genetic diversity (**5**).		Genetic diversity of cultivated plants, farmed and domesticated animals, and wild relatives, continues to be eroded. The wild relatives of important food crops are poorly represented in *ex situ* seed banks that help guarantee their conservation, important for future food security. The proportion of livestock breeds that are at risk or extinct is increasing, although at a slower rate than in earlier years, suggesting some progress in preventing the decline of traditional breeds. Wild relatives of farmed birds and mammals are moving closer to extinction. ***The target has not been achieved*** (medium confidence).

AICHI BIODIVERSITY TARGET	ASSESSMENT OF PROGRESS	SUMMARY OF PROGRESS
 By 2020, ecosystems that provide essential services, including services related to water, and contribute to health, livelihoods and well-being, are restored and safeguarded (**1**), taking into account the needs of women, indigenous and local communities, and the poor and vulnerable. (**2**)		The capacity of ecosystems to provide the essential services on which societies depend continues to decline, and consequently, most ecosystem services (nature's contributions to people) are in decline. In general, poor and vulnerable communities, as well as women, are disproportionately affected by this decline. Mammal and bird species responsible for pollination are on average moving closer to extinction, as are species used for food and medicine. ***The target has not been achieved*** (medium confidence).
 By 2020, ecosystem resilience and the contribution of biodiversity to carbon stocks has been enhanced, through conservation and restoration (**1**), including restoration of at least 15 per cent of degraded ecosystems (**2**), thereby contributing to climate change mitigation and adaptation and to combatting desertification.		Progress towards the target of restoring 15 per cent of degraded ecosystems by 2020 is limited. Nevertheless, ambitious restoration programmes are under way or proposed in many regions, with the potential to deliver significant gains in ecosystem resilience and preservation of carbon stocks. ***The target has not been achieved*** (medium confidence).
 By 2015, the Nagoya Protocol on Access to Genetic Resources and the Fair and Equitable Sharing of Benefits Arising from their Utilization is in force (**1**) and operational, consistent with national legislation (**2**).		The Nagoya Protocol on Access to Genetic Resources and the Fair and Equitable Sharing of Benefits Arising from their Utilization entered into force on 12 October 2014. As of July 2020, 126 Parties to the CBD have ratified the Protocol and 87 of them have put in place national access and benefit sharing measures, as well as establishing competent national authorities. The Protocol can be considered operational. ***The target has been partially achieved*** (high confidence)
 By 2015 each Party has developed (**1**), adopted as a policy instrument (**2**), and has commenced implementing (**3**) an effective, participatory and updated national biodiversity strategy and action plan.		By the December 2015 deadline established in this target, 69 Parties had submitted an NBSAP prepared, revised or updated after the adoption of the Strategic Plan. An additional 101 Parties have since submitted their NBSAP, so that by July 2020, 170 Parties had developed NBSAPs in line with the Strategic Plan. This represents 85% of the Parties to the Convention. However, the extent to which these NBSAPs have been adopted as policy instruments and are being implemented in an effective and participatory manner, is variable. ***The target has been partially achieved*** (high confidence).

AICHI BIODIVERSITY TARGET	ASSESSMENT OF PROGRESS	SUMMARY OF PROGRESS
 By 2020, the traditional knowledge, innovations and practices of indigenous and local communities relevant for the conservation and sustainable use of biodiversity, and their customary use of biological resources, are respected (**1**), subject to national legislation and relevant international obligations, and fully integrated (**2**) and reflected in the implementation of the Convention with the full and effective participation (**3**) of indigenous and local communities, at all relevant levels.		There has been an increase in the recognition of the value of traditional knowledge and customary sustainable use, both in global policy fora and in the scientific community. However, despite progress in some countries, there is limited information indicating that traditional knowledge and customary sustainable use have been widely respected and/or reflected in national legislation related to the implementation of the Convention, or on the extent to which indigenous peoples and local communities are effectively participating in associated processes. ***The target has not been achieved*** (low confidence).
 By 2020, knowledge, the science base and technologies relating to biodiversity, its values, functioning, status and trends, and the consequences of its loss, are improved (**1**), widely shared and transferred, and applied (**2**).		Significant progress has been made since 2010 in the generation, sharing and assessment of knowledge and data on biodiversity, with big-data aggregation, advances in modelling and artificial intelligence opening up new opportunities for improved understanding of the biosphere. However, major imbalances remain in the location and taxonomic focus of studies and monitoring. Information gaps remain in the consequences of biodiversity loss for people, and the application of biodiversity knowledge in decision making is limited. ***The target has been partially achieved*** (medium confidence).
 By 2020, at the latest, the mobilization of financial resources for effectively implementing the Strategic Plan for Biodiversity 2011–2020 from all sources, and in accordance with the consolidated and agreed process in the Strategy for Resource Mobilization, should increase substantially from the current levels. (Specific targets: (**1**) to double international financial flows to developing countries; (**2**) to include biodiversity in national priorities or development plans; (**3**) to report on domestic spending, needs, gaps, priorities; (**4**) to prepare national finance plans and assess the multiple values of biodiversity; and (**5**) to mobilize domestic financial resources.)		There have been increases in domestic resources for biodiversity in some countries, with resources remaining broadly constant for others over the past decade. Financial resources available for biodiversity through international flows and official development assistance have roughly doubled. However, when all sources of biodiversity finance are taken into account, the increase in biodiversity financing would not appear to be sufficient in relation to needs. Moreover, these resources are swamped by support for activities harmful to biodiversity (see Aichi Target 3). Progress on identifying funding needs, gaps and priorities and the development of national financial plans and assessments of biodiversity values has been limited to relatively few countries (see Aichi Target 2). ***The target has been partially achieved*** (high confidence).

FUTURE OUTLOOK

On our current trajectory, biodiversity, and the services it provides, will continue to decline, jeopardizing the achievement of the Sustainable Development Goals. In 'business as usual' scenarios, this trend is projected to continue until 2050 and beyond, due to the increasing impacts of land and sea use change, overexploitation, climate change, pollution and invasive alien species. These pressures are in turn being driven by currently unsustainable patterns of production and consumption, population growth and technological developments. The projected decline in biodiversity will affect all people, but it will have a particularly detrimental effect on indigenous peoples and local communities, and the world's poor and vulnerable, given their reliance on biodiversity for their wellbeing.

Scenarios and pathways to 2050

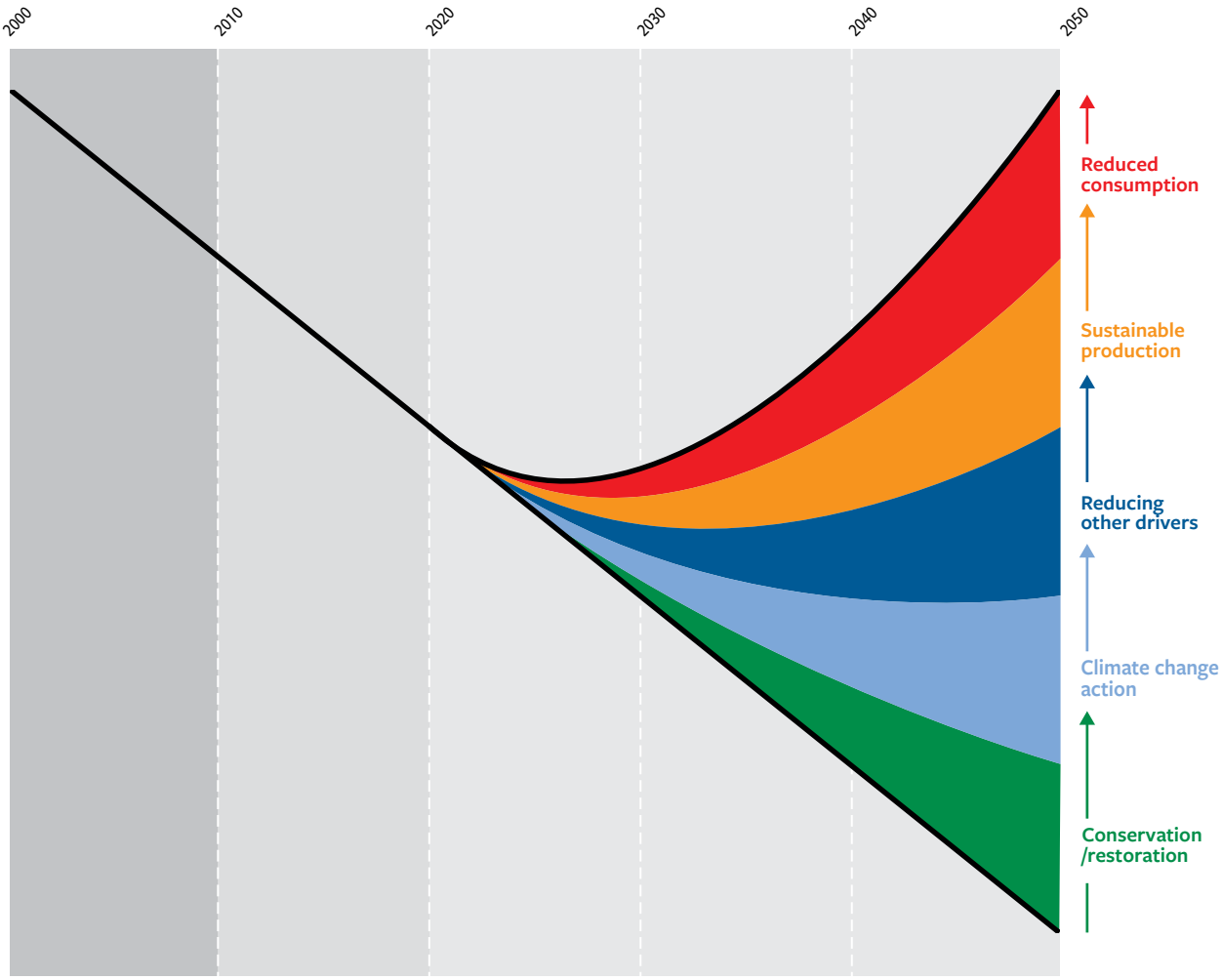
Available evidence suggests that despite the failure to meet the goals of the Strategic Plan for Biodiversity 2011-2020, it is not too late to slow, halt and eventually reverse current trends in the decline of biodiversity. Moreover, the actions required to achieve this turnaround (or 'bending the curve' of biodiversity decline, as it has been termed), are fully consistent with, and indeed crucial components of, the goals and targets set out under the 2030 Agenda for Sustainable Development and the Paris Climate Change Agreement.

In summary, realizing the 2050 Vision for Biodiversity depends on a portfolio of actions in the following areas, each of which is necessary but none on its own sufficient:

- Efforts to conserve and restore biodiversity need to be scaled up at all levels using approaches that will depend on local context. These need to combine major increases in the extent and effectiveness of well-connected protected areas and other effective area-based conservation measures, large-scale restoration of degraded habitats, and improvements in the condition of nature across farmed and urban landscapes as well as inland water bodies, coasts and oceans;
- Efforts to keep climate change well below 2 degrees C and close to 1.5 degrees C above pre-industrial levels are needed to prevent climate impacts from overwhelming all other actions in support of biodiversity. The conservation and restoration of ecosystems can play a substantial role in this. Such 'nature-based solutions' can also be an important part of adaptation to climate change;
- Effective steps need to be taken to address all remaining pressures driving biodiversity loss, including invasive alien species, pollution and the unsustainable exploitation of biodiversity especially in marine and inland water ecosystems;
- Transformations need to be achieved in the production of goods and services, especially food. This will include adopting agricultural methods that can meet growing global demand while imposing fewer negative impacts on the environment, and reducing the pressure to convert more land to production;
- Transformations are similarly needed to limit the demand for increased food production by adopting healthier diets and reducing food waste, and also in limiting the consumption of other material goods and services affecting biodiversity, for example in forestry, energy and provision of fresh water.

Each of these areas of action relies on very substantial changes and innovations, implemented on a short timescale and involving a wide range of actors at all scales and across all sectors of society (see transitions described below). However, even the most intensive efforts in each of these areas will not succeed in 'bending the curve' of biodiversity loss, unless tackled together with the other areas. For example, the most ambitious measures to conserve and restore ecosystems will fail to address biodiversity loss and food security unless equally ambitious steps are taken to sustainably increase agricultural productivity and adopt more sustainable diets. On the other hand, combining actions across all areas will make each of them easier to achieve, due to the connections and synergies between them.

A portfolio of actions to reduce loss and restore biodiversity



Trends in biodiversity (various metrics, left axis) have been declining and are projected to continue to do so under business as usual scenarios (trend line). Various areas of action could reduce the rate of biodiversity decline, and the full portfolio of actions, in combination, could halt and reverse the decline (bend the curve), potentially leading to net biodiversity gains after 2030. These are, from bottom to top: (1) Enhanced conservation and restoration of ecosystems; (2) climate change mitigation; (3) action on pollution, invasive alien species and overexploitation; (4) more sustainable production of goods and services, especially food; and (5) reduced consumption and waste. However, none of the areas of action alone, nor in partial combinations, can bend the curve of biodiversity loss. Moreover, the effectiveness of each area of action is enhanced by the other areas (see Part III of the full report for discussion).

There is no single, 'ideal' pathway towards the 2050 Vision on Biodiversity that applies equally to all regions and all circumstances. Within the essential areas of change outlined above, there are many alternative approaches which will reflect local conditions and priorities. For example, ambitious conservation measures focussed on the protection of large areas of land exclusively for nature may have the greatest impact on the survival of terrestrial species, while equally ambitious approaches that prioritize greener landscapes within farmed and urban environments may result in greater improvements in some of nature's contributions to people. The framework adopted by the global community should be flexible enough to accommodate a variety of conditions and values, while recognizing the consequences of different approaches in terms of outcomes for biodiversity and human societies.

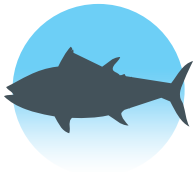
TRANSITIONS TO SUSTAINABLE PATHWAYS

Each of the measures necessary to achieve the 2050 Vision for Biodiversity requires a significant shift away from 'business as usual' across a broad range of human activities. The shape and nature of such transformative change can already be identified through a series of transitions under way to a limited extent in key areas. This Outlook examines the promise, progress and prospects for the following interdependent transitions, that collectively can move societies into a more sustainable co-existence with nature.

Each of these transition areas involves recognizing the value of biodiversity, and enhancing or restoring the functionality of the ecosystems on which all aspects of human activity depend, and at the same time recognizing and reducing the negative impacts of human activity on biodiversity; thus enabling a virtuous cycle – reducing the loss and degradation of biodiversity and enhancing human well-being. The transitions will play out at a range of scales and are interdependent. The transitions are:

The ***land and forests*** transition: conserving intact ecosystems, restoring ecosystems, combatting and reversing degradation, and employing landscape level spatial planning to avoid, reduce and mitigate land-use change. This transition recognizes the essential value of well-conserved habitats for the maintenance of biodiversity and the provision of ecosystem services for the benefit of people, and the need to move to a situation in which maintaining and improving food security no longer involves the large-scale conversion of forests and other ecosystems.

The sustainable ***freshwater*** transition: an integrated approach guaranteeing the water flows required by nature and people, improving water quality, protecting critical habitats, controlling invasive species and safeguarding connectivity to allow the recovery of freshwater systems from mountains to coasts. This transition recognizes the importance of biodiversity in maintaining the multiple roles of freshwater ecosystems to support human societies and natural processes, including linkages with terrestrial, coastal and marine environments.



The sustainable ***fisheries and oceans*** transition: protecting and restoring marine and coastal ecosystems, rebuilding fisheries and managing aquaculture and other uses of the oceans to ensure sustainability, and to enhance food security and livelihoods. This transition recognizes the long-term dependency of marine food supplies and other benefits from the oceans on healthy ecosystems.

The ***sustainable agriculture*** transition: redesigning agricultural systems through agroecological and other innovative approaches to enhance productivity while minimizing negative impacts on biodiversity. This transition recognizes the role of biodiversity, including pollinators, pest and disease control organisms, soil biodiversity and genetic diversity, as well as diversity in the landscape, for productive and resilient agriculture that makes efficient use of land, water and other resources.

Photo by Liubov Ilchuk on Unsplash

The sustainable ***food systems*** transition: enabling sustainable and healthy diets with a greater emphasis on a diversity of foods, mostly plant-based, and more moderate consumption of meat and fish, as well as dramatic cuts in the waste involved in food supply and consumption. This transition recognizes the potential nutritional benefits from diverse foods and food systems, and the need to reduce demand-driven pressures globally while ensuring food security in all its dimensions.

The ***cities and infrastructure*** transition: deploying 'green infrastructure' and making space for nature within built landscapes to improve the health and quality of life for citizens and to reduce the environmental footprint of cities and infrastructure. This transition recognizes the dependency of urban communities on well-functioning ecosystems to sustain the human population, the majority of which is living in cities, the teleconnections between cities and nearby and distant ecosystems, and the importance of spatial planning to reduce the negative impacts on biodiversity of urban expansion, roads and other infrastructure.

The sustainable ***climate action*** transition: employing nature-based solutions, alongside a rapid phase-out of fossil fuel use, to reduce the scale and impacts of climate change, while providing positive benefits for biodiversity and other sustainable development goals. This transition recognizes the role of biodiversity in sustaining the capacity of the biosphere to mitigate climate change through carbon storage and sequestration and in enabling adaptation through resilient ecosystems, as well as the need to promote renewable energy while avoiding negative impacts on biodiversity.

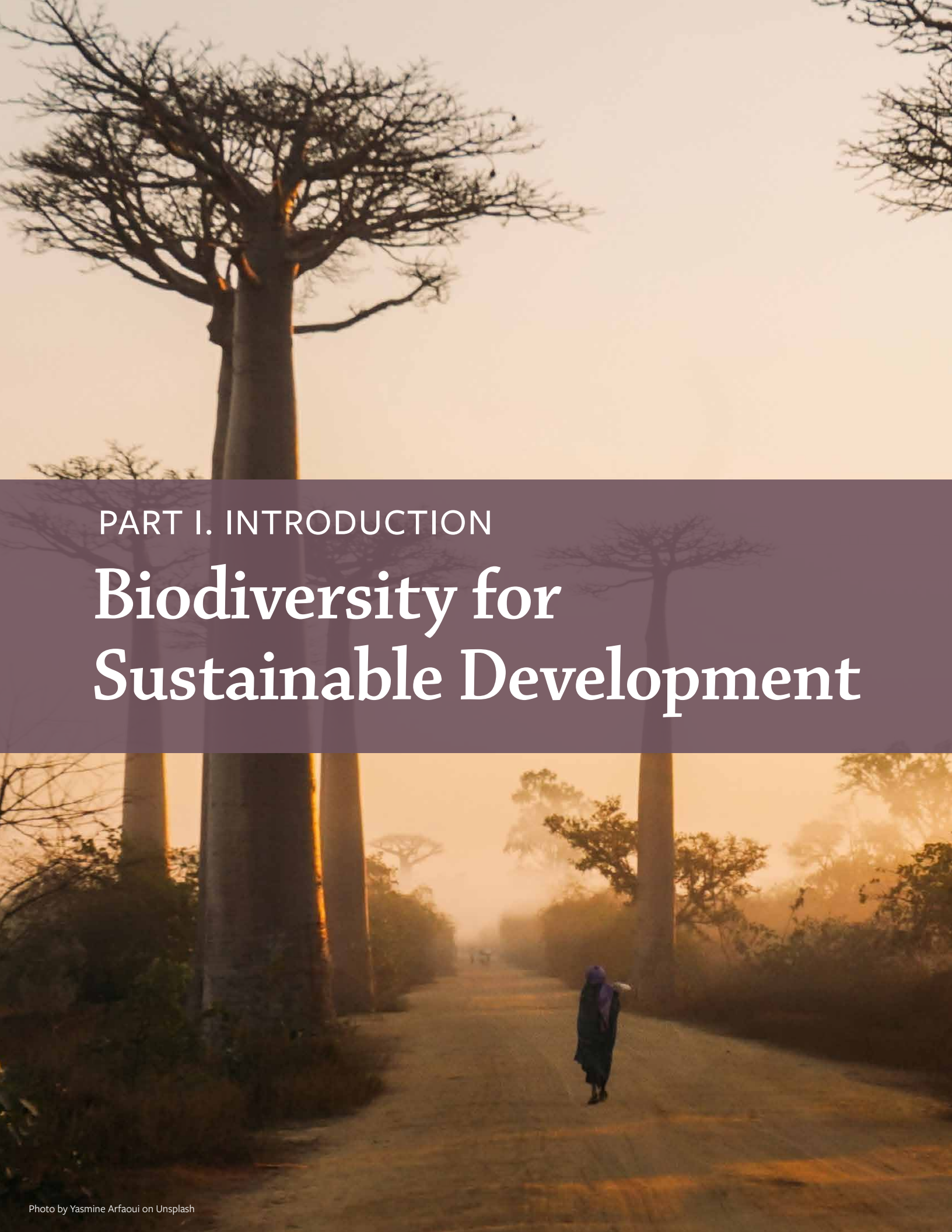
The biodiversity-inclusive ***One Health*** transition: managing ecosystems, including agricultural and urban ecosystems, as well as the use of wildlife, through an integrated approach, to promote healthy ecosystems and healthy people. This transition recognizes the full range of linkages between biodiversity and all aspects of human health, and addresses the common drivers of biodiversity loss, disease risk and ill-health.

Already there are a number of incipient examples of such transitions, which, if scaled up, replicated, and supported by economy-wide measures, could support the transformative changes necessary to achieve the vision of living in harmony with nature by 2050.

A broader approach to sustainability involves better understanding the common factors that can influence fundamental changes in institutions, governance, values and behaviour, essential to bringing about the transitions described in this Outlook. The IPBES Global Assessment has identified eight priority points for intervention, or leverage points (described in detail in Part III of the full report), with five associated 'levers' – incentives and capacity building, coordination across sectors and jurisdictions, pre-emptive action, adaptive decision-making and environmental law and implementation – that may be targeted by leaders in government, business, civil society and academia to spark transformative changes towards a more just and sustainable world.

Finding solutions that address all the varying values we attach to nature is challenging, but the potential rewards are great. As nations evaluate options on how to recover from the COVID-19 pandemic, there is a unique opportunity to initiate the transformative changes needed to achieve the 2050 Vision of living in harmony with nature. Such actions would put biodiversity on a path to recovery, reduce the risk of future pandemics, and produce multiple additional benefits for people.

Photo by Eyoël Kahssay on Unsplash



PART I. INTRODUCTION

Biodiversity for Sustainable Development

Photo by Yasmine Arfaoui on Unsplash

As we enter the third decade of the millennium, humanity stands at a crossroads with regard to the state of global biodiversity, the changes we are witnessing and the legacy we wish to leave to future generations. Evidence in our hands demonstrates the severe, widespread and persistent consequences to people, cultures, economies, the climate and the natural world if we continue along our current paths of behaviour and decisions.

Since the publication of the last Global Biodiversity Outlook, governments have come together around a set of goals for the development of human societies, that combine the wishes we all share for improved well-being of people with the environmental safeguards that will enable such gains to be achieved and sustained into the future. A number of international agreements directly or indirectly addressing issues related to biodiversity, entered into force during this decade[1], including two instruments under the framework of the Convention: the Nagoya Protocol on Access to Genetic Resources and the Fair and Equitable Sharing of Benefits Arising from their Utilization; and the Nagoya - Kuala Lumpur Supplementary Protocol on Liability and Redress. The issue of climate change has increased prominence in global political and economic agendas, and has sparked citizens' action and protests around the world. The time is right for change in our approach to the natural world to take on a similar sense of urgency and priority, and for the inextricable links between human well-being, climate change and biodiversity to be fully understood and acted upon.

The critical role of biodiversity to underpin sustainable development was powerfully reinforced by the Global Assessment of Biodiversity and Ecosystem Services prepared under the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services (IPBES). The overwhelmingly negative trends on the state of species and ecosystems threaten all other goals for the well-being of people and the prosperity of our economies. On the other hand, concerted action addressing *all* direct and indirect causes of biodiversity loss can still slow and eventually reverse current declines, and in doing so support all our goals for humanity.

The COVID-19 pandemic has further highlighted the importance of the relationship between people and nature. We are reminded that when we destroy and degrade biodiversity, we undermine the web of life and increase the risk of disease spillover from wildlife to people. Responses to the pandemic provide a unique opportunity for transformative change as a global community.

This Outlook provides a final assessment of progress towards the current Aichi Biodiversity Targets and draws on the lessons learned during the first two decades of this century to identify the transitions needed to realize the vision agreed by world governments for 2050, 'Living in Harmony with Nature'.

THE STRATEGIC PLAN FOR BIODIVERSITY 2011-2020

In 2010, the third edition of the Biodiversity Outlook (GBO-3) concluded that the target to substantially slow the loss of biodiversity by the end of the first decade of this century had not been met.[2] The analysis carried out for that Outlook demonstrated that while actions around the world had put in place important conservation measures with significant positive impacts on particular species and ecosystems, the main pressures driving biodiversity loss were all still increasing. Indicators of the status and trends of biodiversity demonstrated that the risk of extinction continued to increase across taxonomic groups, and species populations were in decline. It warned that without effective steps to address the origins of those pressures, the planet's ecosystems faced a number of thresholds or tipping points –including widespread dieback of the Amazon through the interaction of deforestation, fire and climate change, the widespread eutrophication of freshwater lakes and other inland water ecosystems due to nutrient pollution, and the collapse of coral reef ecosystems due to the combination and number of interacting global and local pressures. Such risks

seriously threaten the capacity of nature to provide the support for human societies that we take for granted at our peril.

GBO-3 provided the background for the approach taken by the world's governments in agreeing the historic Strategic Plan for Biodiversity 2011-2020, uniting the global community in recognizing the need to address the issue on multiple fronts.[3] The adoption of the plan at the CBD COP 10 meeting in Japan marked the start of the UN Decade on Biodiversity, highlighting the urgency of timely and effective action to achieve a more rational approach to the stewardship of our planet.

The strategy agreed in 2010 comprised five strategic goals and the 20 Aichi Biodiversity Targets, as well as support mechanisms for implementation, monitoring and review, aimed at taking effective and urgent action towards the 2050 Vision on Biodiversity, 'Living in Harmony with Nature'. The Strategic Plan recognized that without progress in reducing the underlying causes of biodiversity loss, policies focussed specifically on conservation were unlikely to overcome those pressures driving its decline. The Aichi Biodiversity Targets therefore focussed not only on the state of biodiversity itself and the pressures affecting it, but also on drivers and responses well beyond the scope of environment ministries, nature protection agencies and conservation organizations. The strategy depended on bringing biodiversity to the heart of decision making on economic development, alleviation of poverty, financial subsidies and incentives, and the way in which goods and services are produced, consumed and traded (Figure 0.1).

In 2014, the fourth edition of the Global Biodiversity Outlook (GBO-4) served as a checkpoint on the way to 2020, the end date for most of the Aichi Biodiversity Targets established under the Strategic Plan.[4] Based on a detailed evaluation of each of the 20 targets, the conclusion was that while the majority were showing movement in the right direction, progress was not sufficient to bring about achievement of the targets by the end of the decade. GBO-4 outlined potential actions in each of the target areas that if stepped up, could still result in achievement of the goals of the Strategic Plan. Importantly, extrapolation of trends at the mid-point of the UN Decade on Biodiversity showed that while responses directly aimed at conservation, sustainable use of biodiversity and equitable sharing of its benefits all suggested good progress by 2020, forecasts were much less positive for indicators of the underlying drivers, direct pressures and the state of biodiversity itself. Part II of this edition of the Outlook updates this analysis, providing a final assessment of progress towards each of the Aichi Biodiversity Targets.

Another important message of GBO-4 was that longer-term achievement of the 2050 Vision was compatible with, and indeed critical to, the priorities for humanity outlined in the Sustainable Development Goals, then still in preparation. In particular, scenarios and models developed for GBO-4 set out a number of pathways that would enable the global community to meet the triple objectives of achieving food security, stabilizing the increase in global temperatures and ending biodiversity loss. All potential routes to that desirable future would, however, involve radical changes or transformations in key sectors of economic activity, most especially those concerning the production and consumption of food.

THE 2030 AGENDA FOR SUSTAINABLE DEVELOPMENT AND LINKS WITH BIODIVERSITY

In September 2015, the United Nations General Assembly adopted a comprehensive plan of action for people, the planet and prosperity. The 2030 Agenda for Sustainable Development, entitled 'Transforming our world', comprises 17 Sustainable Development Goals (SDGs) supported by 169 specific targets.[5] The SDGs are seen as 'integrated and indivisible', that is they are intended to be implemented as a mutually-reinforcing set.

Most of the Aichi Biodiversity Targets are well reflected in the SDGs and related targets.[6] In many cases, the Aichi Biodiversity Targets provided the inspiration for the corresponding targets under the

Figure 0.1. The Strategic Plan for Biodiversity 2011-2020[7]

Vision: Living in harmony with nature where by 2050, biodiversity is valued, conserved, restored and wisely used, maintaining ecosystem services, sustaining a healthy planet and delivering benefits essential for all people.

Mission: Take effective and urgent action to halt the loss of biodiversity in order to ensure that by 2020 ecosystems are resilient and continue to provide essential services, thereby securing the planet's variety of life, and contributing to human well-being, and poverty eradication....

Strategic Goal A

Address the underlying causes of biodiversity loss by mainstreaming biodiversity across government and society

Awareness of biodiversity increased

Biodiversity values integrated

Incentives reformed

Sustainable production and consumption

Strategic Goal B

Reduce the direct pressures on biodiversity and promote sustainable use

Habitat loss halved or reduced

Sustainable management of aquatic living resources

Sustainable agriculture, aquaculture and forestry

Pollution reduced

Invasive alien species prevented and controlled

Ecosystems vulnerable to climate change

Strategic Goal C

Improve the status of biodiversity by safeguarding ecosystems, species and genetic diversity

Protected areas

Reducing risk of extinction

Safeguarding genetic diversity

Strategic Goal D

Enhance the benefits to all from biodiversity and ecosystem services

Ecosystem services

Access to and sharing benefits from genetic resources

Ecosystem restoration and resilience

Strategic Goal E

Enhance the benefits to all from biodiversity and ecosystem services

Biodiversity strategies and action plans

Traditional knowledge

Sharing information and knowledge

Mobilizing resources from all sources

Implementation, Monitoring, Review and Evaluation

- The provision of financial resources
- National biodiversity strategies and action and national and regional targets
- The participation of all relevant stakeholders
- Supported and encouragement of initiatives and activities of indigenous and local communities,
- The Convention's programmes of work

Support Mechanisms

- Capacity-building for effective national action
- Clearing-house mechanism and technology transfer
- Financial resources
- Partnerships and initiatives to enhance cooperation
- Support mechanisms for research, monitoring and assessment

2030 Agenda, reflecting the role of the Convention in setting the global biodiversity agenda and the comprehensive nature of the Strategic Plan for Biodiversity 2011-2020. The conservation and sustainable use of biodiversity may therefore be regarded as foundational to the whole 2030 Agenda.[8]

Sustainable Development Goals 14 and 15 directly address biodiversity in aquatic and terrestrial environments respectively. Beyond these, the achievement of many other Goals is either directly or indirectly dependent on biodiversity. This recognition aids the mainstreaming of biodiversity into the relevant sectors and provides incentives for its conservation and sustainable use. Examples of where biodiversity is a key factor for the achievement of other SDGs are:

- Goal 2 (Zero Hunger): All food systems depend on biodiversity and a broad range of ecosystem services that support agricultural productivity, soil fertility, and water quality and supply. At least one third of the world's agricultural crops depend on pollinators.[9] Genetic diversity in agriculture is a key element of food security, enabling the adaptation of crops and livestock to changing environmental conditions and providing resistance to particular diseases, pests and parasites.
- Goal 6 (Clean water and sanitation): Healthy ecosystems underpin the delivery of water supplies, water quality, and guard against water-related hazards and disasters. For example, wetlands play an appreciable role in surface, sub-surface and ground water storage, as well as preserving dry season river flows and reducing the risk of flooding in wet seasons.

Given that the conservation and sustainable use of biodiversity is essential to achieve many SDGs, the ongoing decline of biodiversity, and the consequent decline of ecosystem services, places achievement of these SDGs in jeopardy (Figure 0.2).[10]

The relationship between biodiversity and the SDGs acts in both directions. Some Sustainable Development Goals address the drivers of biodiversity loss, such as climate change (Goal 13), pollution (Goals 6, 12 and 14) and overexploitation (Goals 6, 12, 14 and 15). Achieving these Goals would therefore contribute to the conservation of biodiversity. Moreover, numerous assessments have indicated that as the world population increases and becomes more affluent, pressures on biodiversity are likely to increase. However, there are pathways to avoid or mitigate these growing pressures, as identified, for example, in the targets associated with Goal 12 (Sustainable production and consumption) on the efficient use of natural resources (Target 12.2) and on reducing food waste (Target 12.3).

Many Sustainable Development Goals focus on the building of institutions and human capital (for example through education) and the strengthening of equality and rights, and these relate to the underlying drivers of biodiversity loss. Such SDGs therefore provide an enabling environment conducive to the improved governance of factors affecting biodiversity. For example:

- Greater access to education (Goal 4) builds human capital and thereby enables effective action, including collective action, to be taken. In addition, education, especially for women and girls, has been shown to reduce fertility rates,[11] and, therefore, this goal may have an indirect effect on biodiversity by reducing population growth, a pressure on biodiversity.
- Gender roles in many countries have an effect on the use and management of biodiversity by influencing the ability of women to participate in decision-making and by affecting their access to and control of land, biological resources and other productive assets. Greater equality and empowerment of women and girls, as called for in Goal 5, would therefore have a positive effect on biodiversity by affording women greater influence in its use.
- Reducing inequalities (Goal 10) will help to develop the human capital required to make meaningful progress towards sustainable development. Moreover, progress on Goals such as zero hunger (Goal 2) and energy for all (Goal 7) can only be reconciled with the protection of the global climate (Goal 13) and biodiversity (Goals 14 and 15)

Figure 0.2. Linkages between biodiversity, the Aichi Biodiversity Targets and the Sustainable Development Goals

SDG	Aichi Biodiversity Target	Biodiversity's impact on the SDG	SDG's impact on biodiversity
1 NO POVERTY	18	✚ !	▽ ⊙
2 ZERO HUNGER	7, 13, 16	✚ !	▲ ▽ ⊙
3 GOOD HEALTH AND WELL-BEING		✚ !	▽
4 QUALITY EDUCATION			▽
5 GENDER EQUALITY			▽
6 CLEAN WATER AND SANITATION	5, 14	✚ !	▲ ▽
7 AFFORDABLE AND CLEAN ENERGY		✜	▲ ⊙
8 DECENT WORK AND ECONOMIC GROWTH	4	✜	▽ ⊙
9 INDUSTRY, INNOVATION AND INFRASTRUCTURE		✜	▽ ⊙
10 REDUCED INEQUALITIES			▽
11 SUSTAINABLE CITIES AND COMMUNITIES		✚ !	▲
12 RESPONSIBLE CONSUMPTION AND PRODUCTION	1	✜	▲
13 CLIMATE ACTION		✚ !	▲ ⊙
14 LIFE BELOW WATER	3, 6, 8, 10, 11	✚ !	▲
15 LIFE ON LAND	2, 5, 9, 11, 12, 15, 16	✚ !	▲
16 PEACE, JUSTICE AND STRONG INSTITUTIONS			▽
17 PARTNERSHIPS FOR THE GOALS	19, 20		▽

The SDGs are listed in column 1. Column 2 shows the Aichi Biodiversity Targets whose elements are reflected in the targets of the SDGs (Relevant targets under the SDGs are further specified in Part 2 of this Outlook).[12] *Column 3 shows which SDGs biodiversity contributes to significantly, and whether the ongoing decline in biodiversity jeopardizes or reduces the likelihood of achieving the SDG.*[13] *Column 4 shows the nature of the effect of the SDGs on the conservation and sustainable use of biodiversity.*

✚ Conservation and sustainable use of biodiversity contributes directly to SDG achievement

✜ Conservation and sustainable use of biodiversity supports SDG achievement

! Declining biodiversity jeopardizes SDG achievement

▲ Achieving SDG contributes to biodiversity. 'Contributes' refers to a relationship where attainment of the SDG would address a major direct pressure on biodiversity

▽ Achieving SDG contributes to the enabling environment for addressing biodiversity. 'Enabling' refers to a relationship where attainment of the SDG improves the enabling environment for addressing biodiversity issues

⊙ Achieving SDG while protecting biodiversity is potentially constraining. 'Constraining' refers to a relationship whereby simultaneously achieving the SDG and the conservation and sustainable use of biodiversity would require the choice of particular pathways to avoid potential conflicts and minimize tradeoffs.[14]

if there is a more equitable distribution of access to resources. Thus, action to reduce inequalities within and among countries is essential to achieve biodiversity objectives at the same time as achieving the other SDGs.

Some potential trade-offs exist between reaching the objectives of the Convention and attaining some of the SDGs – such as Goals 2 (food security), 7 (energy), 8 (economic growth) and 9 (infrastructure). However, these can be avoided or minimized through coherent and integrated decision making. Thus, the Goals may be viewed as constraining the choice of particular pathways of achieving a given SDG, rather than representing a fundamental contradiction. Many of the approaches required to avoid such potential negative impacts are already specified in the targets associated with the Sustainable Development Goals. This implies that care will be needed to select pathways that are compatible with both the objectives of the Convention on Biological Diversity and the 2030 Agenda for Sustainable Development.

CLIMATE CHANGE, THE PARIS AGREEMENT AND LINKS WITH BIODIVERSITY

The Paris Agreement on Climate Change was also adopted in 2015. This agreement, under the United Nations Framework Convention on Climate Change (UNFCCC), produced a global consensus on taking ambitious action to hold the increase in the global average temperature to well below 2°C above pre-industrial levels and to pursue efforts to limit the increase to 1.5°C, recognizing that this would significantly reduce the risks and impacts of climate change and increase the ability to adapt to it.[15]

The issues of climate and biodiversity are intricately connected, with climate change projected to become an increasingly important driver of biodiversity loss. Recent research assessed by the Intergovernmental Panel on Climate Change (IPCC) has emphasized significant differences in the outcomes for biodiversity depending on whether global temperature increases can be kept close to 1.5°C, or whether they exceed 2°C above pre-industrial levels.[16] Addressing other pressures on biodiversity also helps to mitigate climate change by increasing the capacity of marine and terrestrial ecosystems to capture and store carbon, and to support adaptation to adverse climate impacts by increasing resilience of ecosystems and agricultural livelihoods.

IPBES AND THE NEED FOR TRANSFORMATIVE CHANGE

The scale of the challenges and opportunities for biodiversity have been amply described by the Intergovernmental Science Policy Platform on Biodiversity and Ecosystem Services (IPBES), especially in its Global Assessment published in 2019 which drew worldwide attention to the alarming trends facing biodiversity and nature's contributions to people. That assessment, as well as other IPBES regional and thematic assessments, represent the largest-ever accumulation and synthesis of expert knowledge and data on biodiversity and nature's contributions to people. The four highest level key messages[17] of the IPBES global assessment are:

- Nature and its vital contributions to people, which together embody biodiversity and ecosystem functions and services, are deteriorating worldwide (see Aichi Target 14);
- Direct and indirect drivers of change have accelerated during the past 50 years;
- Goals for conserving and sustainably using nature and achieving sustainability cannot be met by current trajectories, and goals for 2030 and beyond may only be achieved through transformative changes across economic, social, political and technological factors;
- Nature can be conserved, restored and used sustainably while other global societal goals are simultaneously met through urgent and concerted efforts fostering transformative change.

The recent assessments of both IPBES and IPCC demonstrate the need for transformative change to address the underlying drivers of change and highlight the urgency of action now and over the decade.

A PATHWAY TO LIVING IN HARMONY WITH NATURE

The international focus on sustainable development as a pressing agenda for our century, with the particular prominence of tackling climate change as an existential issue of high urgency in political and public discourse, builds an opportunity to bring biodiversity into the mainstream. Many of the measures that are required to tackle poverty, reduce hunger, tackle climate change and reduce the risk of future pandemics are also those that are needed to support biodiversity, so there is potential for a powerful shared agenda giving attention and resources to conservation and sustainable use which have often been lacking in the past. On the other hand, some actions promoted to tackle climate change, as well as some approaches to the fight against poverty and hunger, have the potential to have significant negative impacts on biodiversity. Moreover, depending on the approaches taken, economic stimulus measures in light of the COVID-19 pandemic could either contribute to or undermine sustainable development. For all of these reasons, it is essential for biodiversity to be taken fully into account in choices relating to the wider sustainable development agenda. Responses to the pandemic provide both an opportunity and a need to build back better and greener - for transformative changes towards a sustainable future and a 'new normal': one in which all people are able to live in harmony with nature. Part III of this Outlook examines such choices, by identifying pathways and transitions that will address the joint needs of people, nature and climate in the coming decades.

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PART II. BIODIVERSITY IN 2020

Progress towards the Aichi Biodiversity Targets

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This part of GBO-5 provides an evaluation, target by target, of the progress towards the Aichi Biodiversity Targets. It thus provides an update on the midterm assessment of progress contained in GBO-4.

Given that most Aichi Biodiversity Targets have a deadline of 2020, this section of the Outlook essentially provides a final assessment of the progress made in reaching each of the 20 Aichi Biodiversity Targets.[1]

GBO-4, published in 2014, was based on information provided in the fifth national reports to the Convention on Biological Diversity (CBD), indicators, and scientific literature. The present assessment draws upon the information in sixth national reports (Box 0.1), updated indicators, the IPBES Global Assessment and other relevant assessments and scientific literature. GBO-5 also draws on two complementary reports, the second edition of the Local Biodiversity Outlooks and the 2020 edition of the Plant Conservation Report.

For each of Aichi Biodiversity Targets, the following information is provided:

- An overall statement of progress towards the target along with a summary chart depicting the progress towards each of its distinct elements using

Box 0.1. The national biodiversity strategies and action plans and the sixth national reports

National biodiversity strategies and action plans (NBSAPs) are the principal instruments for implementing the Convention at the national level. The Convention requires countries to prepare a national biodiversity strategy or equivalent instrument, and to ensure that this strategy is mainstreamed into the planning and activities of all those sectors whose activities can have an impact, whether positive or negative, on biodiversity (see the assessment of Aichi Target 17 for further information). NBSAPs provide important information on national targets and commitments and on the activities planned to achieve them. GBO-5 draws upon the information provided in 170 NBSAPs.[2]

The periodic reports from Parties to the CBD provide rich information about the progress made by governments to implement the commitments made under the Convention. The **sixth national reports** were due by the end of 2018, and at the time of the finalization of this Outlook (July 2020), 163 reports had been received, representing more than three quarters of CBD Parties.[3] National reports provide information on measures taken for the implementation of the Convention and the effectiveness of these measure.[4] They also give citizens the ability to explore in detail the actions taken within their own countries to address the crisis facing biodiversity. The sixth national reports had a specific focus on reviewing progress in the implementation of the Strategic Plan for Biodiversity 2011-2020 and towards the Aichi Biodiversity Targets, including relevant national targets.

The national biodiversity strategies and action plans and the national reports are two complementary sources of information. Together they provide an overview of each country's ambitions related to the Strategic Plan for Biodiversity 2011-2020 and the actions they have taken to realize these.

A large number of national indicators have been developed by Parties to support implementation of the Convention, although their use remains uneven and with variable alignment to the globally-agreed targets. On average, the number of indicators used in a sixth national report was 84, a significant increase from the average of 49 used in the fifth national reports. National indicators were used 11 times more frequently compared to global indicators in the sixth national reports, and only about 30% of the indicators used matched those identified by the Convention for tracking progress in the implementation of the Strategic Plan for Biodiversity 2011-2020. This creates challenges in analysing indicator information across the national reports.[5]

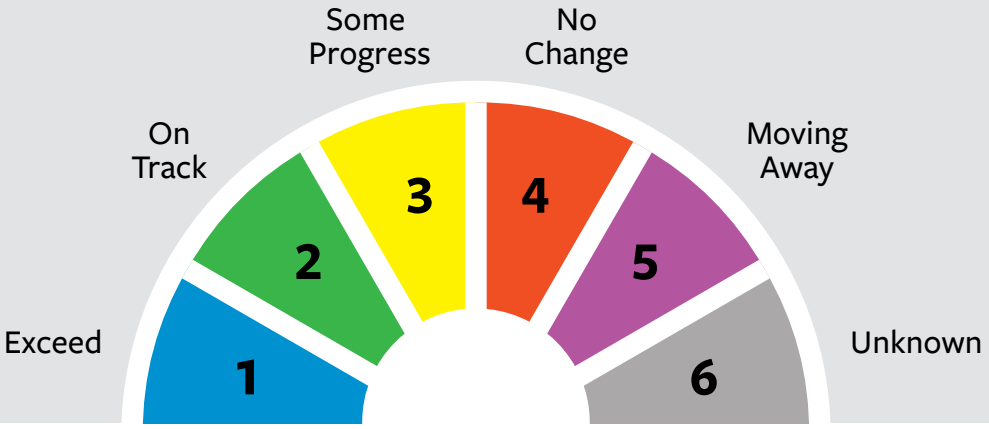
a five-point scale. The scale and the elements are the same as those used in GBO-4 (Box 0.2)[6].

- A brief summary of the types of activities undertaken by Parties, and the challenges they report, to achieve the target, and more specific national examples of action based on information provided in the sixth national reports.[7]
- Information on the trends for the various elements of each target based on the best available evidence and informed by indicators where available. The analysis in Chapter 3 of the IPBES Global Assessment provided the basis for the analysis, supplemented by updated indicator data, as well as studies and assessments published after the Global Assessment was compiled. The information in these summaries is focussed in particular on data that allows comparison of trends before and after the Aichi Biodiversity Targets were set in 2010, and especially since the mid-term assessment carried out for GBO-4. Where trends are shown graphically, two different shades for the background of graphs are used to aid interpretation.
- The SDG targets most relevant to each Aichi Biodiversity Target are highlighted.[8] As noted in Part I, many SDG targets are closely related to the Aichi Biodiversity Targets and thus the assessment towards the Aichi target may also inform an assessment towards the corresponding SDG targets.
- Information on progress towards the national targets or similar commitments established by Parties, complemented by a graphical depiction, based on information contained in the sixth national reports and the national biodiversity strategies and action plans (NBSAPS) (Box 0.3).

The second edition of the Local Biodiversity Outlooks[9], prepared as a complement to GBO-5, shares the views, perspectives and experiences of indigenous peoples and local communities on biodiversity issues. It brings together information and

Box 0.2. Depicting progress towards the Aichi Biodiversity Targets

The twenty Aichi Biodiversity Targets are composed of several elements. The progress towards each of these elements has been depicted graphically. As illustrated below, the progress made in reaching each element of the Aichi Biodiversity Target is shown using a segmented half-circle. Each segment represents an element (the same as the elements used in GBO-4) and the colour represents the progress made. Blue indicates that the element has been exceeded, green indicates the element has been or is likely to be achieved in 2020, yellow indicates that progress has been made towards the element but that it has not been met, red indicates no significant change in the element, and purple indicates that the trends are moving away from reaching the element. In cases where the element could not be assessed, the segment is grey. For an Aichi Target to be achieved overall, all of the segments would be blue or green.



case studies from indigenous peoples, communities and community-based organizations from around the world with information from published academic and non-academic sources. Information and case studies drawn from the Local Biodiversity Outlooks are included as examples of progress in some summaries of achievement of the Aichi Biodiversity Targets throughout this edition of the Global Biodiversity Outlook.

The target by target assessment of GBO-5 is followed by a section providing an overview of the progress made in implementing the Global Strategy for Plant Conservation 2011-2020, drawing on the 2020 edition of the Plant Conservation Report.

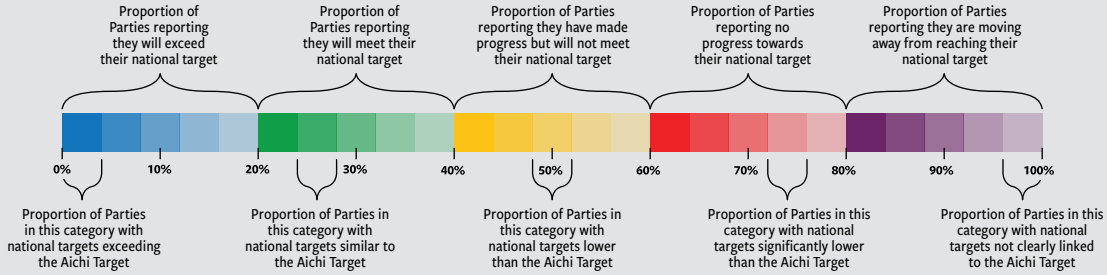
The final section of this part of the Outlook provides an overall analysis on the implementation of the Aichi Biodiversity Targets as a whole and identifies lessons learned over the last ten years of implementation of the Strategic Plan for Biodiversity 2011-2020.

Photo by Geran de Klerk on Unsplash

Box 0.3. Depicting Progress towards national targets

In adopting the Strategic Plan for Biodiversity 2011-2020, the Conference of the Parties invited Parties to set their own targets, taking into account national needs and priorities, while also bearing in mind national contributions to the achievement of the global targets.[10] The majority of Parties have reflected such national targets or similar commitments in their national biodiversity strategies and action plans (see Aichi Target 17). An analysis of these national targets has been undertaken to determine the extent to which they were aligned with the Aichi Biodiversity Targets, classifying each national target into one of five categories: (a) National target surpasses the scope and/or level of ambition of the Aichi Target, (b) National target is commensurate with the Aichi Target, (c) National target is less ambitious than the Aichi Target or does not address all of its elements, (d) National target is significantly less ambitious than the Aichi Target and (e) National target is not clearly linked to the Aichi Target.

In completing their fifth and sixth national reports, Parties were requested to link each of their national targets to one or more Aichi Biodiversity Targets and to indicate the level of progress towards each national target using one of five categories: (a) On track to exceed target, (b) On track to achieve target, (c) Progress towards target but at an insufficient rate, (d) No significant change and (e) Moving away from the target. These national assessments were then combined with information on the degree to which the national targets in the NBSAPs were commensurate with the Aichi Targets referred to above. By combining these two sources of information an analysis was undertaken to assess how the collective ambition and efforts of Parties aligned with the global aspirations set out in the Aichi Targets. Regular updates of progress, based on this methodology, have been presented to meetings of the Convention since 2010.[11] The results of the latest analysis (based on the sixth national reports) are presented for each Aichi Biodiversity Target and summarized graphically using a bar chart as illustrated below.



The coloured segments of the bar illustrate the proportion of Parties reporting progress in a given category. Blue indicates that the target been exceeded, green indicates the target is on track, yellow indicates that progress has been made towards the target but that it has not been met, red indicates no significant change in the target, and purple indicates that the trends are moving away from reaching the target. This is the same colour code that is used in the assessment of the segments of the Aichi Biodiversity Targets.

The intensity of the colour indicates the degree of alignment of the national targets to the Aichi Targets for each reported level of progress. By way of illustration, if all Parties were on track to exceed their national targets and if all national targets exceed the scope and level of ambition of the Aichi Target the entire bar would be dark blue. Conversely, if all Parties were moving away from reaching their national targets and if none of the national targets were clearly linked to the Aichi Target the entire bar would be pale purple.

AWARENESS OF BIODIVERSITY INCREASED

By 2020, at the latest, people are aware of the values of biodiversity and the steps they can take to conserve and use it sustainably.

Summary of target achievement

There has been an apparent increase in the past decade in the proportion of people who have heard of biodiversity and who understand the concept. Understanding of biodiversity appears to be increasing more rapidly among younger people. A recent survey suggested that more than one third of people in the most biodiverse countries have high awareness both of the values of biodiversity and the steps required for its conservation and sustainable use. **The target has not been achieved** (*low confidence*).[1]

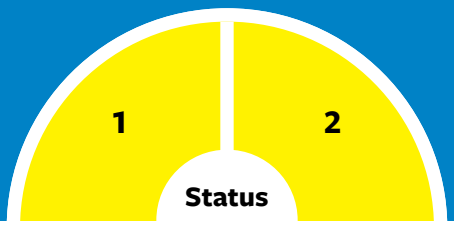
Improving public understanding of biodiversity, including awareness of its values and the steps that we can all take to conserve and use it sustainably is clearly critical to underpin progress towards the 2050 Vision for Biodiversity. Messages relating to biodiversity and its importance to people, as well as opportunities for discussion and information sharing, are available to the public in an ever-expanding variety of formats and platforms, including through television documentaries, social media, museum exhibitions and educational curricula, as well as through direct public engagement projects taking place from neighbourhood or village level to national and international campaigns (Box 1.1).

Actions commonly reported in national reports to achieve national targets related to Aichi Biodiversity Target 1 are the convening of workshops, stakeholder meetings, organizing biodiversity exhibitions, organizing field trips and site visits and other similar awareness-raising activities. Some national reports also note the inclusion of biodiversity in school curricula at the primary, secondary and tertiary levels, including information on its values and the actions needed to conserve it. Other examples of actions taken include the use of media (such as radio, television, movies, social media platforms and print media) to raise awareness of biodiversity, providing training on biodiversity to stakeholders, including farmers, fishers and policymakers, and the creation of biodiversity information centres. However, despite these actions, many reports note that awareness of biodiversity and its values remains low. Some of the challenges identified in reaching national targets related to Aichi Biodiversity Target 1 are the difficulties in reaching all people, including those residing in remote or distant communities, a general lack of knowledge of how to conserve biodiversity, and a lack of understanding of the links between biodiversity and other societal challenges, including the need to address climate change.

There is no globally consistent information showing trends in awareness and willingness to act on biodiversity. However the Union of Ethical BioTrade Biodiversity Barometer, using standard questions to sample the public's understanding of the concept of biodiversity, provides information for 16 countries.[2] Comparative information is available for nine of these countries, six of which show an increase in both the proportion of people who have heard of biodiversity, and in those able to give a correct definition of it. The increase is significantly higher among people aged between 16 and 24, and there is considerable variation among countries.[3]

TARGET ELEMENTS

1. Aware of biodiversity
2. Aware of steps to take



A survey conducted in 2018 in 10 biodiversity-rich developing countries found that on average, more than one third (38 per cent) of respondents showed a high level of awareness of biodiversity values and the steps required for conservation and sustainable use (Table 1.1). The survey uses a methodology that is similar to one developed and applied in Germany since 2009. That survey shows a slight trend upwards in the indicator of 'willingness to act' (and, consequently, in the overall indicator) between 2009 and 2017 while the other indicators remained stable.[4]

A new global indicator has been developed to measure public engagement in biodiversity based on 22 relevant keywords in 31 languages sourced from Twitter, online newspapers and Google Trends. While not yet able to measure longer-term trends over time, this indicator is already able to detect significant short-term patterns such as a close temporal association between public interest in biodiversity and academic schedules, indicating that engagement in biodiversity is largely focussed on academic or educational contexts.[5]

During the COVID-19 pandemic, media coverage of the relationship between biodiversity, human health and well-being has been notable. While this suggests a raised awareness of the links between biodiversity, human health and wellbeing, messages and their potential interpretation are varied and complex, and the pandemic's influence on the progress towards this target will only be known once the impact of the global crisis, and the longer-term changes it has caused, become clearer.

The majority of NBSAPS (87%) contain targets related to Aichi Biodiversity Target 1. Of the Parties that have assessed progress towards their national targets, half report that they are on track to reach (49%) or exceed them (1%). Most of the other half (46%) report that they have made progress towards their targets but not at

Table 1.1. Awareness of biodiversity[6]

	BIODIVERSITY AWARENESS INDICATORS			
	Overall	*Knowledge*	*Attitude*	*Behavior*
Brazil	18	70	56	38
China	34	42	75	84
Colombia	53	80	71	87
India	39	50	76	82
Indonesia	31	49	65	82
Kenya	40	55	67	92
Mexico	48	77	67	85
Peru	48	75	72	85
South Africa	34	54	63	80
Vietnam	37	51	80	81
Average	37	59	68	77

Figures show the % of participants meeting the criteria for each indicator

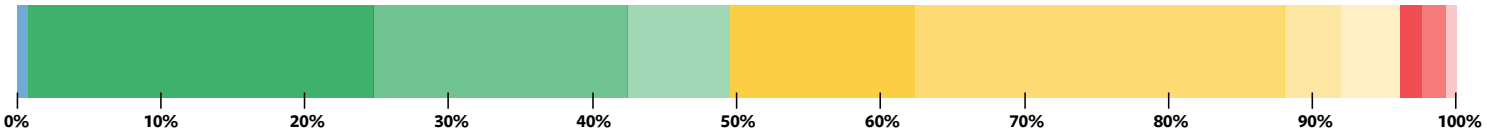
RELEVANT SDG TARGETS

Target 4.7 - By 2030, ensure that all learners acquire the knowledge and skills needed to promote sustainable development...

Target 12.8 - By 2030, ensure that people everywhere have the relevant information and awareness for sustainable development and lifestyles in harmony with nature

Photo by Nandhu Kumar on Unsplash

Assessment of progress towards national targets



The colour bars show the percentage of Parties reporting a given level of progress towards their national targets. (Blue: exceeds target; Green: on track; Yellow: some progress; Red: no change; Purple: moving away from target). The intensity of the colour indicates alignment of national targets with the Aichi Target (Darker colours indicate close alignment).

a rate that will allow them to meet the target. Few Parties (4%) report no progress. However, only about a third of the targets (32%) are equal to the scope and level of ambition set out in Aichi Target 1. Most targets appear to focus on increasing awareness of biodiversity; there are fewer national targets that address making people aware of the actions they can take to conserve biodiversity. Of the Parties that have assessed progress, fewer than a quarter (23%) have national targets similar to Aichi Biodiversity Target 1 and are on track to meet them (see bar chart).

Box 1.1. Examples of national experiences and progress

- **Belize:** With the support of the Wildlife Conservation Society and PCI Media Impact a radio drama series and an associated call-in show on marine protected areas and sustainable fishing were created. The purpose of the series was to increase knowledge, and change attitudes and behaviour related to responsible fishing, marine protected areas and no-take zones. A survey of listeners found that they were significantly more likely to exhibit correct knowledge and possess positive attitudes, as well as practise more sustainable fishing behaviour. Many listeners also reported learning about fisheries regulations, responsible fishing, marine protected areas and no-take zones from the series.[7]
- **Ecuador:** The Ministry of Education has developed a programme to mainstream environmental education by providing children with greater and more regular access to natural spaces through outdoor classrooms. These classrooms are created in natural areas which have been protected or restored, with the objective of linking children and youth with the natural environment. The programme facilitates learning about the value and importance of having a healthy environment, and about issues relating to sustainability and agriculture. Since 2018, 6,378 educational institutions have created such classrooms.[8]
- **Philippines:** The TAWID Indigenous Knowledge Learning Festival brought together indigenous educators from schools and communities in 2019 with the aim of transferring indigenous knowledge to the younger generation, both within and outside the formal school curriculum. This included showcasing of community-led initiatives in the Philippines including 'Schools of Living Tradition', heirloom recipes and indigenous health, and traditional crafts such as weaving and woodcarving.[9]

BIODIVERSITY VALUES INTEGRATED

By 2020, at the latest, biodiversity values have been integrated into national and local development and poverty reduction strategies and planning processes and are being incorporated into national accounting, as appropriate, and reporting systems.

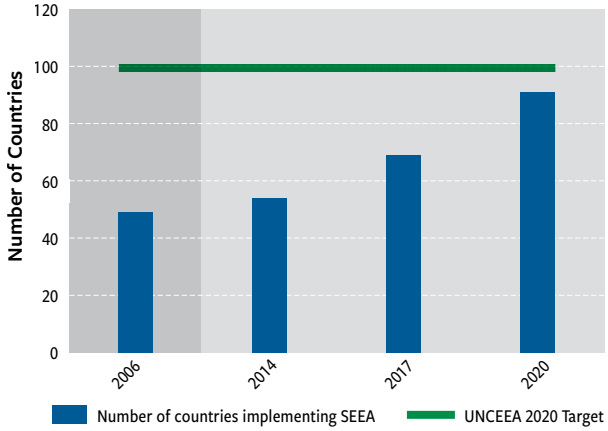
Summary of target achievement

Many countries report examples of incorporating biodiversity into various planning and development processes. There has been a steady upward trend of countries incorporating biodiversity values into national accounting and reporting systems. At the same time, there is less evidence that biodiversity has been truly integrated into development and poverty reduction planning as required by the target. **The target has not been achieved** (*medium confidence*[1]).

Commonly reported actions to reach the national targets associated with Aichi Biodiversity Target 2 are the modification or adoption of legislation and regulations, and efforts to incorporate biodiversity values and considerations into sectoral policies, including policies related to development, forestry, agriculture, fisheries, and energy. Some Parties also reported on the publication of studies on the status of biodiversity to help inform decision-making; building capacity to undertake surveys and studies related to natural capital accounting; creating investment funds which account for the value of natural resources; the development of tools, guidelines and methodologies to support institutions in decision-making; and improved enforcement of existing policies (Box 2.1). Some of the reported challenges to reaching this target were the challenge of implementing regulatory frameworks and translating these to regional and local-level actions, the lack of mainstreaming, and the difficulty of incorporating estimates of the financial costs of biodiversity loss and environmental degradation into the financial plans of other sectors.

Global initiatives have brought about a steady increase in the integration of biodiversity values into national accounting and reporting systems (Box 2.2). Global standards for integrating environmental and economic information have been available through the System of Environmental-Economic Accounting (SEEA) since 2012, and national implementation has risen steadily since.[2] As of early 2020, it was estimated that 91 countries had compiled SEEA accounts, close to the target set by the UN Committee of Experts on Environmental-Economic Accounting (UNCEEA) for at least 100 countries to have ongoing, well-resourced programmes in the SEEA framework by 2020 (Figure 2.1). By the end of 2019, 24 countries had published ecosystem accounts under the Experimental Ecosystem

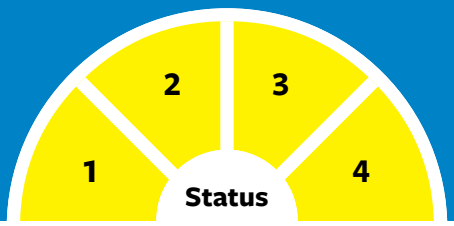
Figure 2.1. Trends in the number of countries implementing the System of Environmental-Economic Accounting



The values for 2020 are provisional. The solid line indicates the 2020 target set by UNCEEA to have 100 countries implementing SEEA.[3]

TARGET ELEMENTS

1. **Biodiversity integrated in strategies**
2. **Biodiversity integrated in planning**
3. **Biodiversity integrated in accounting**
4. **Biodiversity incorporated in reporting**



Accounting programme, part of the SEEA framework, with a view to finalizing a UN statistical standard for ecosystem accounting by 2021.[4] At the same time, there is still work to be done to ensure that such accounts are used by governments in a way that brings biodiversity values into the mainstream of decision-making at a global scale.[5] Global implementation of national accounting has been driven by several international organizations, including the United Nationals Statistics Division, the European Commission, the World Bank (including the Wealth Accounting and Valuation of Ecosystem Services (WAVES) partnership[6]), Conservation International and others.

Box 2.1. Examples of national experiences and progress

- **Colombia:** The National Council for Economic and Social Policy (*El Consejo Nacional de Política Económica y Social*) formulated a payment for ecosystem services policy (*El Plan Nacional de Mercados Verdes*) which encourages alternative uses of biodiversity. The Ministry of Environment has also adopted a national green business plan for sectors dependent on ecosystem services, including ecotourism, organic agriculture, pharmaceuticals, and cosmetics.[7]
- **Liberia:** More than half of the population of the country lives within 65 kilometres of the coast which is dotted with mangroves, forests and reeds which can reach up to 40 kilometres inland. These mangroves support human well-being through the provision of food, protection from storms and floods, and supporting cultural values. A study undertaken in Liberia in collaboration with The Economics of Ecosystems and Biodiversity (TEEB) initiative aims to better understand the multiple values and contributions of these mangroves and the pressures on them. The results of the project will help to inform coastal and marine planning policies by identifying the pressures and threats to coastal mangroves, providing evidence of the benefits of community-based coastal and marine management, the introduction of alternative livelihood options, and the establishment of marine protected areas.[8]
- **Guinea:** Biodiversity values are being increasingly integrated in sectoral and national decision-making processes across the country. For example, they are reflected in the country's 2035 vision for development. Similarly, biodiversity values have been integrated into the country's national environment policy, its national agricultural investment and food security plan, its national plan for economic and social development as well as in 304 community development plans.[9]
- **Namibia:** To improve sectoral coordination and planning on environmental issues, Namibia has put in place integrated regional land use plans. These plans facilitate the allocation of land to the uses that give the greatest sustainable benefit. They allow for cross-sectoral and integrative decision-making processes by taking into account different perspectives, needs and restrictions in land use, and help to link social and economic development with environmental protection in order to minimize land-related conflicts and to achieve the objectives of sustainable development. The approach also integrates Strategic Environmental Assessment.[10]

RELEVANT SDG TARGET

Target 15.9 - By 2020, integrate ecosystem and biodiversity values into national and local planning, development processes, poverty reduction strategies and accounts

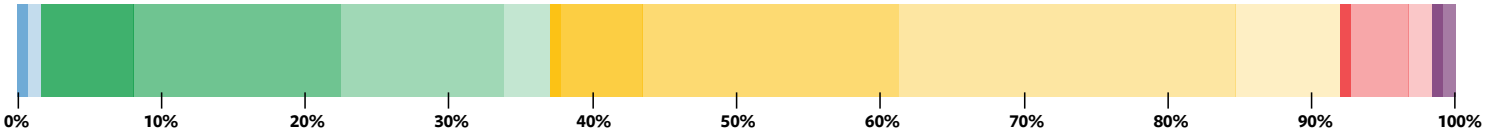
A review of selected countries' Voluntary National Reviews for implementation of the Sustainable Development Goals shows that approximately half of them have mainstreamed biodiversity throughout their reports. Besides SDGs 14 and 15, biodiversity is linked most often in these reports to the SDGs relating to responsible consumption and production (SDG 7), partnerships (SDG 17) and food security (SDG 2).[11]

With regard to the incorporation of biodiversity into poverty reduction strategies, 47 Parties with National Biodiversity Strategies and Action Plans

Box 2.2. Experiences with national accounting

- **European Union:** Several studies related to a project to support the design and implementation of ecosystem accounting at the regional level have been undertaken since 2015. This includes experimental accounts for bird species, pollinators and marine environments. In addition, the Natural Capital Accounting and Valuation of Ecosystem Services project, funded by a European Union partnership with the UN Statistics Division, the United Nations Environment Programme and Secretariat of the CBD, aims to pilot experimental versions of the System of Environmental Economic Accounting in Brazil, China, India, Mexico and South Africa.[12]
- **Guatemala:** An analysis was carried out to determine the state of the ecosystems within the 2,553 km^2 Eastern Dry Corridor and to establish an inventory of available natural capital, including timber, non-timber, agricultural, biodiversity, and soil assets. An economic valuation of ecosystem services, including the provision of wood and firewood, regulation and supply of water, and control of soil erosion, was also conducted for the corridor.[13]
- **Uganda:** There are currently natural capital accounting projects for land, forest, wetlands, tourism, soils, and water. The Green Growth Development Strategy recognizes natural capital, linking biodiversity and ecosystem services to the country's green economy strategy. The overall objective of the Green Growth Development Strategy is to contribute to a transition towards an inclusive, green, and competitive low-carbon economy and the creation of green jobs. In addition, payments for ecosystem services are employed for agro-forestry practice in agricultural landscapes and for wetlands management under the Trees for Global Benefits initiative of the Environmental Conservation Trust of Uganda, the Community Environment Conservation Funds and IUCN.[14]
- **United Kingdom of Great Britain and Northern Ireland**: The Office of National Statistics provides regularly updated natural capital accounts, in partnership with the Department of Environment, Food and Rural Affairs (Defra). The 2019 update included among its main points that the partial asset value of natural capital was estimated to be nearing one trillion pounds in 2016; the removal of air pollution by vegetation equated to a saving of £1.3 billion in health costs in 2017, the cooling effect of urban trees and water bodies saved £248 million in 2017 by maintaining productivity and reducing air conditioning costs, and living within 500 meters of green or blue spaces was estimated to add an average of £2,800 to urban property prices in 2016.[15]

Assessment of progress towards national targets



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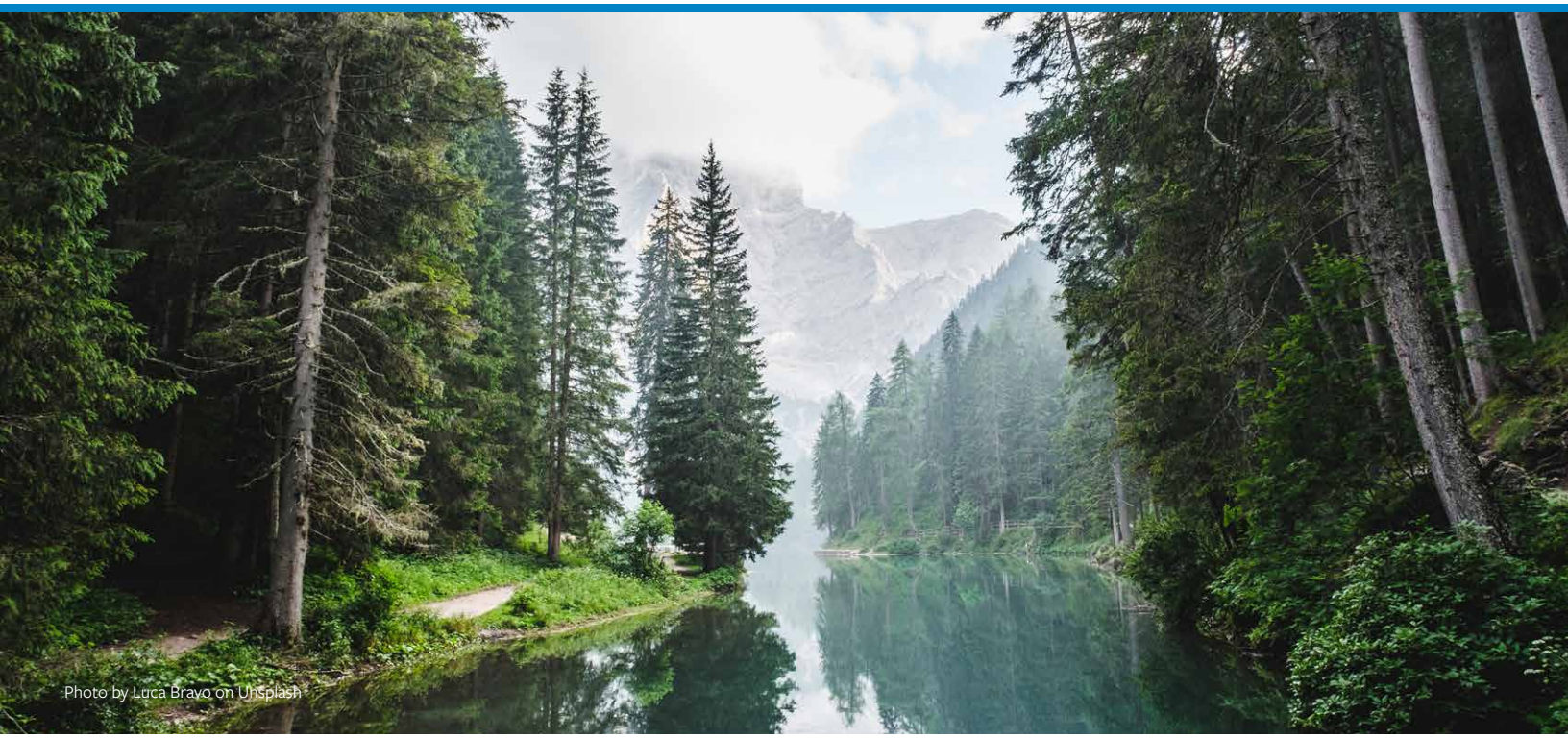


Photo by Luca Bravo on Unsplash

(NBSAPs) developed, updated or revised after the adoption of the Strategic Plan for Biodiversity 2011-2020 include links to poverty eradication and/or integrate this objective into their principles, targets and/or actions. Similarly, 40 Parties indicate in their NBSAPs that biodiversity has been integrated into their national development plan or equivalent instruments.[16]

An analysis of 144 NBSAPs suggests that developing countries, especially in Africa, show a greater awareness of the importance of biodiversity to key productive sectors including agriculture, forestry and fisheries, than developed countries. This may partly be due to the involvement of a broader range of stakeholders in developing NSBAPs in developing countries compared with the process in developed countries.[17]

The majority (84%) of NBSAPs contain targets related to Aichi Biodiversity Target 2. Of the Parties which have assessed progress towards their national targets, more than a third are on track to reach (35%) or exceed them (2%). More than half (55%) have made progress towards their targets but not at a rate that will allow them to meet the target. Few Parties report that they are making no progress (6%) towards the target or are moving away from reaching it (2%). However, few national targets match (7%) or exceed (1%) the scope and level of ambition set out in the Aichi Target. The national targets that have been established largely focus on the integration of biodiversity values into national development strategies and poverty reduction strategies. Many of the targets relate to the issue of policy coherence and/or the integration of biodiversity into decision-making generally. Relatively few address the integration of biodiversity values into national and local planning processes, national accounting or reporting processes. Of the Parties which have assessed progress, few (6%) have national targets similar to Aichi Biodiversity Target 2 and are on track to meet them (see bar chart).

INCENTIVES REFORMED

By 2020, at the latest, incentives, including subsidies, harmful to biodiversity are eliminated, phased out or reformed in order to minimize or avoid negative impacts, and positive incentives for the conservation and sustainable use of biodiversity are developed and applied, consistent and in harmony with the Convention and other relevant international obligations, taking into account national socio economic conditions.

Summary of target achievement

Overall, little progress has been made over the past decade in eliminating, phasing out or reforming subsidies and other incentives potentially harmful to biodiversity, and in developing positive incentives for biodiversity conservation and sustainable use. Relatively few countries have taken steps even to identify incentives that harm biodiversity, and harmful subsidies far outweigh positive incentives in areas such as fisheries and the control of deforestation. **The target has not been achieved** (*medium confidence*).[1]

In their national reports Parties commonly described efforts to revise licensing processes, including for hunting, fishing and felling, phasing out subsidies for pesticides and fossil fuels, and efforts to identify potentially harmful subsidies, but only about 20% of Parties referred to actions related to the removal of harmful subsidies. Some Parties also reported taking action to deny government support to certain types of behaviour or activities harmful to biodiversity. Reported challenges to reaching this target were limited capacity, funding and legislative action, vested interests in maintaining current incentive schemes, and difficulties in upscaling pilot projects.

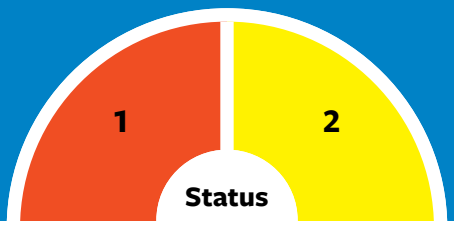
Overall, little progress has been made over the past decade in eliminating, phasing out or reforming incentives potentially harmful to biodiversity. Relatively few governments have even identified such incentives, an essential starting point if this target was going to be achieved. Where information is available, the indications are that the value of subsidies that are harmful or potentially harmful to biodiversity greatly exceeds the finance that is allocated to promote conservation and sustainable use of biodiversity.[2] More specifically, whereas total finance for biodiversity (covering public, private, domestic and international finance) is estimated at about $80-90 billion per year, government support that is potentially environmentally harmful is estimated at about $500 billion.[3] Looking at subsidies for production of commodities linked to forest destruction in Brazil and Indonesia alone, these were estimated in 2015 to exceed by a factor of 100 or more the amount spent on measures to combat deforestation.[4]

Elements of government support to agriculture that are potentially most harmful to the environment declined significantly in value in the 1990s and in the first decade of this century, but there is no evidence of progress in the past decade, with this support remaining well above $100 billion (Figure 3.1).[5]

There has also been little progress in reducing global fisheries subsidies during this decade; and while the increase in total subsidies that occurred in earlier decades appears to have halted since 2009, the value of harmful incentives as a proportion of all fishing subsidies actually increased between 2009 and 2018. Of the more than $35 billion

TARGET ELEMENTS

1. Harmful incentives eliminated or reformed
2. Positive incentives applied



provided as fishing subsidies in 2018, only $10 billion promoted sustainable fisheries, while some $22 billion was spent on subsidies linked to overfishing through expanding the capacity of fishing fleets.[6] The World Bank estimates that lost revenues due to mismanagement of fisheries amounted to $83 billion in 2012.[7]

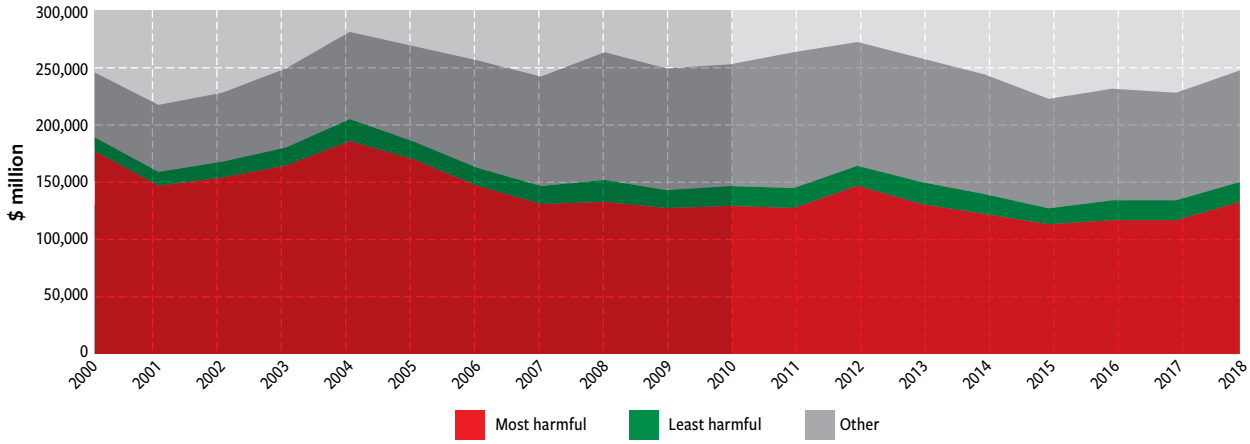
Despite increased subsidies for clean energy, fossil-fuel support remains high, at $478 billion in 2019.[8] These estimates do not include state aid to industries provided as part of economic stimulus measures in response to the COVID-19 pandemic.[9] When environmental costs and other externalities and lost tax revenue are included, total fossil fuel subsidies may be considered to amount to about $5 trillion.[10]

Many countries and regional blocs have introduced positive incentives to encourage conservation and sustainable use of biodiversity, for example through agri-environment schemes in which farmers receive payments to implement agricultural techniques that support biodiversity in farmed landscapes (Box 3.1).

In their national reports, Parties refer to reducing taxes on renewable energy, promoting payment for ecosystem services and offset schemes, establishing certification and compensation schemes to incentivize activities such as sustainable ecotourism, landscape conservation, and the adoption of more efficient technologies. Some Parties also reported on efforts to encourage local land management, the provision of compensation for the reduction of harmful activities, and actions to recognize indigenous and local land use rights.

Many countries have introduced biodiversity-relevant taxes, fees and charges, and tradeable permits. These instruments are tracked through the Organisation for Economic Co-operation and Development (OECD)'s database on Policy Instruments for the Environment (PINE), to which more than 110 countries currently provide data. As of 2020, 206 biodiversity-relevant taxes are currently in force in 59 countries; 179 biodiversity-relevant fees and charges are currently in force in 48 countries; and 38 biodiversity-relevant tradeable permit schemes are currently in force in 26 countries (Figure 3.2). Biodiversity-relevant taxes include those that are applied on pesticides, fertilizers, forest products and timber harvests to reflect the negative environmental externalities

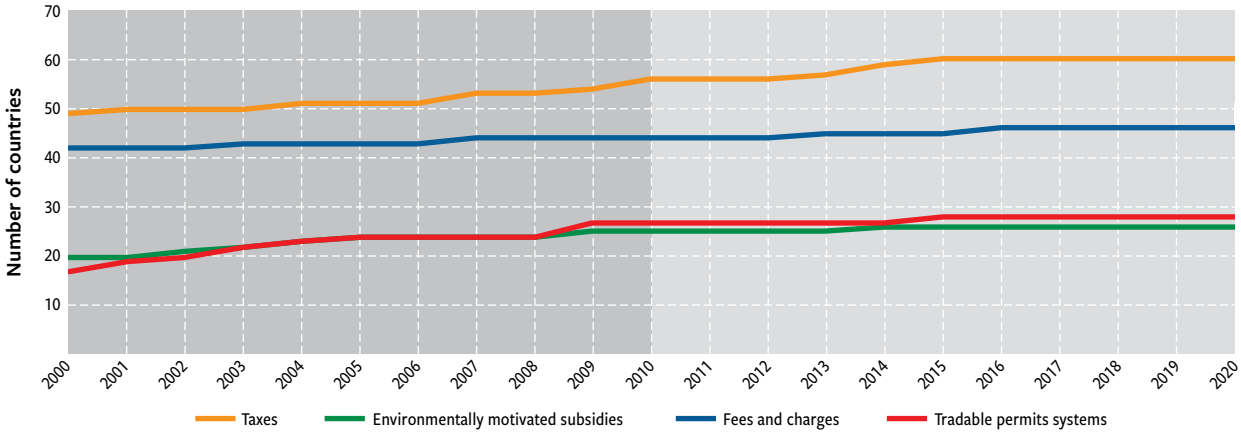
Figure 3.1. Trends in potentially environmentally harmful elements of government support to agriculture in OECD countries[11]



RELEVANT SDG TARGET

Target 14.6 - By 2020, prohibit certain forms of fisheries subsidies which contribute to overcapacity and overfishing, eliminate subsidies that contribute to illegal, unreported and unregulated fishing and refrain from introducing new such subsidies...

Figure 3.2. Number of countries with biodiversity-relevant economic instruments[12]



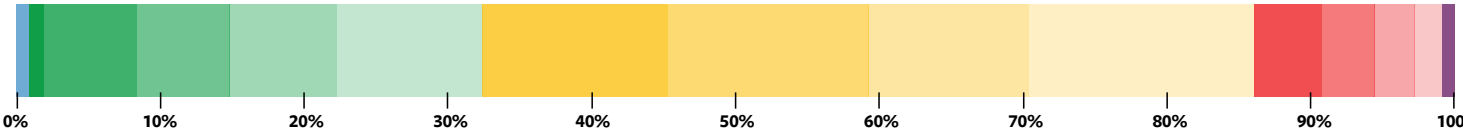
Box 3.1. Examples of national experiences progress

- **Denmark:** Following reform of the Danish pesticide tax in 2013, the country succeeded in meeting its targets to reduce pesticide load by 40 per cent, as measured by sales. Stockpiling of pesticides has diminished significantly since the new tax was introduced. 100% of revenue from the pesticides tax has been earmarked for environmental schemes and compensation for farmers ($78.1 million in 2016.)[13]

- **Guatemala:** The PROBOSQUE programme, initiated in 2015, extended a previous forestry incentive programme that has rewarded landowners and smallholders who have undertaken reforestation and natural forest management activities. The new programme includes more forest types and provides incentives to restore forests with native species. More than 350,000 hectares of natural forest have been brought under sustainable management through the programme.[14]

- **Italy:** Under a law passed in 2016, the Italian Ministry for the Environment published its first catalogue of environmentally friendly and harmful subsidies as part of an effort to design ambitious and efficient environmental and economic policies. Italy has placed restrictions on its subsidies for solar energy to ensure that photovoltaic cells in rural areas are placed in a way that safeguards local agro-food traditions, biodiversity, cultural heritage and landscapes. Italy's budget law of 2018 introduced a 'green bonus' providing tax deductions for properties that include significant green cover in urban environments.[15]

Assessment of progress towards national targets



The colour bars show the percentage of Parties reporting a given level of progress towards their national targets. (Blue: exceeds target; Green: on track; Yellow: some progress; Red: no change; Purple: moving away from target). The intensity of the colour indicates alignment of national targets with the Aichi Target (Darker colours indicate close alignment).

generated by the use of the natural resource or by pollutants. There is potential to scale up the use of all these incentives. The revenue generated from biodiversity-relevant taxes is approximately $ 7.4 billion per year, a little over one per cent of total revenue generated from all environmentally-relevant taxes in OECD countries.

Only just over a half (59%) of NBSAPs contain targets related to Aichi Biodiversity Target 3. Of the Parties which have assessed progress towards their national targets, only about a third are on track to reach (31%) or exceed (1%) them. Another half (54%) have made progress but not at a rate that will allow them to meet their targets. Several Parties (13%) report that they are making no progress towards their targets and a small number (1%) are moving away from reaching them. Moreover, only about a fifth of national targets are similar to (20%) or exceed (1%) the scope and level of ambition of the Aichi Target. Many of the targets in the NBSAPs are general in nature and refer to incentives and subsidies broadly, without specifying the removal of harmful incentives or the development of positive ones. Of the Parties which have assessed progress, only 7% have national targets similar to Aichi Biodiversity Target 3 and are on track to meet them (see bar chart).

Photo by Sebastian Pena Lambarri on Unsplash

SUSTAINABLE PRODUCTION AND CONSUMPTION

By 2020, at the latest, Governments, business and stakeholders at all levels have taken steps to achieve or have implemented plans for sustainable production and consumption and have kept the impacts of use of natural resources well within safe ecological limits.

Summary of target achievement

While an increasing number of governments and businesses are developing plans for more sustainable production and consumption, these are not being implemented on a scale that eliminates the negative impact of unsustainable human activities on biodiversity. While natural resources are being used more efficiently, the aggregated demand for resources continues to increase, and therefore the impacts of their use remain well above safe ecological limits. **The target has not been achieved** (*high confidence*).[1]

In their national reports, Parties commonly refer to efforts in specific sectors, such as agriculture, forestry, fisheries, energy, and mining. Actions that have been reported include developing sector-specific sustainability plans and regulatory measures, the promotion of green product labelling, corporate social responsibility practices and reporting, and promoting certification measures. Some Parties also referred to actions related to the expansion and support for organic farming practices, the development of biodiversity-friendly criteria in public procurement, and the promotion of strategies to address waste. The national reports also note actions related to the development of capacity to assess ecological limits as a means of informing policy decisions, as well as providing support to small and medium enterprises for sustainable development (Box 4.1). Commonly reported challenges to reaching this target were a lack of funding and capacity to upscale activities, and the limited involvement of industries and non-environmental ministries and agencies in plans and projects.

Humanity's use of biological resources continues to exceed the Earth's capacity to regenerate them, although the ratio has stabilized within the past decade. Before 2010, the ecological footprint had been steadily rising since it went into 'deficit' towards the end of the 1960s. Between 2011 and 2016, the ecological footprint has remained at approximately 1.7 times the level of biocapacity – in other words, requiring '1.7 Earths' to regenerate the biological resources used by our societies. The ecological footprint is estimated to be about 1.6 planets in 2020 – the decrease driven by the global economic slowdown resulting from the COVID-19 pandemic rather than a transition towards more sustainable production and consumption (Figure 4.1).[2, 3]

There has been a significant increase since 2010 in the number of countries with national legislation meeting the requirements of the Convention on International Trade in Endangered Species (CITES), reaching 101 countries (55% of CITES Parties) by 2019, an increase of 20 countries in the past decade. While this represents progress, it demonstrates that nearly half of all countries have not yet put in place the laws and regulations required to control such trade.[4]

The number of businesses taking biodiversity into account in their supply chains, reporting processes and activities appears to be increasing, though information is limited (Box 4.2). For example, an analysis of corporate reports and websites of cosmetic and food companies found

TARGET ELEMENTS

1. Sustainable production and consumption
2. Use within safe limits

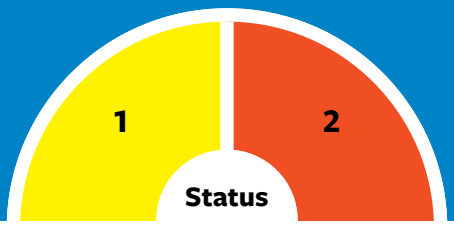
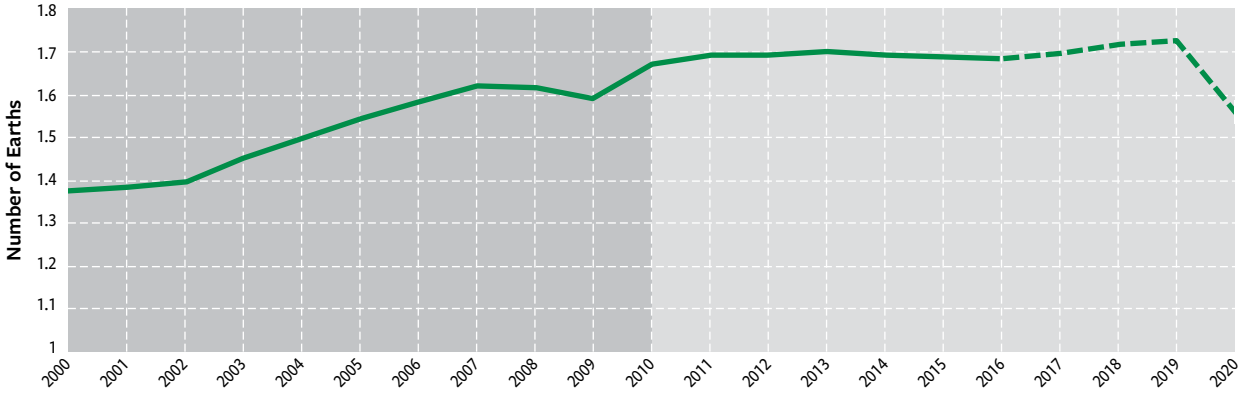


Figure 4.1. Trends in the Ecological Footprint



The data from 2017 to 2020 is an extrapolation based on preliminary information.

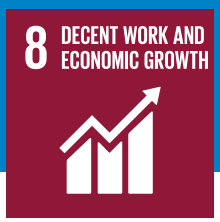
that references to biodiversity increased significantly over the current decade. Among those reviewed, the number of companies in the beauty sector that referred to biodiversity increased from 13% in 2009 to 49% in 2019. For food and beverage companies the corresponding figures were 53% in 2012 and 76% in 2019. While this trend is positive, the depth and quality of the information provided is limited and is mostly related to palm oil, deforestation and sustainable packaging.[5] Through the 10x20x30 Food Loss and Waste Initiative, 10 of the worlds largest food retailers and providers aim to halve rates of food waste by 2030.[6] Other private sector initiatives include the Global Partnership for Business and Biodiversity, launched by the CBD Secretariat in 2011, and now comprising 21 national and regional initiatives representing 62 countries and thousands of businesses[7], and Business for Nature,[8] led by the World Business Council For Sustainable Development, which is working to engage business, including in making biodiversity commitments.

The Red List Index (internationally traded species) shows a continued increase in extinction risk for those bird species associated with international trade, typically meeting the demand for pet birds kept in cages.[9] In addition, the Red List Index (impacts of utilization) shows that, on average, that use by people is increasing the degree to which species of birds, mammals and amphibians are threatened with extinction.[10]

The depletion of the biosphere is further illustrated by recent analysis showing that global stocks of natural capital declined per person by nearly 40% between 1992 and 2014, compared with a doubling of produced capital and a 13% increase in human capital over the same period.[11] The interim report of an independent review on the economics of biodiversity finds that efficiencies alone cannot lead to sustainable use of natural capital assets, and that long-term sustainability involves confronting difficult questions involving what and how we consume, how we manage our waste and the role of family planning and reproductive health. It also involves looking beyond conventional metrics such as Gross Domestic Product (GDP) in order to maximize wealth and human well-being.[12]

More than three quarters (77%) of NBSAPs contain targets related to Aichi Biodiversity Target 4. Of the Parties that have assessed progress towards their national targets, just over a third are

RELEVANT SDG TARGETS



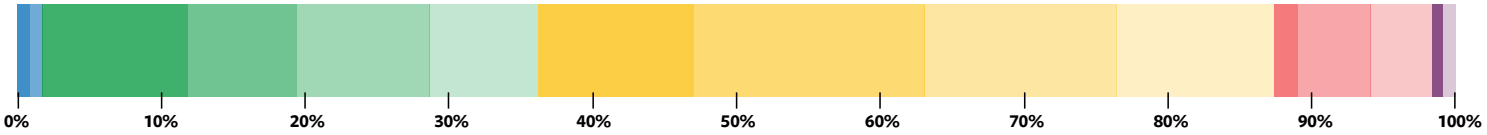
Target 8.4 - Improve progressively, through 2030, global resource efficiency in consumption and production and endeavour to decouple economic growth from environmental degradation...

Target 12.2 - By 2030, achieve the sustainable management and efficient use of natural resources.

Box 4.1. Examples of national experiences and progress:

- **Chile:** In 2016 a National Program for Sustainable Consumption and Production was put in place. The programme aims to decouple growth and development from environmental degradation, and to transition towards more sustainable consumption and production patterns. The programme has twelve lines of action and includes an action plan (2017-2020) to coordinate national and private initiatives.[13]
- **European Union:** In 2015, the European Commission adopted a Circular Economy Package, which includes measures to stimulate Europe's transition towards a circular economy, boost global competitiveness, foster sustainable economic growth and generate new jobs. The package has an associated action plan to address production, consumption, waste management and the market for secondary raw materials. The Circular Economy Package is complemented by various policy instruments, including a European wide strategy for plastics, as well as provisions for clear, credible and relevant information to inform consumer choices and means of monitoring the implementation.[14]
- **France:** In 2018 a circular economy roadmap was developed to accelerate the transition to a circular economy. The roadmap presents a set of measures that will allow all actors, through a set of 50 concrete actions, to better produce, consume, manage waste and mobilize all relevant actors. The roadmap will also contribute to the achievement of some targets under the Sustainable Development Goals.[15]
- **Mexico:** Numerous initiatives to mainstream biodiversity into the agricultural, forestry, fishing, and tourism sectors have been taken. These include the creation of a system for evaluating the ecological footprint of these actors, providing economic incentives that support productive diversification and the sustainable use of natural resources, and running campaigns to promote the reduction of waste and promote sustainability in consumption, production and supply chains. Other initiatives include strengthening the operation of monitoring and information systems, promoting comprehensive research with an ecosystem vision, developing an analysis of key information gaps for each sector relating to biodiversity and establishing work and research guidelines to generate missing information, and integrating conservation criteria for species at risk across sectors. Activities such as these have contributed and annual growth in green jobs of 1.19% between 2013 and 2017 across these sectors.[16]
- **Republic of Korea:** The Ministry of Environment established and operates the "Biz N Biodiversity Platform" (BNBP). The BNBP undertakes projects related to the identification of best practices in production processes that take biodiversity into account and establishes guidelines on biodiversity for the private sector, including training and information sharing on implementation of the Nagoya Protocol. There are 44 companies participating in the BNBP.[17]

Assessment of progress towards national targets



The colour bars show the percentage of Parties reporting a given level of progress towards their national targets. (Blue: exceeds target; Green: on track; Yellow: some progress; Red: no change; Purple: moving away from target). The intensity of the colour indicates alignment of national targets with the Aichi Target (Darker colours indicate close alignment).

on track to be reached (34%) or exceeded (2%). Another half (51%) have made progress towards their targets but some (11%) report that they are making no progress and a few (2%) are moving away from reaching the targets. It should be noted that fewer than a fifth of national targets (16%) are similar to the scope and ambition of the Aichi Target. Few refer to keeping the impact of the use of natural resources within safe ecological limits or address sustainable production and consumption specifically. Of the Parties which have assessed progress, only a tenth have national targets similar to Aichi Biodiversity Target 4 and are on track to meet them (see bar chart).

Box 4.2. Examples of private sector initiatives and engagement

- **Danone:** The multinational European food-products corporation based in Paris has established the WeActForWater initiative to bring healthy and safe drinking water to those who lack it. To do this the company has committed to responsible packaging, climate neutrality, and watershed preservation. Specific objectives include: halving the amount of virgin plastic used in packaging; carbon neutrality in Europe by 2025; enhancing watershed and wetlands preservation around the world; creating a fund to help 50 million people in developing countries access safe drinking water by 2030; and achieving B Corp certification for its water brands worldwide by 2022.[18]
- **Unilever:** in June 2020 the British-Dutch multinational consumer goods company committed to a range of actions: net zero emissions for all products by 2039; a deforestation-free supply chain by 2023; empowering farmers and smallholders to protect and regenerate their environment with a new Regenerative Agriculture Code for all suppliers; putting in place water stewardship programmes in 100 locations in water-stressed areas by 2030; and investing €1 billion over 10 years in a climate and nature fund.[19]

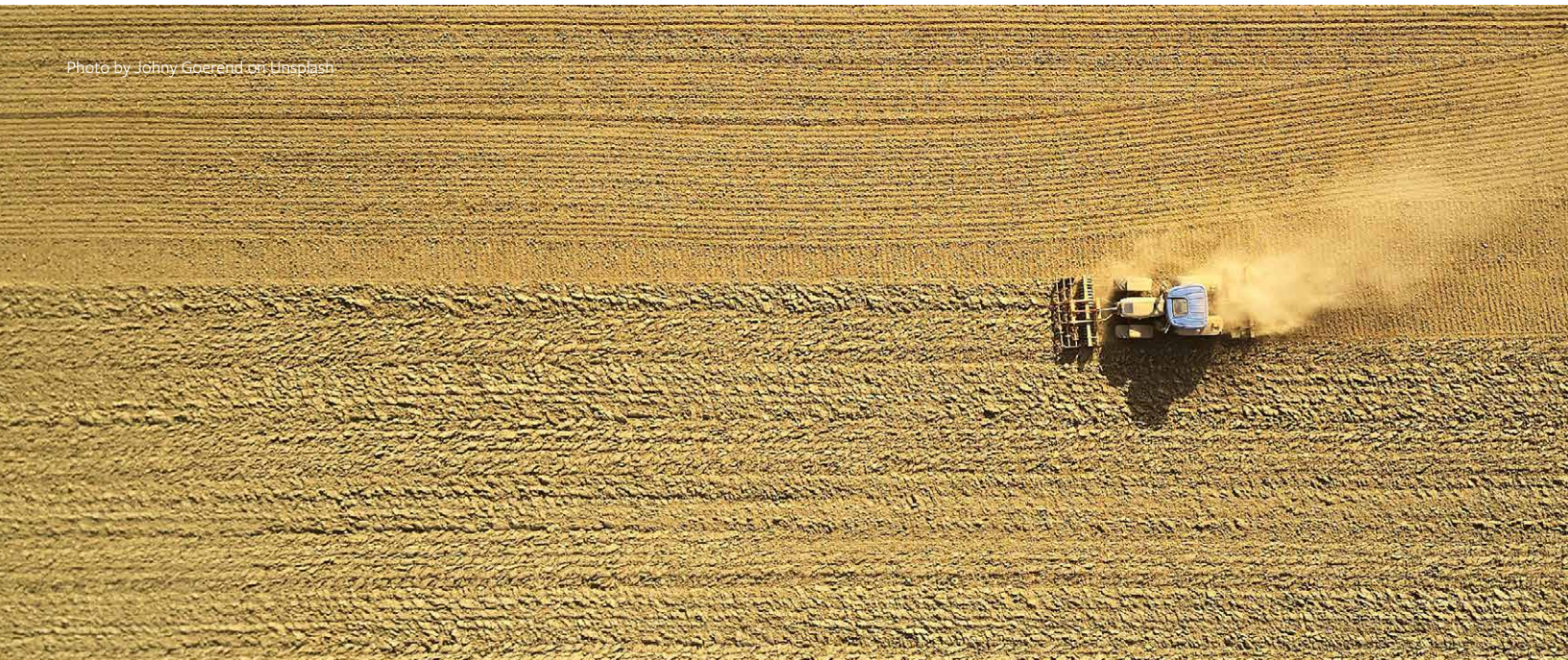


Photo by Johny Goerend on Unsplash

HABITAT LOSS HALVED OR REDUCED

By 2020, the rate of loss of all natural habitats, including forests, is at least halved and where feasible brought close to zero, and degradation and fragmentation is significantly reduced.

Summary of target achievement

The recent rate of deforestation is lower than that of the previous decade, but only by about one third, and deforestation may be accelerating again in some areas. Loss, degradation and fragmentation of habitats remains high in forest and other biomes, especially in the most biodiversity-rich ecosystems in tropical regions. Wilderness areas and global wetlands continue to decline. Fragmentation of rivers remains a critical threat to freshwater biodiversity. **The target has not been achieved** (*high confidence*).[1]

Parties report taking various actions to reach their national targets associated with Aichi Biodiversity Target 5. Some Parties had an emphasis on addressing deforestation, while others focussed on reforestation, restoration and on combatting desertification. Commonly-reported actions were the establishment of protected areas, the planting of trees and other vegetation, and the identification of priority areas for conservation. Parties also referred to actions to promote sustainable resource and habitat management, actions to better recognize land tenure and incentivize sustainable management, and efforts to increase the understanding of the value of ecosystems. Some Parties referred to their use of integrated land use planning, the development of guidelines, for example on issues related to fire management strategies and restoration, the promotion of agri-environmental approaches to habitat management, and the promotion of inter-departmental and inter-institutional cooperation. Parties also reported on actions they are taking to address degradation and fragmentation, including establishing protected area buffer zones, undertaking restoration, developing green corridors, and promoting ecosystem connectivity (Box 5.1).

According to the 2020 Global Forest Resources Assessment of the United Nations Food and Agriculture Organization (FAO), the rate of global deforestation between 2015-2020 was around 10 million hectares per year. This compares with deforestation rates of 15 million hectares per year in the decade after 2000, and 12 million hectares per year from 2010-2015. Thus, the deforestation rate fell (20%) over the five years following the establishment of the Aichi Biodiversity Targets, with an additional but smaller reduction (17%) in the second half of the decade. While rates during the decade overall are about 27% lower than in the previous one, the most recent rates are 33% lower than the previous decade. Therefore, while deforestation continues to decline, the rate of the decline is slowing. There are also signs of reversal in some regions such as the Brazilian Amazon.

The rate of net forest loss (deforestation combined with forest expansion) was about 10% lower during 2010-2020 than in the previous decade (4.7 million hectares per year compared with 5.2 million hectares per year during 2000-2010), and the rate of net forest loss has fallen by about 40% since the annual average of 7.8 million hectares in the 1990s (Figure 5.1). The relatively small change in the past decade is due to decline in forest expansion since 2010, even though deforestation has continued to fall.

TARGET ELEMENTS

1. Forest loss at least halved
2. Loss of other habitats at least halved
3. Degradation and fragmentation reduced

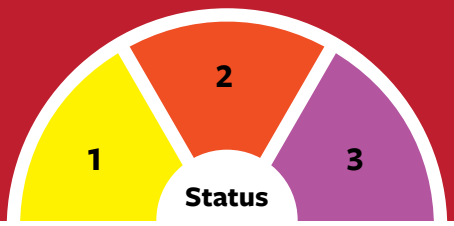
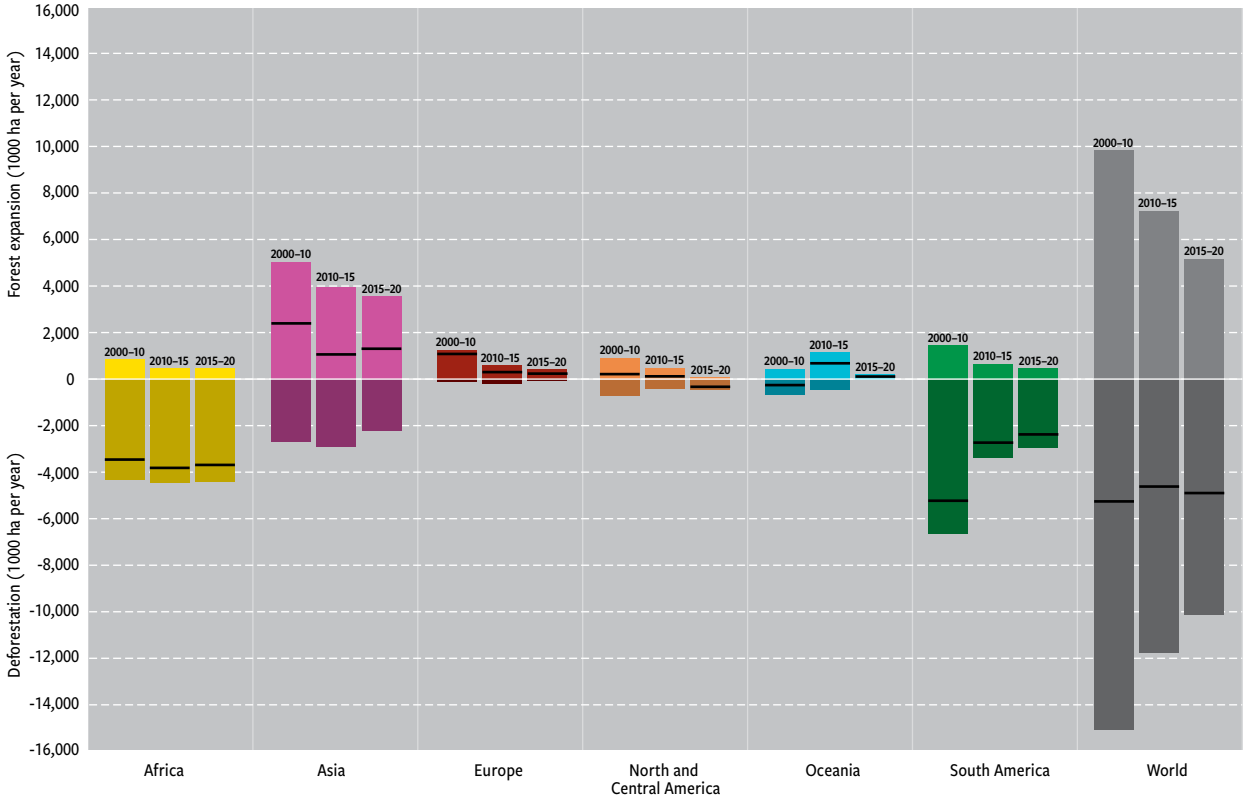
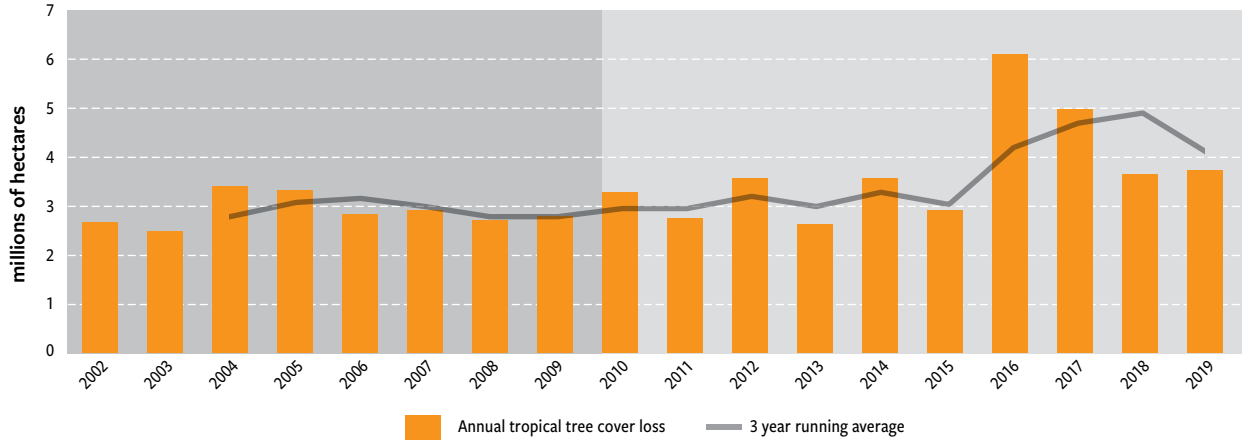


Figure 5.1. Annual rate of global forest expansion and deforestation.[2]



The black line on each bar shows the difference between forest expansion and deforestation (net forest loss/gain).

Figure 5.2. Loss of tree cover from tropical primary forests[3]



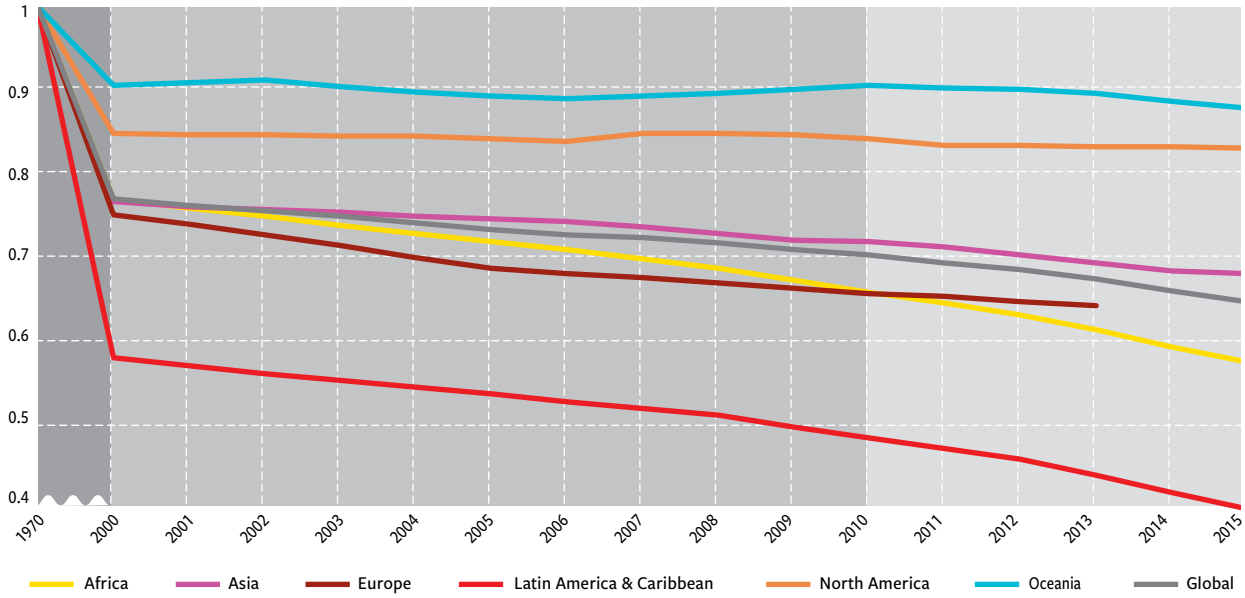
RELEVANT SDG TARGET

Target 15.1 - By 2020, ensure the conservation, restoration and sustainable use of terrestrial and inland freshwater ecosystems and their services, in particular forests, wetlands, mountains and drylands, in line with obligations under international agreements

Target 15.2 - By 2020, promote the implementation of sustainable management of all types of forests, halt deforestation, restore degraded forests and substantially increase afforestation and reforestation globally

Target 15.5 - Take urgent and significant action to reduce the degradation of natural habitats, halt the loss of biodiversity and, by 2020, protect and prevent the extinction of threatened species

Figure 5.4. Wetland Extent Trends (WET) index relative to 1970 showing change from 2000-2015 in the extent of natural wetlands in six regions and globally.[4]



The indicator is indexed to a value of 1 in 1970. Note that the time series has been truncated between 1970 and 2000.

There are widely varying trends in different countries and regions of the world, with net forest gains in Asia, Oceania and Europe contrasting with continued net forest losses in Africa and South America. In the past decade, Africa has replaced South America to become the continent with the highest rate of net forest loss. The rate of net forest loss increased in Africa in each of the three decades since 1990, while since 2010 the rate of net forest loss in South America has roughly halved.[5]

A somewhat different picture emerges from analysis of satellite data through the Global Forest Watch initiative. This showed that the average annual loss of tree cover increased globally from approximately 17 million hectares per year in the first decade of this century to more than 21 million hectares per year during the period 2011-2019.[6] In part, this discrepancy is due to different definitions and methodologies regarding what is being measured.[7] Loss of tree cover from tropical primary forests has been particularly high in the second half of this decade (Figure 5.2). However, rates of primary forest loss have fallen in some countries.

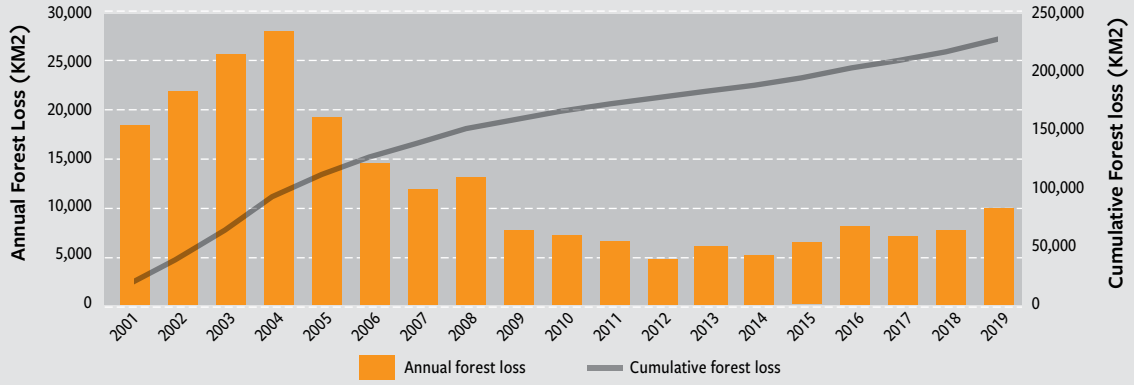
A global database of mangrove forest cover developed in 2016 found that between 2000 and 2012 the rate of deforestation of mangrove had substantially decreased at the global level, but remained high in Southeast Asia where half of all mangroves are located. Figures are not yet available to assess the rate of mangrove loss during most of the period covered by this target.[8]

The area covered by natural wetlands has continued to decline, with the Wetland Extent Trends (WET) index having reduced by an average of 35% worldwide between 1970 and 2015. Losses have been relatively greater in coastal areas than

Box 5.1. Examples of national experiences and progress

- **Brazil:** Deforestation in the Brazilian part of the Amazon biome has been monitored consistently using high-resolution satellite images since the 1990s by Brazil's National Space Research Institute (INPE). The rate of deforestation fell by 84% from a high in 2004 to a low in 2012 thanks to Brazil's Action Plan for Deforestation Prevention and Control in the Legal Amazon (Figure 5.3). Over the current decade as a whole deforestation rates are less than half those in the previous decade. However, progress has not been sustained in recent years, with the most recent figures from satellite imagery showing that deforestation is on an upward trend. Deforestation of the Brazilian Amazon in 2019 showed the highest level since 2008, reaching over one million hectares.[9] Preliminary data based on real-time deforestation alerts for the early months of 2020 showed a further substantial increase compared with 2019.

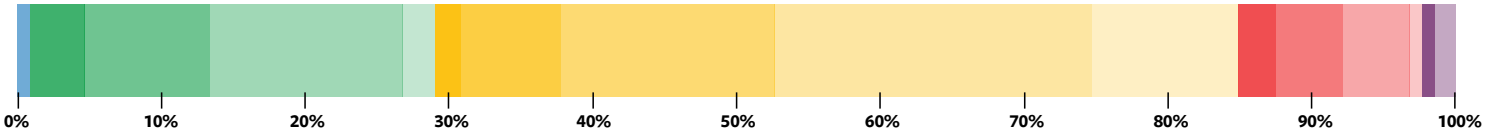
Figure 5.3. Annual deforestation rates for the Brazilian Amazon.[10]



- **Côte d'Ivoire** and **Ghana:** From 2018 to 2019, the rate of forest loss was halved in both countries. Several policies and actions have contributed to this success including the Cocoa and Forest Initiative. The initiative is a partnership between the two countries and the World Cocoa Foundation, the Sustainable Trade Initiative, the International Sustainability Unit of the Office of the Prince of Wales, and private cocoa companies, to create an enabling environment for the cocoa sector to contribute positively to the preservation of forests and the economy of the two countries. The initiative takes a holistic approach to deforestation in cocoa production with a focus on sustainable production and farmers' livelihoods, forest protection and restoration, and community engagement and social inclusion.[11]
- **Indonesia:** Since 2016 the rate of primary forest loss has been decreasing and in 2019 it was 5% lower than in 2018. This decline has been supported by various policies including a moratorium on permits for the use of primary natural forests. As a result of the moratorium, no rights to production or other use will be granted on a forest area of 66.4 million hectares.[12]

Richard Whitcombe/Shutterstock

Assessment of progress towards national targets



The colour bars show the percentage of Parties reporting a given level of progress towards their national targets. (Blue: exceeds target; Green: on track; Yellow: some progress; Red: no change; Purple: moving away from target). The intensity of the colour indicates alignment of national targets with the Aichi Target (Darker colours indicate close alignment).

inland areas. Latin America and the Caribbean showed the greatest loss of wetlands. During the same period, the area covered by human-made wetlands more than doubled. The rate of wetland loss remained fairly constant after 2011 compared with the previous period (Figure 5.4).[13] Permanent surface water was lost from an area of almost nine million hectares between 1984 and 2015, approximately the equivalent of Lake Superior. Seventy per cent of this loss was located in the Middle East and Central Asia, linked to drought and human actions including damming and diverting rivers, and unregulated withdrawal. Over the same period, new permanent bodies of water covering more than 18 million hectares have formed elsewhere, largely from reservoir filling.[14]

In addition to loss in extent, habitats suffer significant and continuing fragmentation and other forms of degradation. A recent study of more than 130 million tropical forest fragments on three continents found that forest fragmentation was close to a critical point, beyond which fragments will greatly increase in number and reduce in size, but that these consequences could be partly mitigated by reforestation and forest protection.[15]

Rivers are becoming increasingly fragmented, further threatening freshwater biodiversity. An assessment in 2019 of the connectivity status of 12 million kilometres of rivers globally found that only 37 per cent of rivers longer than 1,000 kilometres remained free-flowing over their entire length, and just 23 per cent flowed uninterrupted to the ocean.[16]

Overall, an estimated 3.3 million square kilometres of wilderness has been lost since the early 1990s, accounting for nearly one tenth of the total wilderness remaining at that time. In this context, wilderness refers to landscapes that are largely intact and relatively free of human disturbance – although many are occupied by and essential for indigenous peoples and local communities. Wilderness provides critical strongholds for endangered biodiversity, for carbon storage and sequestration, for regulating local climates and for supporting many of the world's most marginalized communities. The largest losses of wilderness took place in South America (29.6% loss) and Africa (14% loss). By 2015, less than one quarter of the Earth's land surface (23.2%) was estimated to remain as wilderness.[17]

The Red List Index for species specialized to specific habitats provides a further indication of the continuing impact on biodiversity from loss and degradation of habitat. The index for forest specialist species shows that species of birds, mammals, amphibians and cycads dependent on forests for their habitat are, on average, moving closer to extinction (see also Aichi Target 12).[18]

More than three quarters (79%) of NBSAPs contain targets related to Aichi Biodiversity Target 5. Of the Parties that have assessed progress, fewer than a third are on track to reach (28%) or exceed (1%) them. A further 56% of Parties have made progress towards their targets but 13% report no progress and a few (2%) are moving away from it. Fewer than a tenth of national targets (8%) are similar in scope and level of ambition to the Aichi Target. The targets that reference specific habitats most commonly refer to forests. Mangroves, coral reefs, rivers, rangeland and marine environments are also mentioned, but to a much lesser extent. Few national targets specify the percentage by which the rate of habitat loss is to be reduced, and few explicitly refer to habitat degradation or fragmentation. Only 4% of reporting Parties have national targets of similar scope and ambition to Aichi Biodiversity Target 5 and are on track to meet them (see bar chart).

SUSTAINABLE MANAGEMENT OF AQUATIC LIVING RESOURCES

By 2020 all fish and invertebrate stocks and aquatic plants are managed and harvested sustainably, legally and applying ecosystem based approaches, so that overfishing is avoided, recovery plans and measures are in place for all depleted species, fisheries have no significant adverse impacts on threatened species and vulnerable ecosystems and the impacts of fisheries on stocks, species and ecosystems are within safe ecological limits.

Summary of target achievement

While there has been substantial progress towards this target in some countries and regions, a third of marine fish stocks are overfished, a higher proportion than ten years ago. Many fisheries are still causing unsustainable levels of bycatch of non-target species and are damaging marine habitats. **The target has not been achieved** (*high confidence*).[1]

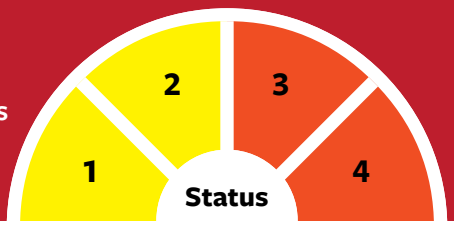
Actions to reach this target described in national reports generally focus on: better assessment of fish stocks; the development of regulatory measures, including for issues related to illegal, unreported and unregulated fishing, fishing practices and equipment; and better monitoring of fishing vessels and by-catch. Actions related to ensuring the health of fish stocks include regulations on fish size, seasonal or periodic fishing bans, the establishment of marine protected areas and the restoration of fish habitat. Some national reports also refer to actions related to the promotion and support of community ownership and management of fisheries (Box 6.1).

Additional information on measures taken by countries is contained in the responses provided to FAO on the implementation of the Code of Conduct for Responsible Fisheries (CCRF), which since 2016 is also used to report on progress towards Aichi Biodiversity Target 6 and relevant SDG targets. The responses indicate an increase in the rate of development and use of fishery management plans and in the use of the ecosystem approach to fisheries, although these are less developed for inland water fisheries than for marine fisheries. Of the countries reporting, about 95% indicate that they have measures providing for the protection of endangered species and prohibiting destructive fishing methods and practices in marine fisheries. However, information of the impacts of these measures is incomplete.[2] From 2006 to 2017, Regional Fishery Management Organizations have progressively expanded the scope of governance measures and controls to include biodiversity-related considerations. These are examples of increased attention to the mainstreaming of biodiversity in fisheries.[3]

The proportion of assessed marine fish stocks that are fished within biologically sustainable levels has continued to decline during this decade, falling from 90% in 1974, and 71% in 2010 to 65.8% in 2017 (although the latter represents 78.7% by weight in landings). Thus, about one-third of the world's stocks are overfished (Figure 6.1).[4] However there is a great deal of variation among regions, and among stocks (species). The area with the highest percentage of unsustainably fished stocks is the Mediterranean and Black Sea (62.5%) followed by the Southeast Pacific (54.5%) and Southwest Atlantic (53.3 %). In contrast, the Eastern Central, Northeast, Northwest and Western Central parts of the Pacific Ocean had the highest percentage of sustainably fished stocks (between 78% and 87%) (Figure 6.2). Of the ten species with the largest

TARGET ELEMENTS

1. All stocks are managed sustainably
2. Recovery plans and measures are in place for all depleted species
3. Fisheries have no significant adverse impacts
4. The impacts of fisheries are within safe ecological limits



landings since 1950, three had higher than average proportions of overfished stocks: Chilean jack mackerel, Atlantic cod and Japanese pilchard. The status of tuna stocks has slightly improved overall, although 33% of them are still overfished.[5]

Despite the overall negative trends globally, there are important signs of progress across fisheries that have been subject to scientific stock assessments. Such fisheries have been increasing in number and now account for about half of global marine catches. In these fisheries, abundance of fish stocks has been increasing and, on average, exceeds levels of biomass that provide maximum sustainable yields (MSY) (Figure 6.3). A number of these fisheries have been rebuilt by reducing fishing effort to allow stocks to recover.[6] Such progress is highly correlated with indicators of fisheries management, including stock assessments, catch limits, and enforcement; and there is a very strong negative association between fish stock recovery and subsidies that increase fishing effort.[7]

Figure 6.1. Global trends in the proportion of sustainably-fished fish stocks[8]

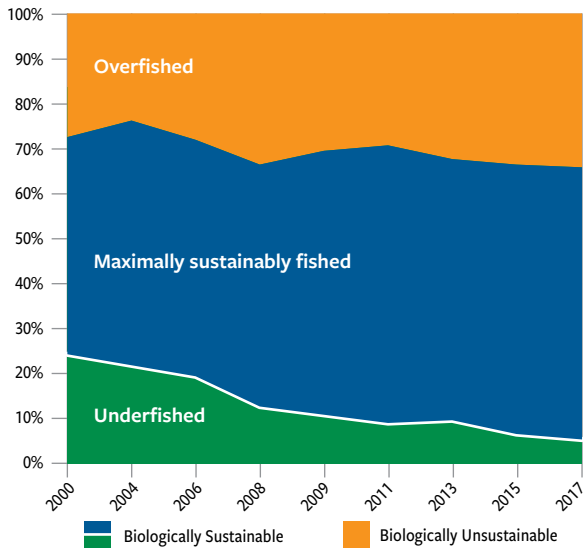
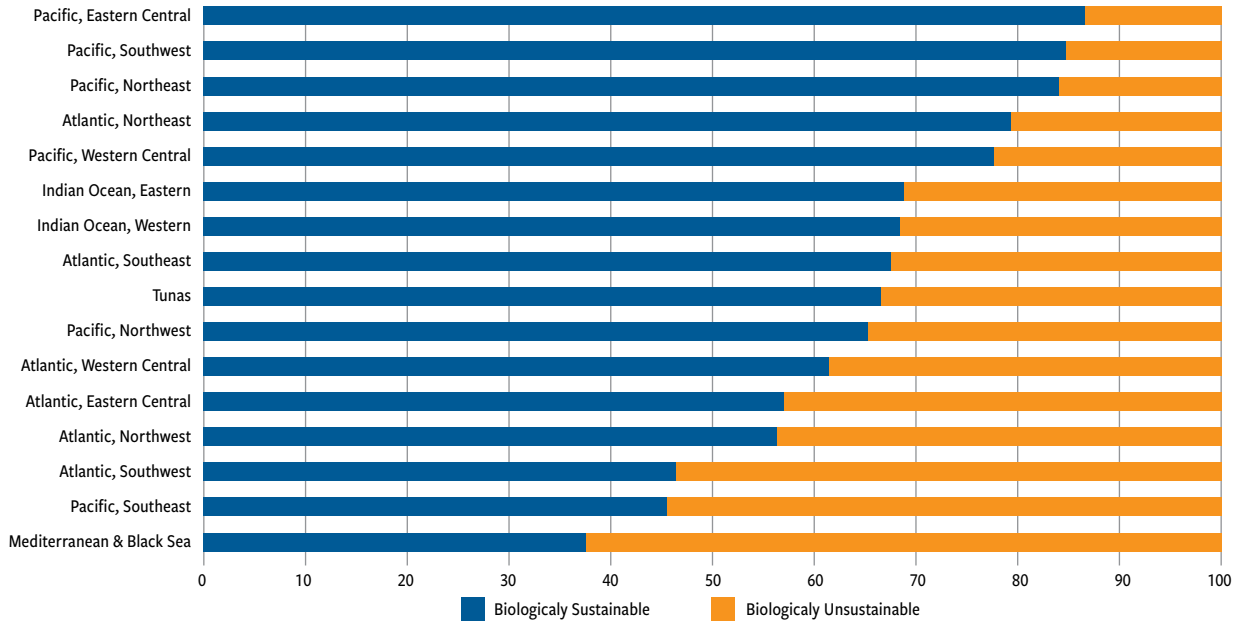


Figure 6.2. Percentage of marine fish stocks within safe biological limits, over time and by ocean area. Tuna stocks are singled out as they are largely migratory and straddle statistical areas.[9]



RELEVANT SDG TARGET

Target 14.2 - By 2020, sustainably manage and protect marine and coastal ecosystems to avoid significant adverse impacts, including by strengthening their resilience, and take action for their restoration in order to achieve healthy and productive oceans

Target 14.4 - By 2020, effectively regulate harvesting and end overfishing, illegal, unreported and unregulated fishing and destructive fishing practices and implement science-based management plans, in order to restore fish stocks in the shortest time feasible, at least to levels that can produce maximum sustainable yield as determined by their biological characteristics

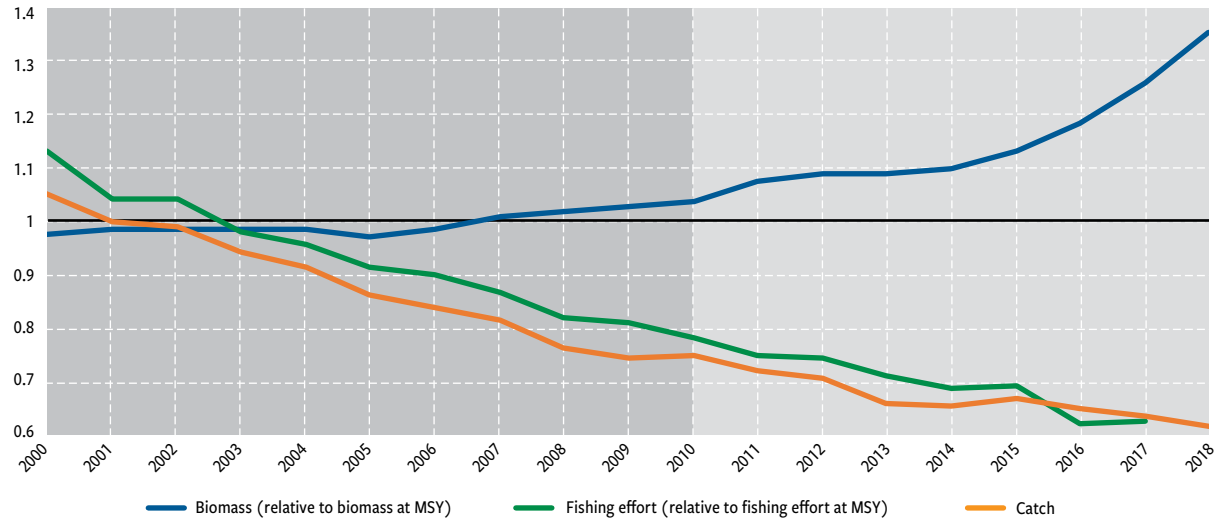
For the other half of the world's fisheries, where stocks are not scientifically assessed, evidence suggests that stocks are in poor shape. These include most areas in South and Southeast Asia and in East Africa.[10] However, there have also been some notable successes recently in reducing overfishing by addressing illegal, unreported and unregulated fishing. The development of vessel monitoring systems and lists of offending vessels has improved the tracking of fishing operations, and there are prospects for further action to be taken in the framework of the Port State Measures Agreement which entered into force in 2016.[11]

Rivers, lakes, wetlands and other inland waters are very biodiverse, and living aquatic resources extracted from these ecosystems (inland fisheries) benefit people by providing food for billions and livelihoods for millions of people worldwide. Inland water ecosystems are under multiple and synergistic pressures; their effective management is therefore integral to the conservation of freshwater biodiversity. However, little global-level information is available about the current state and the sustainability of inland water fisheries.[12]

The volume of fish catch certified under the Marine Stewardship Council (MSC) – a market-based instrument – has more than doubled since 2010. In 2019, 16% of wild-caught seafood consumed worldwide, accounting for 11.9 million tonnes per year, was landed by MSC certified fleets based on verifiable commitments towards more sustainable practices (Figure 6.4). However, there is wide regional variation, with the proportion of fisheries with certification being much higher in temperate ocean regions than in the tropics.[13]

The Red List Index (impacts of fisheries) tracks trends in the status of mammals, birds and amphibians driven by negative impacts of fisheries, such as bycatch, mortality in fishing gear and disturbance from fishing activities, or the positive impacts of measures to manage fisheries sustainably. This index shows that on average, the extinction risk of species groups impacted by

Figure 6.3. Trends in relative biomass, fishing effort and catch in fisheries subject to formal stock assessments.[14]

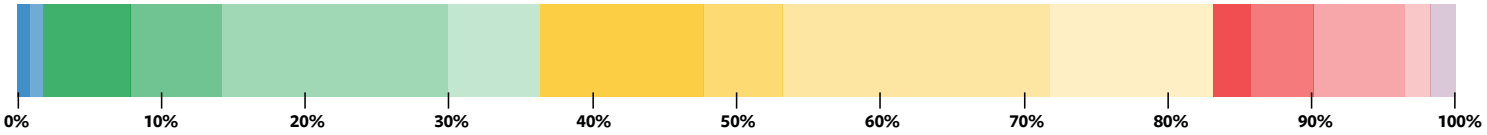


Box 6.1. Examples of national experiences and progress:

- **Belize:** In 2016, Belize established the Managed Access Program, a rights-based approach, to reduce overfishing and improve the status of marine biodiversity while improving the livelihood of fishers, by restricting the use of fishing areas to traditional users. Under the program nine management areas, covering over 11,000 km^2, or 60% of Belize's marine territorial area, were created. Fishers need a licence to fish in the area and are required to record information in logbooks. This information, which includes the quantity and weight of the fish species caught, the fishing gear used, and the length of fishing trips, is used to inform decisions on the management of the fishery.[15]
- **Cambodia:** To support fisheries management and contribute to poverty reduction, the Ministry of Agriculture, Forest and Fisheries has promoted the establishment of community fisheries with delegation of rights to fishers so that they can appropriately manage their own fishery areas. By 2017, 475 inland and 41 marine community fisheries had been established involving more than 330,000 people, 35% of whom are women.[16]
- **Chile:** A number of laws to related to the precautionary principle regulate fishing practices. For example, one law prohibits bottom-trawling activities that affect vulnerable marine ecosystems, while another sets out considerations for avoiding or eliminating overexploitation and excessive fishing, reducing discards and bycatch, and for the management of fishing resources according to the ecosystem approach. In 2017, a responsible consumption and sustainable fishing program (*Programa de Consumo Responsable y Pesca Sustentable* (*Sello Azul*)) was established to certify, recognize and distinguish people and companies that promote the responsible extraction and consumption of marine resources, as well as to combat illegal fishing. As of 2019, 66 restaurants and 7 selling facilities have this certification.[17]
- **Indonesia:** A number of policies and laws have been put in place to make fisheries more sustainable, with a major focus on reducing illegal, unreported and unregulated (IUU) fishing. In 2017, 163 cases of IUU fishing were subject to legal proceedings and more than 300 fishing vessels caught fishing illegally, most of them from other countries, were sunk. A national Illegal Fishing Eradication Task Force cooperates with other countries as well as Interpol and the United Nations Office on Drugs and Crime to gather information about foreign vessels entering Indonesian waters. These efforts have decreased overall fishing pressure, while allowing an increase in catch by local, mostly small-scale fishers.[18]
- **South Africa:** In the framework of the ecosystem approach, restrictions have been introduced for the deep sea demersal trawl sector, including on the use of fishing gear, catch size, fishing practices and restrictions in specific fishery management areas and marine protected areas, in order to reduce damage to the sea bed and reduce bycatch. Application of the ecosystem approach has also been instrumental in reducing seabird mortality through requirements for the deployment of tori lines (bird-scaring lines), and the management of offal discharge, among other things.[19] In 2008, some 18,000 seabirds were dying each year from being caught in fishing gear. Following collaboration between Birdlife International's Albatross Task Force and the MSC-certified cooperative fishery, seabird bycatch from the South African trawl fishery was reduced by 90 per cent by 2014, and the number of albatross deaths had fallen by 99 per cent.[20]

Photo by Tadeu JNR on Unsplash

Assessment of progress towards national targets



The colour bars show the percentage of Parties reporting a given level of progress towards their national targets. (Blue: exceeds target; Green: on track; Yellow: some progress; Red: no change; Purple: moving away from target). The intensity of the colour indicates alignment of national targets with the Aichi Target (Darker colours indicate close alignment).

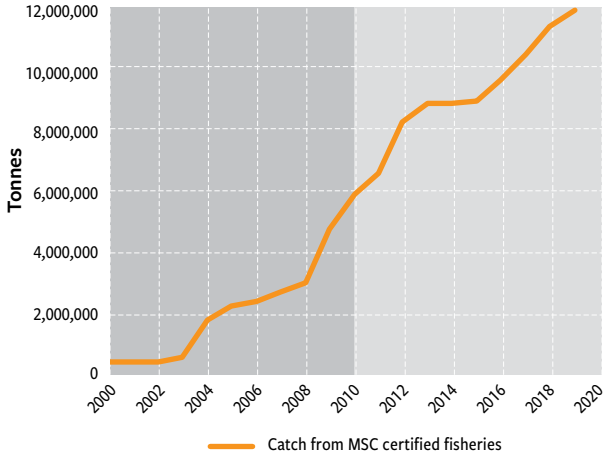
fisheries is increasing over time. Analyses of the drivers of these shifts in status show that, overall, fisheries are having a net negative impact, with the species of declining status outnumbering those improving.[21] Reef sharks, for example, have been impacted by fisheries, now being completely absent from reefs in several nations. However, fishery measures including shark sanctuaries, closed areas, catch limits and bans on the use of gillnets and longlines are associated with a substantially higher relative abundance of reef sharks.[22]

With regard to vulnerable ecosystems, some progress has been made in designating and protecting areas of the High Seas as Vulnerable Marine Ecosystems (VMEs).[23] Various regional fisheries management organizations have designated VMEs in their management areas, and the VME approach is now firmly embedded in the management of deep-sea fisheries in marine areas beyond national jurisdiction.

Significant progress has been made under the Convention to describe Ecologically and Biologically Significant Marine Areas (EBSAs). More than 320 EBSAs have been described through a comprehensive and cross-sectoral process involving 15 regional workshops and covering more than 75% of the ocean.[24] The identification and mapping of EBSAs often uses information from fisheries management systems, including information on VMEs. Although EBSAs are not management tools and do not prescribe any specific kinds of management measures but rather focus only on ecological and biological features, information from EBSA descriptions can be used to support improved fisheries management and cross-sectoral coordination.

As noted under the analysis for Target 11, there has been significant progress in developing a network of marine protected areas during the decade.

Figure 6.4. Growth in the volume of global fish catch managed by fisheries certified by the Marine Stewardship Council.[25]



Governments and authorities are assessing area-based management tools within the fisheries domain for possible identification and reporting as 'other effective area-based conservation measures' (OECMs) (See Fisheries and Oceans transition in Part III).

About two-thirds of NBSAPs (63%) contain targets related to Aichi Biodiversity Target 6. Of the Parties which have assessed progress towards their national targets, more than a third report that they are on track to be reached (35%) or exceeded (2%). Almost half (47%) have made progress towards their targets but several (15%) report no progress and a few (2%) are moving away from the target. It should be noted that only about 13% of national targets are similar in scope and ambition to that set out in the Aichi Target. Few address recovery plans for depleted species, avoiding adverse impacts on threatened or vulnerable ecosystems, or keeping the impacts of fisheries at safe ecological limits. Only 7% of reporting parties have national targets of similar scope and ambition to Aichi Biodiversity Target 6 and are on track to meet them (see bar chart).

SUSTAINABLE AGRICULTURE, AQUACULTURE AND FORESTRY

By 2020 areas under agriculture, aquaculture and forestry are managed sustainably, ensuring conservation of biodiversity.

Summary of target achievement

There has been a substantial expansion of efforts to promote sustainable agriculture, forestry and aquaculture over recent years, including through farmer-led agroecological approaches. The use of fertilizers and pesticides has stabilized globally, though at high levels. Despite such progress, biodiversity continues to decline in landscapes used to produce food and timber; and food and agricultural production remains among the main drivers of global biodiversity loss. **The target has not been achieved** (*high confidence*).[1]

Parties report various actions taken with a view to making ***agriculture*** more sustainable. These include promoting sustainable soil management, the rehabilitation and restoration of degraded habitats, promoting research on crop efficiency and resilience, support and promotion of organic agriculture and agro-forestry, encouraging agricultural diversification, and improved watershed management. Some national reports note actions to promote and subsidize the use of climate- resilient crops, incentives to incorporate modern practices into agricultural systems, the promotion of improved irrigation techniques, encouraging lower fertilizer use, and the improvement of *ex situ* conservation and seed banks (Box 7.1). Reports by countries to the Food and Agriculture Organization (FAO) on the State of the World's Biodiversity in Food and Agriculture also describe an increasing use of biodiversity-friendly practices.[2]

A 2018 study estimated that 163 million farms (29% of all worldwide) were practising some form of sustainable intensification on 453 million hectares of agricultural land (9% of the worldwide total). This was based on the adoption of one or more of seven types of sustainable intensification: integrated pest management; conservation agriculture; integrated crop and biodiversity; pasture and forage; trees on farms; irrigation management; and small or patch systems (see Sustainable Agriculture Transition).[3]

The UN Committee on World Food Security (CFS) has recently developed policy recommendations on Agroecological and Other Innovative Approaches.[4] Many shifts to low-external input farming systems have been led by small farmer movements, for example 'zero budget natural farming' being rolled out on a large scale in India (Box 7.1). The Satoyama Initiative, bringing together local knowledge and practices from around the world for living in harmony with nature, is another approach to promote socio-ecological production landscapes and seascapes.[5]

While organic farming systems generally produce lower yields compared with conventional agriculture, they can be more profitable and environmentally friendly, and deliver equally or more nutritious foods. Organic farming may also deliver greater ecosystem services and social benefits.[6] From 2010 to 2018, the area of land under organic agriculture, and the number of organic producers, both doubled (1.4 million producers and 35 million hectares in 2010; 2.8 million producers and 72 million hectares in 2018).[7]

While the rate of use (per area) of pesticides and nitrogen-based fertilizers has stabilized this decade, globally and in most regions, rates are higher than the previous decade by about 14% and 12% respectively (see Aichi Target 8).[9] The area of cropland has grown by about 5% compared to the previous

TARGET ELEMENTS

1. Agriculture is sustainable
2. Aquaculture is sustainable
3. Forestry is sustainable

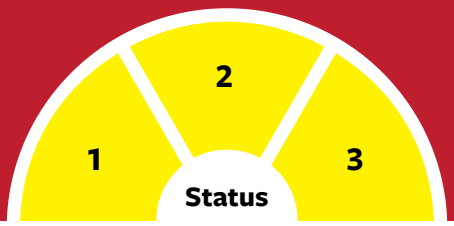
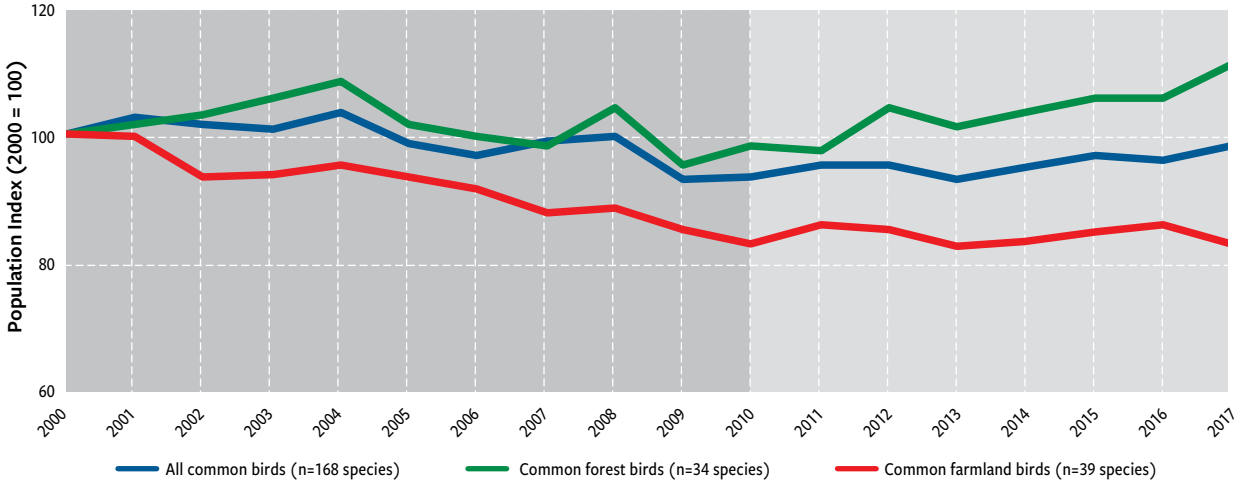


Figure 7.1. The European wild bird indicators



The European wild bird indicators from the Pan-European Common Bird Monitoring Scheme, showing trends over 2000 - 2017 in abundance of species in all common bird species as well as common bird species specializing in forest and farmland habitats. The indicators are set against a 2000 benchmark.[8]

decade, now accounting for 12% of total land area, though this increase is more than compensated by a reduction in area of permanent meadows and pastures. In total, agriculture now occupies about 37% of total land area.[10] Total greenhouse gas emissions from agriculture have grown by some 7% compared to the previous decade.[11]

Overall, unsustainable monoculture-based agriculture, with high levels of external inputs, continues to drive biodiversity loss. In addition to deforestation and loss of habitat through expansion of agriculture, impacts include soil degradation and erosion, impoverishment of soil biodiversity, loss of genetic diversity, depletion of nutrients and water, contamination of soil and water, and emergence of new pests and diseases.[12]

Agricultural intensification remains one of the main causes of biodiversity loss and ecosystem degradation in Europe[13] and efforts under the Common Agricultural Policy to address this have not been sufficient to reduce the decline.[14] For example, wild bird indicators from the PanEuropean Common Bird Monitoring Scheme (PECBMS) show that bird species specializing in farmland habitats have on average declined in abundance over recent years, while populations of bird species overall have been roughly stable, and forest specialist species have even shown signs of recovery (Figure 7.1).[15] The European Union has recently published new strategies for biodiversity and the food system.[16]

The 2019 FAO report on the State of the World's Biodiversity in Food and Agriculture concluded that many key components of biodiversity in food and agriculture at genetic, species and ecosystem levels were in decline (see also Aichi Target 13). Based on the reports of countries on the trends of micro-organisms, invertebrates, vertebrates and plants across 12 production systems of agriculture, forestry and aquaculture, 33% indicated decreasing trends, 15% stable trends and 19% increasing

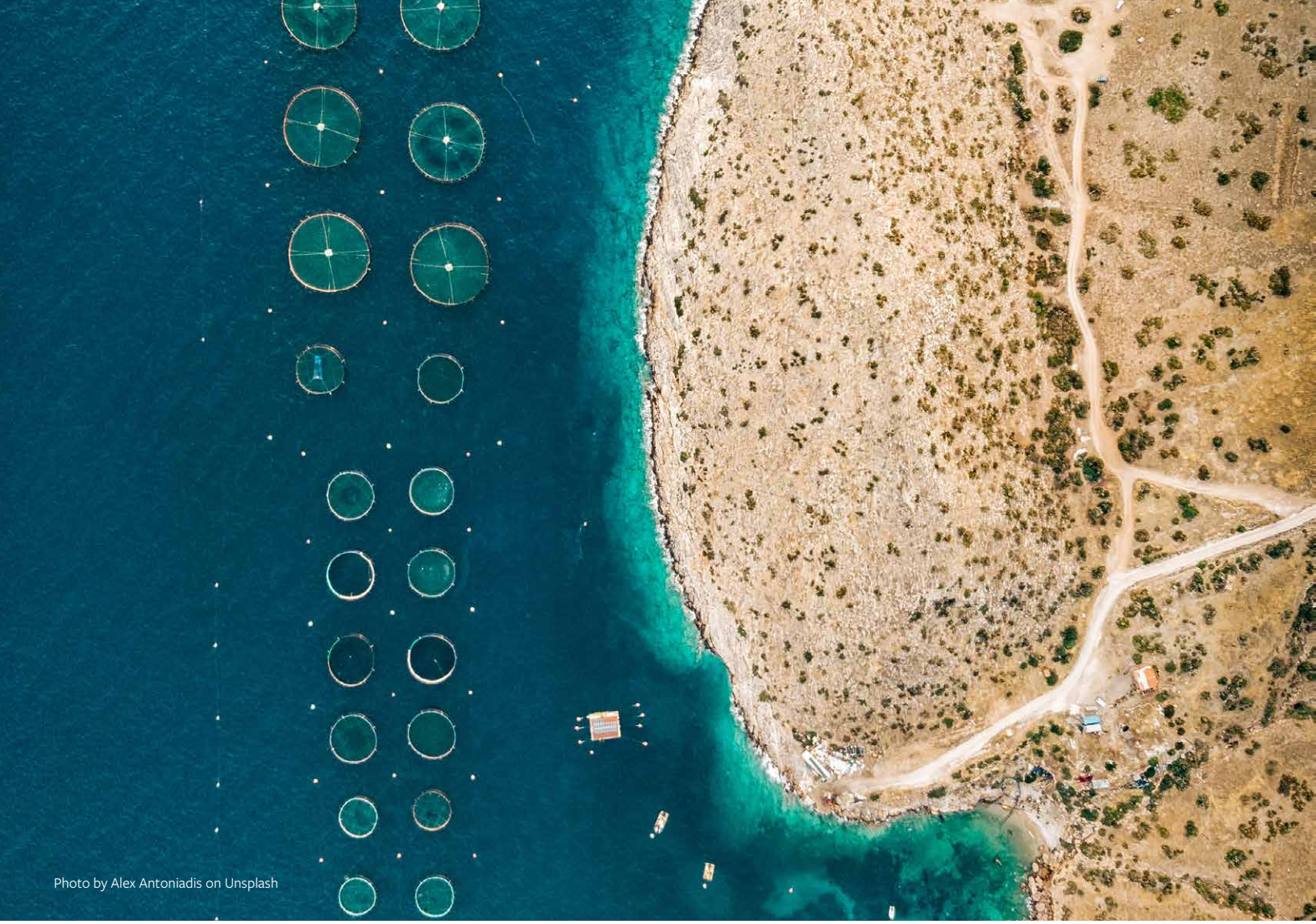


Photo by Alex Antoniadis on Unsplash

trends, with the remainder indicating lack of information (Figure 7.2).[17]

The decline of agricultural biodiversity may, in some cases, compromise agricultural production. For example, the decline in the abundance and diversity of pollinating species contributes to lower yields of pollinator-dependent crops (see also Aichi Target 14).[18] The decline of species that are natural enemies of pests may lead to lower production and increased costs.[19]

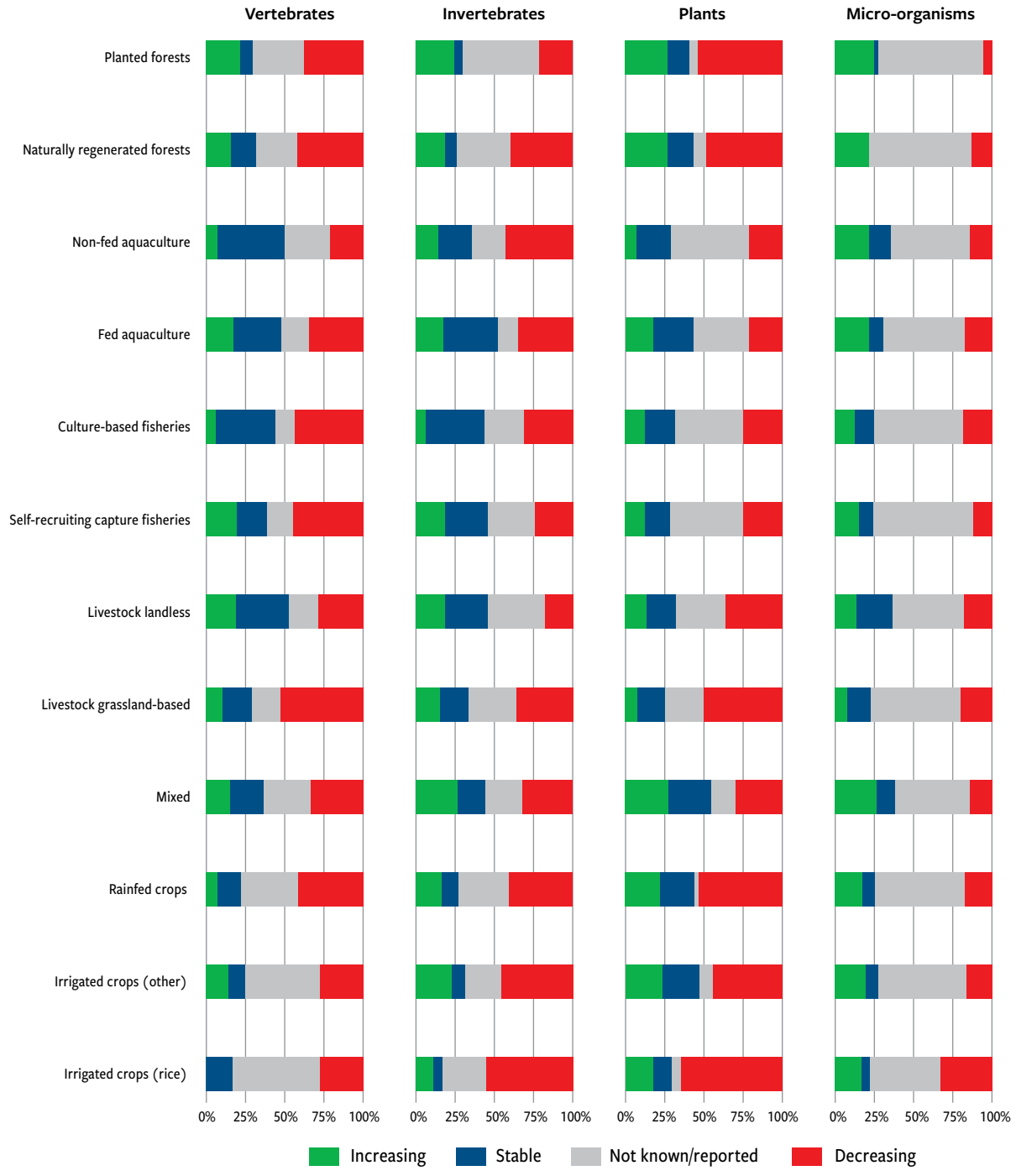
With regard to the sustainable management of ***forests***, actions noted in the sixth national reports include the decentralization of forest management, improving forest governance frameworks and capacity-building, promoting restoration, encouraging forest certification, and updating and reviewing forestry licences. Some reports also note actions related to compensating or incentivizing landowners not to cut forests, and to promote silvicultural practices that also help with poverty alleviation.

Countries have provided comprehensive information on the status of forests as part of FAO's Forest Resources Assessment (see also Aichi Target 5).[20]

Globally, about 1.15 billion hectares of forest is managed primarily for the production of wood and non-wood forest products, a relatively stable area since 1990. In addition, a decreasing amount, now about 750 million hectares, is designated for multiple use. The area of forest under long-term management plans has increased significantly to an estimated 2.05 billion hectares in 2020, equivalent to 54% of the forest area, an increase of around 10% since 2010.[21]

The area of forestry certified under the Forest Stewardship Council (FSC) or the Programme for the Endorsement of Forest Certification (PEFC) schemes has increased significantly within the last decade (by 28.5% during 2010-2019). This indicates a growing proportion of timber production for which there is third party verification of responsible

Figure 7.2. Status in biodiversity associated with different production systems, based on 91 country reports prepared for The State of the World's Biodiversity for Food and Agriculture (2019).[22]



RELEVANT SDG TARGETS

Target 2.4 - By 2030, ensure sustainable food production systems and implement resilient agricultural practices that increase productivity and production, that help maintain ecosystems....

Target 14.7 - By 2030, increase the economic benefits ..... from the sustainable use of marine resources, including through sustainable management of fisheries, aquaculture and tourism.

Target 15.2 - By 2020, promote the implementation of sustainable management of all types of forests...

forest management with regard to biodiversity conservation, as well as social, economic, cultural and ethical dimensions.[23]

Despite these advances, overall, biodiversity in forests continue to decline.[24]

The sixth national reports generally pay much less attention to ***aquaculture*** than to issues associated with forestry and agriculture. Some countries noted actions to improve the management of aquaculture through technological innovations and modernization. Others note the promotion of certification schemes and environmental standards.

Aquaculture is the fastest growing sector of global food production. World aquaculture production attained an all-time high of 114.5 million tonnes live weight in 2018, although growth rates have slowed from the very rapid expansion of the first decade of this century.[25]

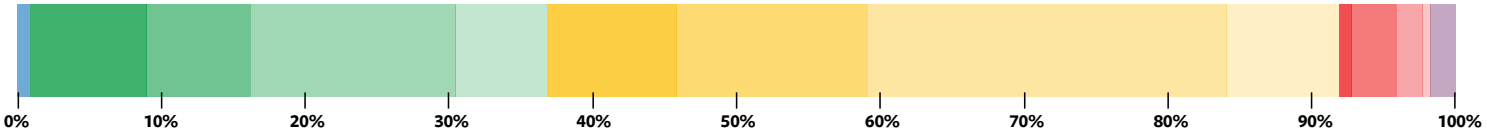
Aquaculture comprises a diversity of traditional and non-traditional production methods. It includes production of a broad variety of aquatic plants, seaweeds, algae, molluscs, crustaceans and echinoderms, as well as finfish. It takes place in inland, coastal and marine environments. Challenges for sustainability vary enormously, depending on, among other things, whether the produced species are fed or not, and the degree of integration with other agricultural activities. For example, traditional rice-fish practices remain important in countries such as China (Box 7.1) and are expanding. Overall, much inland-water aquaculture, constituting approximately two-thirds of the total world production, is considered sustainable.[26]

On the other hand, expansion of aquaculture into many coastal areas has caused large-scale loss and destruction of coastal wetlands (especially mangroves), and pollution of soil and water.[27] Much mariculture relies, to a large extent, on capture fisheries for feed, with relatively low conversion rates. However, in recent years the proportion of feed coming from capture fisheries has declined, and of this, more is coming from bycatch. Another positive practice is the increased use of marine bivalve filter feeders, sometimes grown in combination with fed finfish species, helping to lower nutrient load and reduce water pollution.[28] Other practices considered sustainable, and gaining increasing attention, are the farming of seaweed and microalgae as fish feeds, for human nutrition supplements, and other uses.[29]

While the expansion of aquaculture has generally outpaced the development of regulatory frameworks, an increasing number of countries report to FAO that they have legal frameworks, rising from 38 in 2011 to 91 in 2018. The FAO Committee on Fisheries has noted the increasing importance of sustainable aquaculture for food security and nutrition, and has recommended the development Sustainable Aquaculture Guidelines, complementing the Code of Conduct for Responsible Fisheries.[30]

The majority of NBSAPs (81%) contain targets related to Aichi Biodiversity Target 7. Of the Parties that have assessed progress towards their national targets associated with Aichi Biodiversity Target 7, more than a third report that they are on track to reach (36%) or exceed (1%) them. Another 55% report progress and only a few Parties (6%) report that they are making no progress towards the target or are moving away from reaching it (2%). However, only 13% of Parties with NBSAPs have national targets that are similar in scope and ambition to the Aichi Target. Many of the targets are related to sustainable management generally and do not specify agriculture or forestry. Few of the national targets address issues associated with aquaculture. Only 8% of reporting parties have national targets of similar scope and ambition to Aichi Biodiversity Target 7 and are on track to meet them (see bar chart).

Assessment of progress towards national targets



The colour bars show the percentage of Parties reporting a given level of progress towards their national targets. (Blue: exceeds target; Green: on track; Yellow: some progress; Red: no change; Purple: moving away from target). The intensity of the colour indicates alignment of national targets with the Aichi Target (Darker colours indicate close alignment).

Box 7.1. Examples of national experiences and progress

- **China:** Rice–fish co-culture has been maintained for over 1,200 years in Zhejiang province, south China, and has been designated a 'globally important agricultural heritage system'.[31] While rice production and yield stability are similar to rice monoculture, the co-culture requires 68% less pesticide and 24% less chemical fertilizer. The rice–fish co-culture is considered a sustainable form of agriculture because it maximizes the benefits of scarce land and water resources by using relatively few chemical inputs, by producing both staples and protein, as well as micronutrients, and by conserving biodiversity. The stability of the system is associated with positive interactions between rice and fish. On the one hand, fish can be biocontrol agents in rice, reducing insect pests, diseases, and weeds, especially rice planthoppers, rice sheath blight, and a variety of weeds. Conversely, rice benefits fish, by providing shade and reducing water temperature during the hot season.[32]
- **Cuba:** The Integrated Tree Farms program established 1,342 tree farms covering an area of more than 63,000 hectares. This programme has helped to increase forest cover, particularly in watershed and catchment areas, increased soil productivity, improved food security, and created employment in rural areas.[33]
- **The Gambia:** The country has established 458 community-managed forests, covering more than 31,000 hectares. Local communities have been given greater management authority and ownership of both land and trees. This reform has allowed for the decentralized management of forests, and has promoted the sustainable use of forest-based products and services.[34]
- **Guyana:** While still in its infancy, aquaculture contributed more than $3 million to the economy, and has the potential to continue to grow. Measures to ensure sustainable growth include promoting the use of local fish species in aquaculture to reduce risk of introducing invasive alien species, promoting the use of by-products from seafood processing as feed for aquaculture, and providing training on aquaculture management.[35]
- **India:** Zero budget natural farming (ZBNF) is an approach initiated by a grassroots movement, and now being scaled up across a number of Indian states. 'Natural farming' refers to a farming approach that emphasizes the importance of co-production of crops and animals so that synergistic effects of different parts of the system can be used, relying on crop treatments on-farm, and microorganisms or mycorrhizae to build fertility of the soil and reduce fungal infections. 'Zero budget' refers to financial inputs, as a way of overcoming the inability of many poor farmers to access improved seed and manufactured agrochemicals, and to avoid cycles of debt due to high production costs, high interest rates and volatile market prices. ZBNF is now one of the largest 'experiments' in agroecology in the world. In Karnataka, where it originated in 2002, over 100,000 farming households are following ZBNF methods. In neighbouring Andhra Pradesh, by August 2019, 523,000 farmers had converted to ZBNF in 3,015 villages across 204,000 hectares. This is equivalent to 13% of the area of the state under productive agriculture (as defined by area sown to more than one crop). The long-term aim of the government of Andhra Pradesh is to roll out ZBNF to all six million farmers in the state by 2024. The programme is being extended nationally.[36]

POLLUTION REDUCED

By 2020, pollution, including from excess nutrients, has been brought to levels that are not detrimental to ecosystem function and biodiversity.

Summary of target achievement

Pollution, including from excess nutrients, pesticides, plastics and other waste, continues to be a major driver of biodiversity loss. Despite increasing efforts to improve the use of fertilizers, nutrient levels continue to be detrimental to ecosystem function and biodiversity. Plastic pollution is accumulating in the oceans, with severe impacts on marine ecosystems, and in other ecosystems with still largely unknown implications. Actions taken in many countries to minimize plastic waste have not been sufficient to reduce this source of pollution. **The target has not been achieved** (*medium confidence*).[1]

Parties report in their sixth national reports that they are taking a range of actions to address issues related to pollution. These include regulatory approaches, setting up monitoring systems and standards, and promoting the development and improvement of infrastructure to improve waste management. With regard to nutrients, commonly reported policies are the regulation of fertilizer use, the monitoring of agricultural runoff and the placing of caps on nitrogen use (about 30% of national reports referred to these types of action). With regard to plastic pollution, commonly reported actions were bans or restrictions on certain types of plastics (about 20% of national reports referred to this type of action), awareness campaigns and community clean-up events. Some reports also referred to increased efforts related to recycling (Box 8.1).

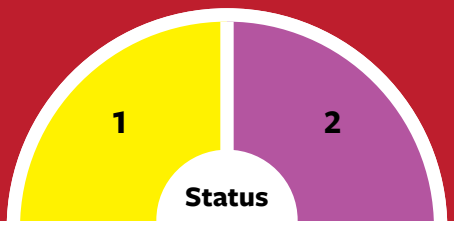
Excessive levels of nutrients, in particular of reactive nitrogen and phosphorous, are considered one of the main drivers of global change,[2] affecting species composition in terrestrial, freshwater and coastal ecosystems with cascading effects on biodiversity, ecosystem function and human well-being.[3] Agricultural fertilizers are a major source of both nitrogen and phosphorous pollution. There have been efforts at various levels to increase the efficiency of fertilizer use and reduce waste and pollution.[4] Following earlier increases, the rate of nitrogenous and phosphate fertilizer use per hectare appears to have leveled off in most regions during this decade (Figure 8.1).[5] However, overall emissions of reactive nitrogen, which rose rapidly from the 1950s, continue to increase.[6]

The average quantity of pesticides used per hectare remained stable between 2010 and 2017, having grown significantly during the two previous decades. Nevertheless, pollution from pesticide use remains at a level that has a detrimental impact on biodiversity.[7] The level of pesticide use varies widely across regions, with the quantity per hectare in Asia and the Americas exceeding the use in Africa more than tenfold (Figure 8.2).[8]

Plastic pollution is accumulating across terrestrial, freshwater and marine ecosystems, with micro-plastics entering food chains and circulating in the atmosphere.[9] Recent estimates indicate that more than 10 million tonnes of plastic waste are currently entering the oceans every year.[10] It is also estimated that between 1.15-2.41 million tonnes are carried by rivers.[11] One study estimated that there were over 5.25 trillion plastic particles, weighing over 260,000 tons in the world's oceans,[12] endangering fish, seabirds and other taxa.[13] According to research in 2018, accumulating plastic debris greatly increases the likelihood of coral reefs being affected by disease,

TARGET ELEMENTS

1. Pollution is not detrimental
2. Excess nutrients are not detrimental



threatening ecosystem health and human livelihoods (see also Aichi Target 10). Plastic debris may release toxins, facilitates the transport of land-based microbial pathogens to the corals, and weakens their resistance to stress through deprivation of light and oxygen. Public concern about plastic pollution has risen sharply in many countries, and this has given rise to a wide range of policies and campaigns to reduce or prohibit single-use plastics in products such as bags, straws and cups. A recent review found that measures to reduce single-use plastic bags, including bans and levies, ranged in effectiveness from a 33% reduction to a 96% reduction in bag use.[14] Another study estimated that the full implementation of all commitments to date would reduce plastic waste entering the environment by only around 7%.[15]

Abandoned, lost or otherwise discarded fishing gear ('ghost gear') is a particularly deadly form of

Figure 8.1. Average nitrogen use per area of cropland at regional and global level[16]

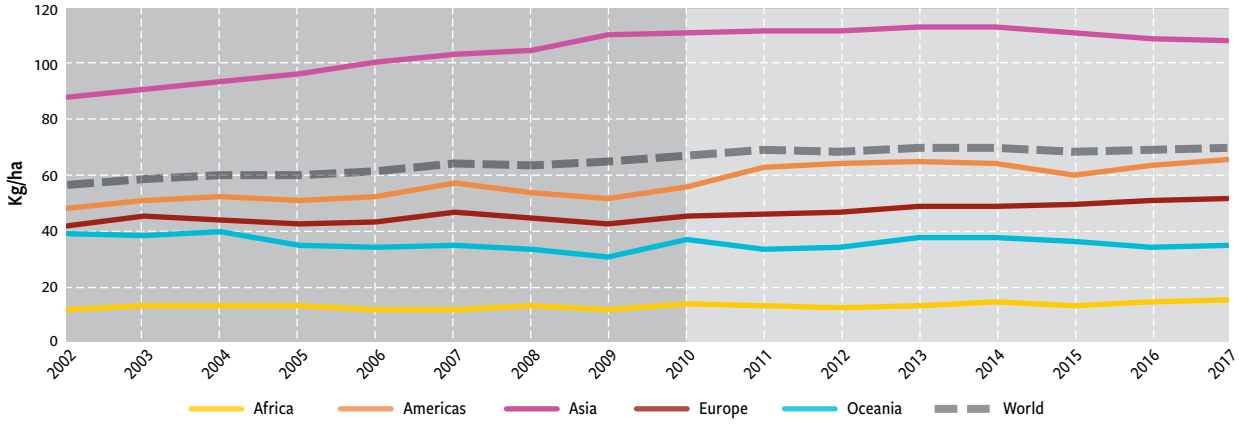
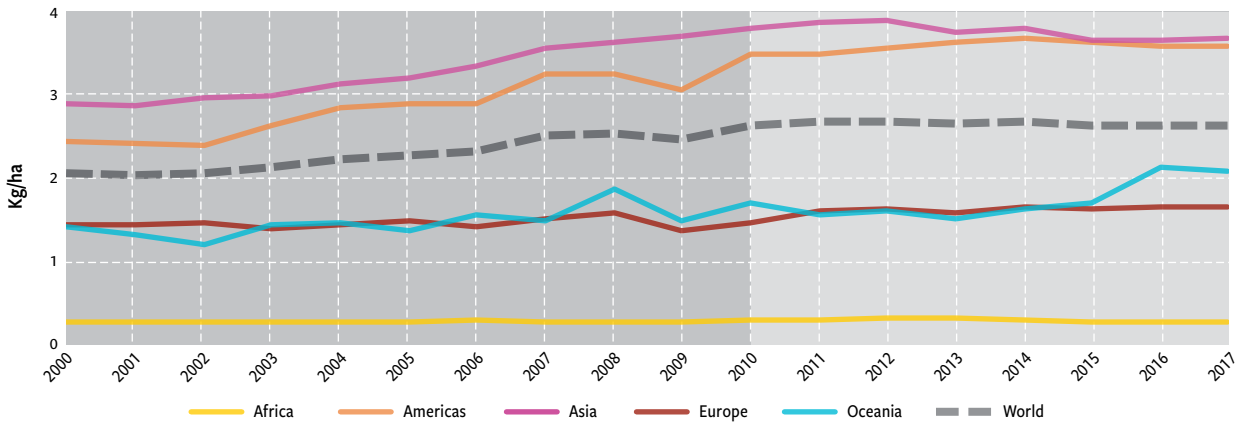


Figure 8.2. Average pesticide use per area of cropland at regional and global level. [17]



RELEVANT SDG TARGETS

Target 6.3 - By 2030, improve water quality by reducing pollution, eliminating dumping and minimizing release of hazardous chemicals and materials, halving the proportion of untreated wastewater and substantially increasing recycling and safe reuse globally

Target 14.1 - By 2025, prevent and significantly reduce marine pollution of all kinds, in particular from land-based activities, including marine debris and nutrient pollution

Photo by Julia Joppien on Unsplash

marine waste impacting many threatened species. Forty-six percent of the species on the IUCN Red List of Threatened Species have been impacted by such gear, including through entanglement and ingestion. It also has impacts on sensitive marine environments, such as coral reefs.[18] FAO's Committee on Fisheries endorsed voluntary guidelines to address this problem in 2019.[19]

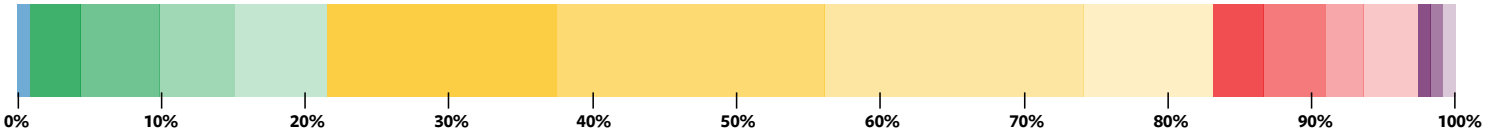
Electronic waste is another growing source of pollution fuelled by higher consumption rates of electrical and electronic equipment, short life cycles, and few repair options. In 2019, the world generated 53.6 megatonnes of e-waste, 20% more than in 2014. Electronic waste contains several toxic additives or hazardous substances. Only about 17% of this waste is known to be recycled and growth in recycling is lagging behind increases in waste.[20]

Impacts of pollution continue to drive species towards extinction, according to the Red List Index (Impacts of Pollution).[21] The trend of this indicator continued downwards from 2010 through to 2016, indicating that that pollution levels remained detrimental to biodiversity by increasing extinction risk within these groups.

A number of international conventions promote action to reduce particular sources of pollution, including the Basel, Rotterdam and Stockholm Conventions which target, respectively, hazardous waste, pesticides and persistent organic pollutants.[22] In August 2017, the Minamata Convention on Mercury entered into force. Mercury and many of its compounds are toxic and can have a range of impacts on species, ecosystems and human health. This new agreement includes provisions for banning new mercury mines and the phasing-out of existing ones.[23]

Seventy percent of NBSAPs contain targets related to Aichi Biodiversity Target 8. Of the Parties which have assessed progress towards their national targets, more than a fifth report that they are on track to reach (21%) or exceed (1%) them. In addition, well over half (62%) of Parties have made progress towards their targets but some (14%) report no progress and a few (3%) report that they are moving away from the target. However, only about a fifth (19%) of the national targets are similar to the scope and level of ambition of the Aichi Target. While national targets do address reducing pollution, only a minority address reducing excess nutrients specifically. Only 3% of reporting parties have national targets of similar scope and ambition to Aichi Biodiversity Target 8 and are on track to meet them (see bar chart).

Assessment of progress towards national targets



The colour bars show the percentage of Parties reporting a given level of progress towards their national targets. (Blue: exceeds target; Green: on track; Yellow: some progress; Red: no change; Purple: moving away from target). The intensity of the colour indicates alignment of national targets with the Aichi Target (Darker colours indicate close alignment).

Box 8.1. Examples of national experiences and progress

- **China:** China has undertaken a programme to engage smallholder farmers to apply enhanced management practices. More than 20 million farmers in 452 counties participated in the programme. Farmers were encouraged and supported by agricultural technicians and field agents to implement practices for high yield (i.e. high-yield), high efficiency (i.e. high-efficiency) and low pollution (i.e. low-pollution) agriculture. As a result of the project, the application of nitrogen fertilizer decreased by 14.7-18.1%, saving the application of 1.2 million tonnes of nitrogen fertilizer. At the same time, average yields of maize rice and wheat increased by 10.8-11.5% and there was net gain in output of 33 million tonnes.[24]
- **Egypt:** In order to effectively address pollution from all sources, Egypt has put several sectoral plans in place, and carried out specific targeted activities. National systems for monitoring water and air pollution have been established. Wetlands are being created to help manage sewage and to reduce soil pollution.[25]
- **Panama:** In recent decades there has been an accumulation of waste, and especially of plastic waste, in the Gunayala region. The Guna people have given themselves the task of finding simple, rapid, low cost measures to deal with it. The highest Guna political-administrative authority, the Guna General Congress, has committed to numerous actions on this issue. The most important is a project "Zero Waste: recycling routes in Guna Yala", which aims to create a centre for the collection and sale of recyclable material and a landfill site for the disposal of non-recyclable waste.[26]
- **The Commonwealth Clean Oceans Alliance:** In 2018 the United Kingdom of Great Britain and Northern Ireland and Vanuatu announced the Commonwealth Clean Oceans Alliance, which calls on 54 Commonwealth countries to pledge action to reduce plastic waste. As part of this alliance the United Kingdom committed to providing up to £66.4 million to drive research and innovation, including £25 million towards the Commonwealth Marine Plastics Research and Innovation Challenge Fund, which will support researchers to address marine plastics from a scientific, technical and social perspective. The United Kingdom and Canada have also launched the Global Plastics Action Partnership (GPAP) to help deliver the goals of the Alliance and further bring businesses, governments and organizations together to develop country action plans to address the plastic problem. This partnership has also received support and matching funding from Coca Cola, Pepsico Foundation and Dow Chemicals.[27]

INVASIVE ALIEN SPECIES PREVENTED AND CONTROLLED

By 2020, invasive alien species and pathways are identified and prioritized, priority species are controlled or eradicated and measures are in place to manage pathways to prevent their introduction and establishment.

Summary of target achievement

Good progress has been made during the past decade on identifying and prioritizing invasive alien species in terms of the risk they present, as well as in the feasibility of managing them. Successful programmes to eradicate invasive alien species, especially invasive mammals on islands, have benefited native species. However, these successes represent only a small proportion of all occurrences of invasive species. There is no evidence of a slowing down in the number of new introductions of alien species. **The target has been partially achieved** (*medium confidence*).[1]

Parties report through the sixth national reports that they have taken various actions towards Aichi Biodiversity 9. These include the creation and implementation of legislation or regulations for monitoring, controlling, and eradicating invasive alien species, including rules and regulations related to import and export requirements, measures to control and manage ballast water, establishment of national guidelines for management and control of invasive alien species, and the establishment of phytosanitary and zoosanitary checkpoints at national points of entry. Parties also commonly address the development and implementation of strategies related to biosecurity (including border control, inspection, quarantine, early warning systems and rapid response systems), awareness-raising (including the development of information portals and websites, training programmes and community events), as well as strategies of inter-regional collaboration. However, some countries also note that they experience challenges in taking these types of actions owing to limited resources, knowledge, capacity and awareness, and the lack of necessary legal frameworks.

Information and data about the occurrence and distribution of invasive alien species is increasingly available and accessible, with multiple organizations collaborating to help link up previously disconnected data sources. This includes the role of citizen scientists whose observations on the ground can now be made available in real time to researchers and decision makers.[2] Such information has enabled progress in prioritizing invasive alien species in terms of the risk they present, as well as in the feasibility of managing them.[3]

The availability of comprehensive data on the threats posed by invasive species has been especially valuable in helping to prioritize eradication programmes on islands.[4] More than 800 eradications of invasive mammals on islands have been successful, with positive benefits for an estimated 236 native terrestrial species on 181 islands (Figure 9.1). Of these eradications almost 200 have occurred since 2010. Such eradications have benefited more than one hundred highly threatened species of birds, mammals and reptiles, including for example the island fox (*Urocyon littoralis*) and Seychelles magpie-robin (*Copsychus sechellarum*).[5]

Recent analysis has also identified 107 priority islands where eradication of invasive mammals could feasibly start in the near future, improving the survival prospects for 80 highly-threatened vertebrates, thus making a significant contribution to the fight against global extinctions. Examples

TARGET ELEMENTS

1. Invasive alien species identified and prioritized
2. Pathways identified and prioritized
3. Priority species controlled or eradicated
4. Pathways managed to prevent introduction and establishment

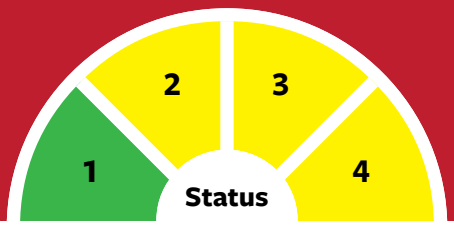
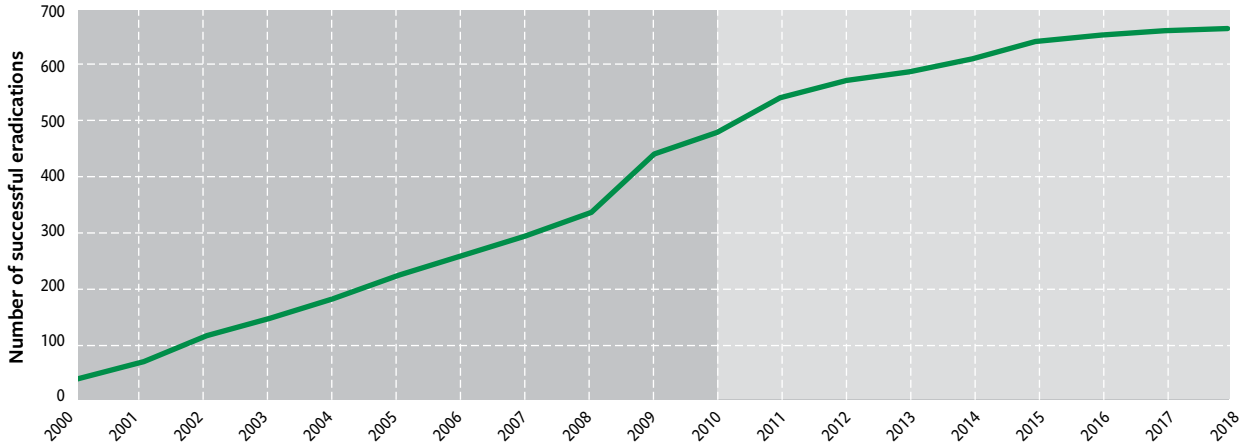


Figure 9.1. Cumulative number of successful invasive mammal eradication projects by year since 2000 on whole islands.[6]



of species that could benefit include Townsend's Shearwater (*Puffinus auricularis*) on Socorro island, Mexico and Masafuera rayadito (*Aphrastura masafuerae*) on Alejandro Selkirk Island in Chile's Juan Fernández Islands. [7]

There are far fewer examples of successful efforts to eradicate invasive alien species in continental ecosystems.[8] One exception is the North American ruddy duck (*Oxyura jamaicensis*) whose numbers in Europe were reduced by more than 90 per cent between 2000 and 2013 through eradication programmes across several countries, reducing the threat posed to the native white-headed duck *(Oxyura leucocephala),* an endangered species, through hybridization.[9] By 2020, in the United Kingdom, there was no evidence of breeding of the ruddy duck anywhere for the first time in more than 50 years.[10]

Preventing introductions in the first place is likely to be far more cost-effective than attempting to eradicate alien species once they become established and start to impact native species. In their sixth national reports, about a quarter of Parties report that they are taking actions to identify and prioritize introduction pathways. Introduction pathways commonly noted in the national reports are shipping, horticulture, trade, aquaculture, transportation, forestry and urbanization.

The International Convention for the Control and Management of Ships' Ballast Water and Sediments, developed under the International Maritime Organization, entered into force in 2017. The convention, by requiring international shipping traffic to meet certain standards in the management of their ballast water and sediments, will help to manage a significant pathway for invasive species introductions.[11] Further, under the International Plant Protection Convention updated International Standards for Phytosanitary Measures have been adopted[12] while under the Convention on Biological Diversity supplementary voluntary guidance related to the trade in live organisms has been welcomed.[13]

The IUCN Global Register of Introduced and Invasive Species shows that the cumulative number of invasive alien species increased by about 100 from 2000-2010 and a further 30 species since (Figure 9.2). However, the apparently slower rate since 2010 is likely the result of time delays between the time a species is introduced

RELEVANT SDG TARGET

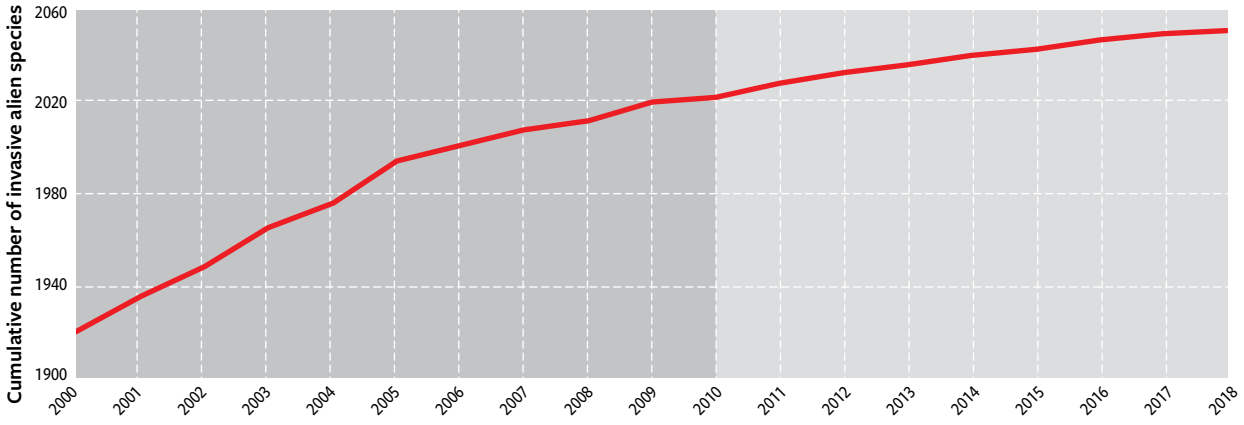
Target 15.8. By 2020, introduce measures to prevent the introduction and significantly reduce the impact of invasive alien species on land and water ecosystems and control or eradicate the priority species

and reported as having established populations in a country or island. A comprehensive study in 2017 found no evidence of slowing in the rate of invasion, at least for unintentional introductions linked to travel and trade.[14] It appears that efforts to combat species invasions have not been effective enough to keep up with increasing globalization, and in particular the impact of massively expanded trade (imports and exports have roughly tripled since 2000[15], for example), providing additional opportunities to carry species into alien environments.

Current indicators also suggest that on balance, more species are moving closer to extinction due to increased pressure from invasive alien species, than those native species given a better survival chance thanks to eradication or control of biological invaders. This is shown in the negative trend of the Red List Index (impacts of invasive alien species), indicating that assessed birds, mammals and amphibians are increasingly being driven towards extinction by the pressure of invasive alien species.[16]

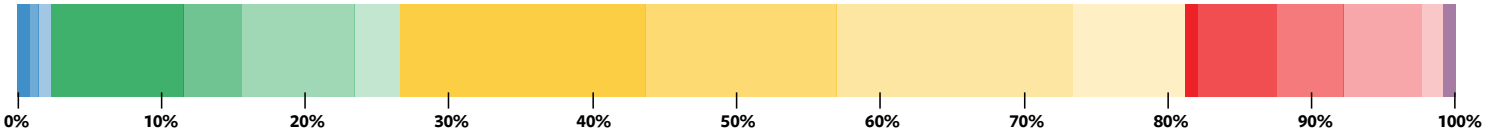
The majority of NBSAPS (84%) contain targets related to Aichi Biodiversity Target 9. Of the Parties which have assessed progress, more than a quarter of Parties report that they are on track to reach (24%) or exceed (2%) them while more than half (55%) have made progress but not at a rate that will allow them to be met. Fewer than a fifth of Parties (18%) report that they are making no progress towards their targets or are moving away from reaching them (1%). About a quarter of national targets are similar to (26%) or exceed (1%) the level of ambition and scope set out in the Aichi Target. This Aichi Target is among those with the highest level of alignment between the national targets and the Aichi Target. However, many of the targets are broad and refer in general terms to the control of invasive alien species. Relatively few national targets address the identification and prioritization of pathways for the introduction of invasive alien species. Only 10% of reporting parties have national targets of similar scope and ambition to Aichi Biodiversity Target 9 and are on track to meet them (see bar chart).

Figure 9.2. Trend of the cumulative number of invasive alien species worldwide.



The trend is based on the years when an invasive alien species has been recorded for the first time as having an established population outside its native range, as recorded by the IUCN Global Register of Introduced and Invasive Species (GRIIS) database.[17]

Assessment of progress towards national targets



The colour bars show the percentage of Parties reporting a given level of progress towards their national targets. (Blue: exceeds target; Green: on track; Yellow: some progress; Red: no change; Purple: moving away from target). The intensity of the colour indicates alignment of national targets with the Aichi Target (Darker colours indicate close alignment).

Box 9.1. Examples of national experiences and progress

- **Antigua and Barbuda:** Goats and black rats were introduced to Redonda Island in the 1930s. These invasive species have had significant negative impacts on the ecosystem, and on several species of birds and reptiles which, as a result, are listed as Critically Endangered. The Redonda Restoration Programme addressed the problem by removing the goats and rats from the island. As a result, trees and grasses have been able to grow, stabilizing the island's soils and reducing runoff which was previously damaging surrounding coral ecosystems. The lizard population on Redonda has tripled following the eradication of goats and rats. Efforts are under way to have Redonda declared a protected area.[18]
- **Belgium:** The TrIAS project aims to build a system to track the progression of alien species, identify emerging species, assess their current and future risk and help to inform policy in a dynamic and timely manner. TrIAS uses open science and open data infrastructures and international biodiversity standards to ensure interoperability, reusability and sustainability of invasive alien species data. As TrIAS is an open science project, all of its associated software, data and documentation are freely shared so that it can be reused once the project has concluded.[19]
- **Republic of Congo:** Invasive aquatic plants, such as water hyacinth, water lettuce and giant salvinia have a range of negative impacts on water systems by outcompeting or displacing endemic species for space, light and nutrients. They can also reduce oxygen levels and affect water flow. In order to control these invasive aquatic plants, three species of weevils are being used as biocontrol agents. As a result of these efforts some waterways in the Kouilou and Likouala regions have been restored.[20]
- **New Zealand:** A vision of having predator-free New Zealand by 2050 was established in 2016. To reach this vision a goal has been set for the eradication of possums, rats, and stoats from the entire country. To help reach this 2050 vision the active involvement of community groups, scientists and different levels and sectors of government is being promoted. Further in 2018, the government committed NZD $81.28 million, over a four year period, to suppress introduced species that prey on indigenous and endemic biodiversity in priority ecosystems, to protect and increase biodiversity on offshore islands, and to develop more effective and efficient predator control methods.[21]
- **Pacific Region:** Several countries in the region, with the support of the Secretariat of the Pacific Regional Environment Program (SPREP) and the Global Environment Facility and in collaboration with indigenous peoples and local communities developed a Pacific-wide strategy to combat invasive alien species. The strategy includes resources to support learning, reporting, and education, as well as the management of invasive alien species across the islands.[22]

ECOSYSTEMS VULNERABLE TO CLIMATE CHANGE

By 2015, the multiple anthropogenic pressures on coral reefs, and other vulnerable ecosystems impacted by climate change or ocean acidification are minimized, so as to maintain their integrity and functioning.

Summary of target achievement.

Multiple threats continue to affect coral reefs and other vulnerable ecosystems impacted by climate change and ocean acidification. Overfishing, nutrient pollution and coastal development compound the effects of coral bleaching. Corals have shown the most rapid increase in extinction risk of all assessed groups. Hard coral cover has declined significantly in some regions, and there has been a shift towards coral species less able to support diverse reef habitats. Other ecosystems especially in mountains and polar regions have experienced significant impacts from climate change, compounded by other pressures. **The target was missed by the stated date of 2015, and it has not been achieved by 2020** (*high confidence*).[1]

Among the actions reported by Parties to reach national targets related to Aichi Biodiversity Target 10 are the adoption of national policy instruments focussed on the health of coral reef systems and the sustainable use of the services they provide, actions to reduce pollution, including from plastics and excess nutrients, the promotion of restoration and conservation of vulnerable ecosystems in national policies and plans, and supporting research and capacity-building (Box 10.1). Commonly reported challenges to reaching this target were the lack of capacity and funding as well as the challenge of upscaling pilot projects to the national level.

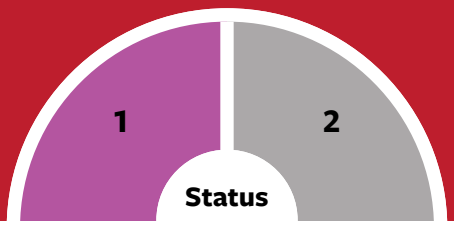
Multiple pressures continue to threaten coral reefs, with accelerating impacts from climate change and ocean acidification, interacting with other threats. Higher sea temperatures have led to an increase in mass coral bleaching, compounded by the impact of ocean acidification.[2] A recent analysis of coral bleaching over the last two decades, based on information from 3351 sites in 81 countries, found that the probability of coral bleaching has been increasing over time (Figure 10.1).[3]

More than sixty per cent of the world's coral reefs face immediate direct threats, with overfishing and destructive fishing being the most pervasive immediate drivers. Other key immediate threats include pollution both from marine and land-based sources, physical destruction from coastal development, and the effects of runoff from agricultural land including sedimentation and the build-up of nutrients. Plastic waste has also recently been identified as another cause of stress to coral reefs (see Aichi Biodiversity Target 8). Corals have shown the steepest declines in status of all taxonomic groups assessed in the Red List Index (see Aichi Biodiversity Target 12).

Preliminary analysis in 2020 of long-term data trends from nearly 700 coral reef sites around the world shows a decline in the level of hard coral cover, although the decline is less than expected based on past studies on coral cover and reef health. This is likely due to a number of factors including the small number of datasets available from before the 1990s, the high level of regional variation and a tendency to select relatively healthy reef sites to begin monitoring programmes.[4]

TARGET ELEMENTS

1. **Pressures on coral reefs minimized**
2. **Pressures on vulnerable ecosystems minimized**



Box 10.1. Examples of national experiences and progress

- **Cambodia:** Coastal development, marine-based pollution, sedimentation, overfishing and destructive fishing are the major pressures impacting coral reefs in Cambodia. To help address these the Koh Rong Marine National Park was established in 2016 after five years of baseline social and biophysical research and intensive consultations and collaborative work with government agencies, NGOs, local authorities, tourism operators and community fisheries.[5]
- **Djibouti:** The country has initiated a project to assesses the impact of climate change on coastal habitats and marine ecosystems, and to support the resilience of marine and coastal areas, including maintaining water quality. Specific actions include the establishment of a coastal zone co-management system and participatory plans to restore coastal habitats affected by climate change. These engage and benefit communities through employment linked to restoration, including through women's groups.[6]
- **Gabon:** The ecosystems most vulnerable to the effects of climate change in the country are coastal ecosystems. Gabon has adopted a National Coastal Adaptation Plan, describing and analysing the characteristics of the coastal environment, its population, human activities and the different processes that govern these areas. It also provides the basis for establishing a long-term land use and urban planning strategy.[7]
- **Ghana:** Through the Coastal Sustainable Landscapes Project, famers were encouraged to plant trees and engage in agroforestry practices in order to reduce the impacts of climate change. Through the project tree species were provided to coastal communities to plant as a climate change adaptation and mitigation strategy. The project helped to restore mangrove ecosystems as well as reduce deforestation.[8]
- **Maldives:** The country is composed of a series of atolls built by coral reefs. These atolls are home to multiple ecosystem types which support a rich biodiversity. Given the importance of coral reefs to the country, a number of actions have been taken to minimize the pressures on them. This includes the creation of 61 marine protected areas, the identification of particularly sensitive areas to facilitate planning, the creation of a coral reef monitoring framework to collect and manage coral reef data, the development of waste management plans to control unregulated dumping, the elimination of destructive fishing practices and the protection of endangered and threatened species. Further, tourism activities are guided by the 'one island one resort' concept, in order to help protect and conserve the areas on which tourism activities are undertaken.[9]

RELEVANT SDG TARGET

Target 14.2 - By 2020, sustainably manage and protect marine and coastal ecosystems to avoid significant adverse impacts, including by strengthening their resilience, and take action for their restoration in order to achieve healthy and productive oceans

Target 14.3 - Minimize and address the impacts of ocean acidification, including through enhanced scientific cooperation at all levels

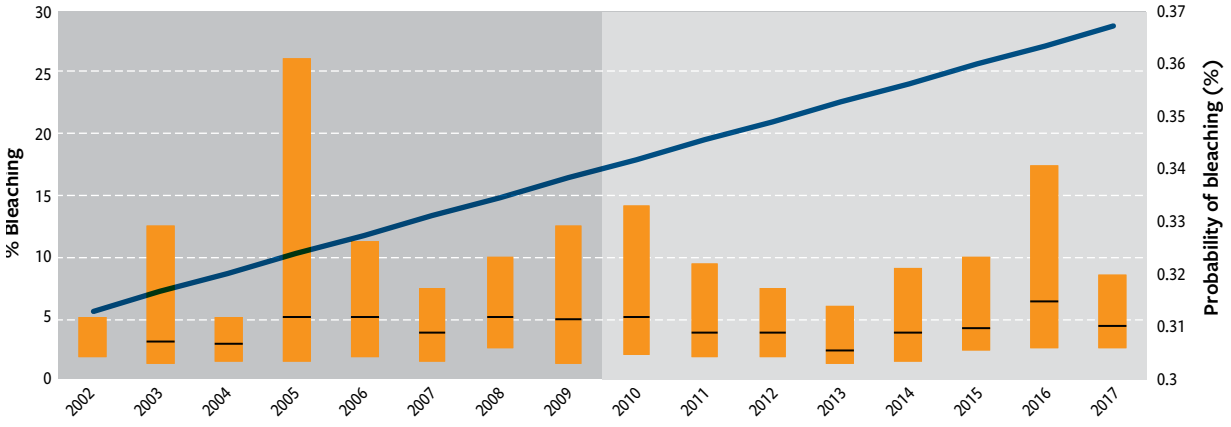
The highest levels of coral cover decline have been in the Caribbean, while reefs in the Western Indian Ocean have shown intermediate decline. Overall coral cover in the largest regions has been relatively stable. However, these trends mask significant shifts in the composition of coral reef communities in many locations, away from faster-growing species that create complex habitat for reef-dwelling species, and towards slower-growing corals more resistant to higher temperatures, but offering less niche-space to other species. There has been a marked increase in the algal cover of many reef systems, especially evident in the Western Indian Ocean.[10]

Two coral reef regions are currently included in the IUCN Red List of Ecosystems measuring the risk of ecosystem collapse: the Caribbean coral reefs are classed as Critically Endangered, while the Western Indian Ocean coral reefs are considered Vulnerable.[11]

The conservation of coral reefs through Marine Protected Areas and other area-based measures has shown mixed results, due to complex factors influencing the effectiveness of protection, and because most protection regimes to date have not been designed to address climate threats.

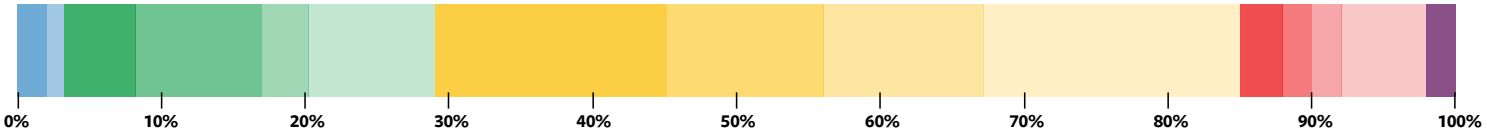
Climate change has impacted terrestrial and freshwater species and ecosystems in high mountain and polar regions, through appearance of land previously covered by ice, changes in snow cover, and thawing permafrost. These changes have contributed to shifts in seasonal activities of species, and altered the abundance and distribution of plant and animal species that have ecological, cultural and economic importance. Climate change has locally increased the number of species in some habitats such as high mountains, as lower-elevation species migrate to higher altitudes. However, species adapted to cold or snow have declined in abundance, increasing their risk of extinction, notably on mountain summits. Other negative climate-linked impacts on biodiversity include contraction of the habitats of ice-associated marine mammals and seabirds linked to polar sea ice changes, an increase in wildfire and rapid thaw of permafrost. Cascading impacts of changes in species

Figure 10.1. Percent and probability of coral bleaching over time.



For each boxplot the black horizontal line is the mean percent bleaching, and the boundary of the box corresponds to the interquartile range (25% and 75%). The sloping line is the probability of bleaching, shown on the right axis.[12]

Assessment of progress towards national targets



The colour bars show the percentage of Parties reporting a given level of progress towards their national targets. (Blue: exceeds target; Green: on track; Yellow: some progress; Red: no change; Purple: moving away from target). The intensity of the colour indicates alignment of national targets with the Aichi Target (Darker colours indicate close alignment).

interactions, linked to climate change, affect the structure and functioning of ecosystems, in turn threatening food security and other components of human well-being.[13]

More than half (56%) of NBSAPs contain targets related to Aichi Biodiversity Target 10. Less than a third of Parties report that they on track to reach (26%) or exceed (3%) their national targets. More than half (56%) of Parties have made progress towards their targets but not at a rate that will allow them to be met. Some Parties (13%) report that they are making no progress towards their targets and few (2%) are moving away from reaching them. However only about a quarter of the national targets (26%) are similar to or exceed (1%) the scope and level of ambition set out in the Aichi Target. This Aichi Target is among those with the smallest number of NBSAPs containing comparable targets. The established national targets are, for the most part, general, and few explicitly refer to coral reefs or other specific ecosystems vulnerable to climate change. Only 5% of reporting parties have national targets of similar scope and ambition to Aichi Biodiversity Target 10 and are on track to meet them (see bar chart).

Photo by Hiroko Yoshii on Unsplash

PROTECTED AREAS

By 2020, at least 17 per cent of terrestrial and inland water areas and 10 per cent of coastal and marine areas, especially areas of particular importance for biodiversity and ecosystem services, are conserved through effectively and equitably managed, ecologically representative and well-connected systems of protected areas and other effective area-based conservation measures, and integrated into the wider landscape and seascape.

Summary of target achievement

The proportion of the planet's land and oceans designated as protected areas is likely to reach the targets for 2020 and may be exceeded when other effective area-based conservation measures and future national commitments are taken into account. However, progress has been more modest in ensuring that protected areas safeguard the most important areas for biodiversity, are ecologically representative, connected to one another as well as to the wider landscape and seascape and are equitably and effectively managed. **The target has been partially achieved** (*high confidence*).[1]

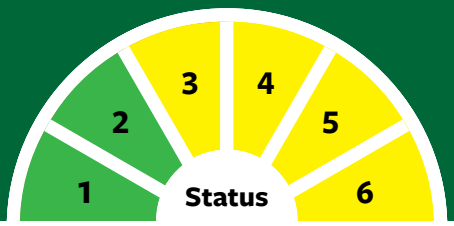
Commonly reported national actions to reach this target include the creation or expansion of protected areas, the development of buffer zones, converting private reserves into formal protected areas, providing support for community-based conservation areas, and providing formal recognition of indigenous and community-conserved areas (Box 11.1). Reported challenges to reaching this target include complex land tenure systems, land tenure uncertainties, a bias towards creating protected areas in remote areas rather than on making them ecologically representative and covering areas of importance for biodiversity, a greater focus on terrestrial than on marine areas, limited recognition of the ecosystem approach in protected areas management, limited management effectiveness, the lack of management effectiveness assessment systems, limited coordination between national agencies, the lack of protected areas management and development plans, limited monitoring and surveillance systems, and a lack of financial and human resources.

The world's protected area network continues to expand and may exceed numerical targets for coverage of terrestrial and marine environments by 2020. By August 2020, the World Database on Protected Areas showed that about15% of the world's terrestrial and freshwater environments were covered by protected areas, with about 7.5% of the marine area covered (including 17.2% of marine areas within national jurisdiction, and 1.2% of marine areas beyond national jurisdiction).[2] Specific commitments made by countries for new or expanded protected areas amount to more than 4.1 million km^2 on land and over 12.5 million km^2 in the oceans. If these commitments are fulfilled, coverage would exceed 10% of the global ocean and 17% of land and inland waters by the end of 2020 (Figure 11.1).[3]

Recent growth in the global protected area network has been greatest in parts of the marine environment, with the total extent of marine protected areas almost ten times greater in 2020 than in 2000. This increase has resulted in particular from the establishment of some extremely large marine protected areas in the Pacific Ocean, such as the Marae Moana Marine Park in the Cook Islands in 2017 (1.97 million km^2) and the expansion in 2016 of the Papahānaumokuākea Marine National Monument in the Hawaiian Islands (1.5 million km^2).[4]

TARGET ELEMENTS

1. 17% of terrestrial and inland water areas conserved
2. 10% of coastal and marine areas conserved
3. Areas of particular importance conserved
4. Protected areas are effectively and equitably managed
5. Protected areas are ecologically representative
6. Protected areas are well connected and integrated



The component of this target dealing with 'other effective area-based conservation measures' relates to geographic areas not formally defined as protected areas, but governed or managed in ways that achieve positive and sustained outcomes for biodiversity conservation.[5] Once such areas are fully taken into account, the elements of the target relating to the percentage of land and sea area covered, will be clearly higher.[6]

Moderate progress has been made towards making protected areas more ecologically representative, and encompassing areas of importance for biodiversity. 42.4% of the world's 823 terrestrial ecoregions have at least 17% of their area covered by protected areas and an additional 15.3% have at least 10% coverage, while 46.1% of the 232 marine ecoregions have at least 10% of their area covered and an additional 9.1% have at least 5% coverage.[7] Overall, 18% of the world's forest area falls within legally-established protected areas. However, these areas are not yet fully representative of the diversity of forest ecosystems. While more than 30% of tropical rainforests, subtropical dry forests and temperate oceanic forests are within protected areas, subtropical humid forest, temperate steppe and boreal coniferous forest are less than 10% covered.[8] Protected area coverage of species distributions also remains limited with fewer than half (43%) of 25,380 species assessed to date having adequate coverage of their distributions by protected areas.[9]

For the more than 15,000 Key Biodiversity Areas ('sites contributing significantly to the global persistence of biodiversity'), the global mean percentage area covered by protected areas increased from 29% in 2000 to 43% in 2019. The coverage of Key Biodiversity Areas by protected areas in freshwater, marine, terrestrial and mountain ecosystems have exhibited a similar trend (Figure 11.2). Thus, a significant proportion of the most important areas for biodiversity remains without formal protection.[10]

It is estimated that only about 27% of amphibians, birds and land mammals have their overall distribution adequately represented by protected areas. Moreover, taking into account the need for species to adapt to climate change and other environmental change, current protected areas are adequate in covering the climatic niches for only about 10% of these taxa.[11]

Only 9.4% of countries have assessed half or more of their protected areas for management effectiveness.[12] The Global Database on Management Effectiveness of Protected Areas (GD-PAME) compiles assessments for more than 21,000 protected areas. While this represents fewer than one in twelve of all protected areas, they cover around 5% of the world's terrestrial surface (one-third of the total protected terrestrial area), and around 1% of coastal and marine areas (one-seventh of total protected marine area).[13] Another analysis in 2019 of management reports from more than 2,000 protected areas, representing 23 per cent of the area covered by all terrestrial protected areas, found that fewer than a quarter have adequate resources in terms of both staffing and budget.[14]

A meta-analysis of 165 protected areas from 171 published studies found that where local people were explicitly involved as stakeholders in the co-management of protected areas, both conservation and socioeconomic outcomes were improved.[15] However, no comprehensive global indicators are available to assess the proportion of protected areas that are equitably managed.

Maintaining or creating connections for nature between protected areas, across landscapes and seascapes, and through freshwater basins – referred to as ecological connectivity – is an essential component of effective conservation.[16] While specific targets or comprehensive indicators of connectivity are not yet available, a recent assessment indicated that a little over half of the

RELEVANT SDG TARGETS

Target 11.4 - Strengthen efforts to protect and safeguard the world's cultural and natural heritage

Target 14.5 - By 2020, conserve at least 10 per cent of coastal and marine areas, consistent with national and international law and based on the best available scientific information

Target 15.1 - By 2020, ensure the conservation, restoration and sustainable use of terrestrial and inland freshwater ecosystems and their services, in particular forests, wetlands, mountains and drylands, in line with obligations under international agreements

terrestrial area under protection (7.7% of all land area) was adequately connected in 2018, an increase from 6.5% of the 'protected, connected' area in 2010. This is a relatively greater increase than the growth in terrestrial protected area coverage as a whole, indicating an improvement in the design of protected area systems; however, considerable further action is required to achieve adequate connectivity worldwide.[17] Another indicator measuring connectedness of protected areas, that also includes the contribution of primary vegetation in the wider landscape, shows only a very slight improvement between 2005 and 2019.[18]

The overwhelming majority of NBSAPs (90%) contain targets related to Aichi Biodiversity Target 11. Of the Parties that have assessed progress towards their national targets, more than half are on track to reach (43%) or exceed (9%) them. Most of the remainder (41%) have made progress towards their targets but not at a rate that will allow them to be met. A few Parties (6%) report that they are making no progress towards the target or that they are moving away from reaching them (1%). However, most national targets (85%) fall short of the scope and ambition of Target 11. The greatest emphasis of national targets is on expanding the size of the terrestrial protected areas estate, with slightly less attention to the creation of marine protected areas. Fewer national targets deal with components such as representativeness, management effectiveness, protecting important areas and connectedness. Only 12% of reporting parties have national targets of similar scope and ambition to Aichi Biodiversity Target 11 and are on track to meet them (see bar chart).

Figure 11.1. Global protected area coverage and future commitments.[19] The dotted lines indicate the level of protected area coverage for each category if commitments are met.

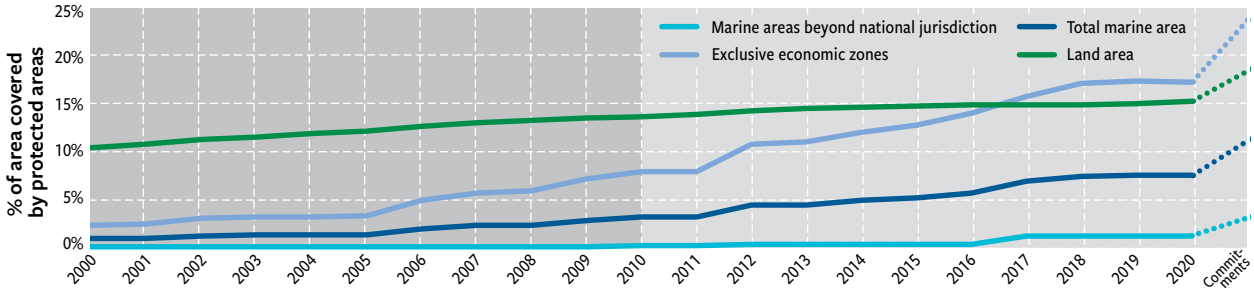
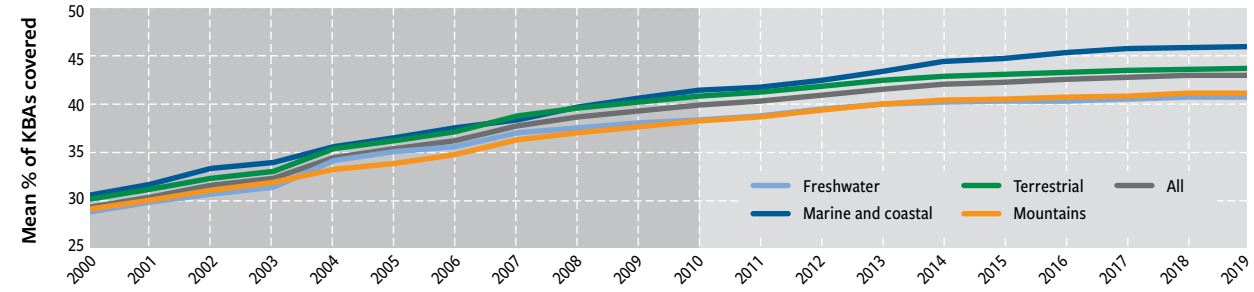
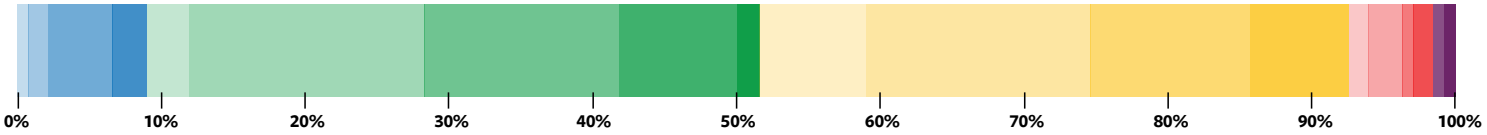


Figure 11.2. The average proportion of Key Biodiversity Areas covered by protected areas, overall and for terrestrial, marine and coastal, freshwater and mountain ecosystems.[20]



Note the vertical axis is truncated.

Assessment of progress towards national targets



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Box 11.1. Examples of national experiences and progress

- **Belize:** The National Protected Areas System Act, adopted in 2015, creates unified legislation for the management of all protected areas. A National Protected Areas Advisory Council ensures the effective management of protected areas. The act also allows for the declaration of areas as protected landscapes/seascapes for a defined period of time, allowing natural ecosystems to regenerate in the absence of anthropogenic pressure, and for the establishment of biological corridors to maintain biological connectivity. There are also provisions for the declaration of private protected areas.[21]
- **Canada:** A number of marine protected areas and other effective area-based conservation measures have been established. These include the establishment, in cooperation with the Inuvialuit, of the Anguniaqvia niqiqyuam marine protected area in the Northwest Territories in 2016, and the Western/Emerald Banks Conservation Area off Nova Scotia in 2017. Also, in 2017, interim protection was announced for the Tallurutiup Imanga National Marine Conservation Area, in Lancaster Sound, Nunavut in cooperation with the Qikiqtani Inuit Association. Further the Scott Islands marine National Wildlife Area of the coast of British Columbia was announced in 2018. Collectively these areas cover more than 130,000 square kilometers.[22]
- **China:** Beginning in 2011, the Ecological Conservation Red Line initiative identifies and protects important ecological areas and systems. These areas are identified based on their biodiversity, importance for crucial ecosystem services (such as pollination and soil conservation) and resilience to natural disasters. Once identified, strict boundaries are drawn to protect these areas from industrialization and urbanization. More than 28,000 square kilometres of land around the Yangtze River Delta have been set aside for protection, while the red-lined area for the Bohai Economic Rim region covers approximately 37% of the sea area and 31% of its coastline and interior land. The Red Line initiative is already being rolled out across 15 provinces while plans for more continue to be added.[23]
- **Costa Rica:** The Cabo Blanco Marine Management Area was established in 2017 to protect sea turtle nesting sites, coral reefs, breeding grounds for several commercially-important fish species and an aggregation location for whales and dolphins. The area of more than 80,000 hectares was established following six years of consultations with the local community and the productive and tourism sectors. The management area will help to reduce pressures on the marine and coastal ecosystem from pollution, overexploitation and fishing and trawling.[24]
- **Senegal:** The Rural Community of Mangagoulack, in the Casamance region of Senegal, is a relatively remote area inhabited nearly exclusively by the Djola people. In response to the degradation of the coastal environment, the fishermen of the community decided to create an association and established an Indigenous and Community Conserved Area (ICCA) with the support of the ICCA Consortium and the Global Environment Facility Small Grants Programme. The established ICCA covers nearly 10,000 hectares of land and water.[25]

REDUCING RISK OF EXTINCTION

By 2020 the extinction of known threatened species has been prevented and their conservation status, particularly of those most in decline, has been improved and sustained.

Summary of target achievement

Species continue to move, on average, closer to extinction. However, the number of extinctions of birds and mammals would likely have been at least two to four times higher without conservation actions over the past decade. Among well-assessed taxonomic groups, nearly one quarter (23.7%) of species are threatened with extinction unless the drivers of biodiversity loss are drastically reduced, with an estimated total of one million threatened species across all groups. Vertebrate species populations have fallen, on average, by more than two-thirds since 1970, and by nearly one-third since 2010**. The target has not been achieved** (*high confidence*).[1]

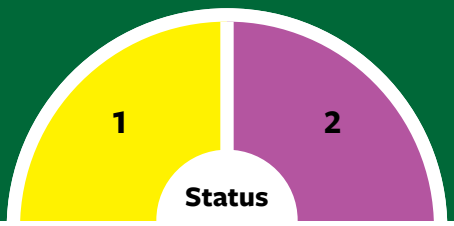
Most Parties report that they have taken actions to document and monitor the status of threatened species, and that they are making efforts to further expand monitoring systems. Some Parties also note that they are taking action to reach this target through development and implementation of species-specific recovery programmes, typically in relation to keystone or culturally-important species. Others refer to efforts related to ecosystem restoration, community-based conservation, and breeding programmes (Box 12.1). Some Parties also refer to their involvement with the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES). Among the challenges noted by Parties to the achievement of this target are the lack of funding, limited resources and capacity, and a lack of attention to aquatic species.

Although difficult to quantify, conservation actions have succeeded in reducing the risk of extinction of many species, and are estimated to have prevented between 28 and 48 bird and mammal species from going extinct since 1993 (when the CBD came into force), including between 11 and 25 since 2010. Considering that 15 bird and mammal species are confirmed or strongly suspected to have gone extinct since 1993, extinction rates would have been between 2.9 and 4.2 times higher over the last three decades in the absence of conservation action. If the rate of species extinctions from 1993–2009 is found to have continued over the last decade, the number of extinctions since 2010 would have been 2.3–4 times higher without conservation.[2] Furthermore, a recent study finds that global conservation efforts have reduced the rate at which bird species have moved through the categories of extinction risk and become extinct (i.e. the effective extinction rate) by at least 40%. However, this has been achieved mostly through preventing Critically Endangered species from going extinct, rather than by preventing species at low risk from moving to higher risk categories. This suggests an accumulation of 'extinction debt' causing a wave of extinctions in future, unless there are expanded conservation efforts to reduce the threat to species before they reach the most critical level of risk.[3]

Examples of extinctions documented this decade include Bramble Cay Melomys (*Melomys rubicola*) in Australia (declared extinct in 2016); Western Black Rhinoceros (*Diceros bicornis longipes*) in Cameroon (declared extinct in 2011), the Pinta Giant Tortoise (*Chelonoidis abingdonii*) in Galapagos (in 2012) and the Alagoas Foliage-gleaner (*Philydor novaesi*) in Brazil (in 2011).[4] While extinctions themselves are very difficult to detect, the Red List Index shows that, overall, species are continuing rapidly to move

TARGET ELEMENTS

1. **Extinctions prevented**
2. **Conservation status of threatened species improved**

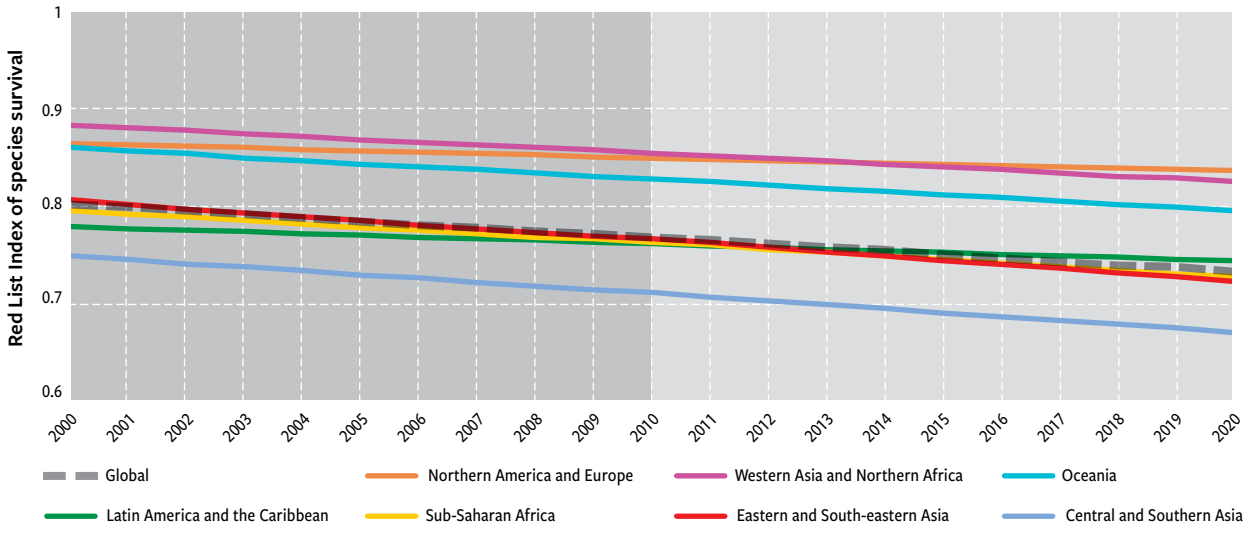


towards extinction, with cycads, amphibians and particularly corals declining most rapidly. Globally, between 2000 and 2020 the Red List Index has declined by almost 9%. Declines have also occurred in all regions, ranging from 3.3% in North America and Europe to 10.5% in Central and Southern Asia (Figure 12.1).[5]

The proportion of species threatened with extinction averages 23.7% across comprehensively assessed taxonomic groups, ranging from 7.5% for selected families of bony fishes, to 14% of birds, 26% of mammals, 30% of sharks and rays, 33% of reef-forming corals, 34% of conifers, 36% of selected families of dicots (magnolias and cacti), 41% of amphibians, and 63% of cycads (Figure 12.2).[6] In all, out of 120,372 species assessed for the IUCN Red List, a total of 32,441 species (27%) are listed as threatened with extinction. However, only about 5% of described species have been evaluated.

The Living Planet Index (LPI), is a sensitive indicator of changes in species abundance tracking trends for almost 21,000 surveyed populations of over 4,300 vertebrate species. Overall, the index showed an average decline of 68% between 1970 and 2016, with 95% confidence that the decline was between 62% and 73%.[7] This means that, on average (using a geometric mean), vertebrate species populations worldwide are approximately under one-third the size they were in 1970. For freshwater species, the index is less than one-fifth of the 1970 level. At a regional level, the LPI has declined the most, compared to 1970 levels, in Latin America and the Caribbean (94% since 1970) driven by very negative trends in reptiles, amphibians and fish.[8] The decline in other regions since 1970 is: 33% in North America, 24% in Europe and Central Asia, 65% in Africa and 45% in Asia and the Pacific.[9]

Figure 12.1.Trends in Red List Index at global and regional levels.



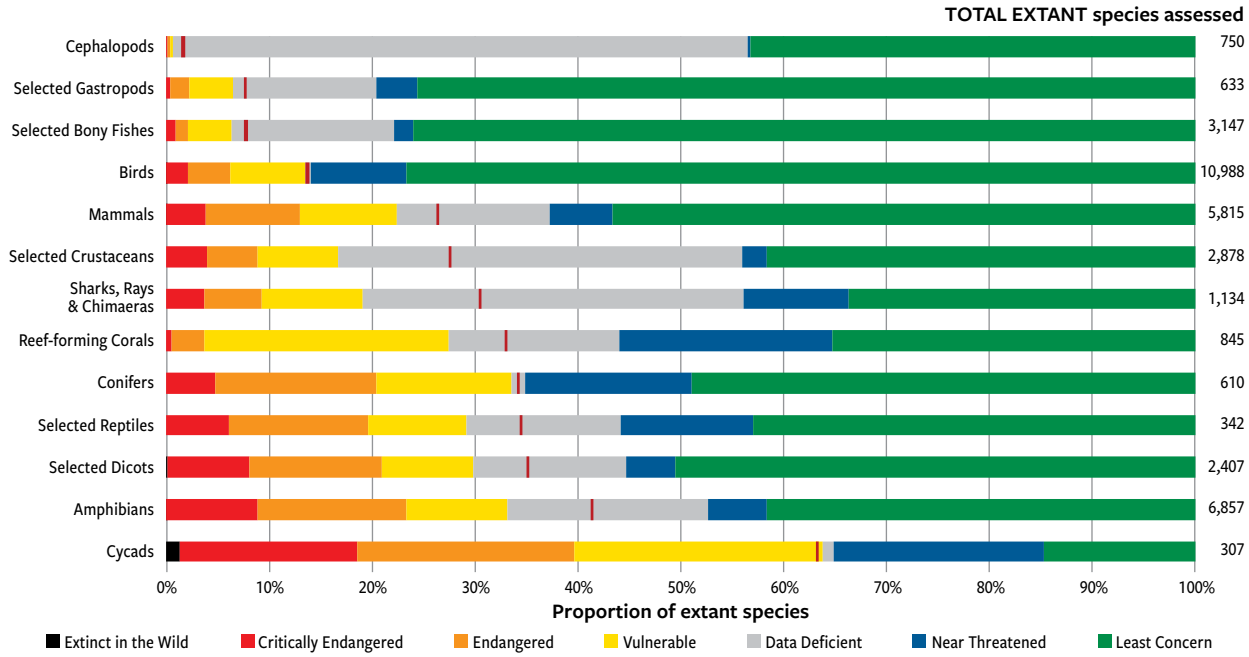
A Red List Index value of 1 equates to all species within a group qualifying as Least Concern (i.e., not expected to become extinct in the near future). An index value of 0 equates to all species having gone extinct. Values for 2020 are projections. Regional indices weight each species by the fraction of its range within the region, and therefore show the degree to which species are being conserved within a region relative to its potential contribution to global conservation of species.[10]

RELEVANT SDG TARGET

Target 15.5 - Take urgent and significant action to reduce the degradation of natural habitats, halt the loss of biodiversity and, by 2020, protect and prevent the extinction of threatened species

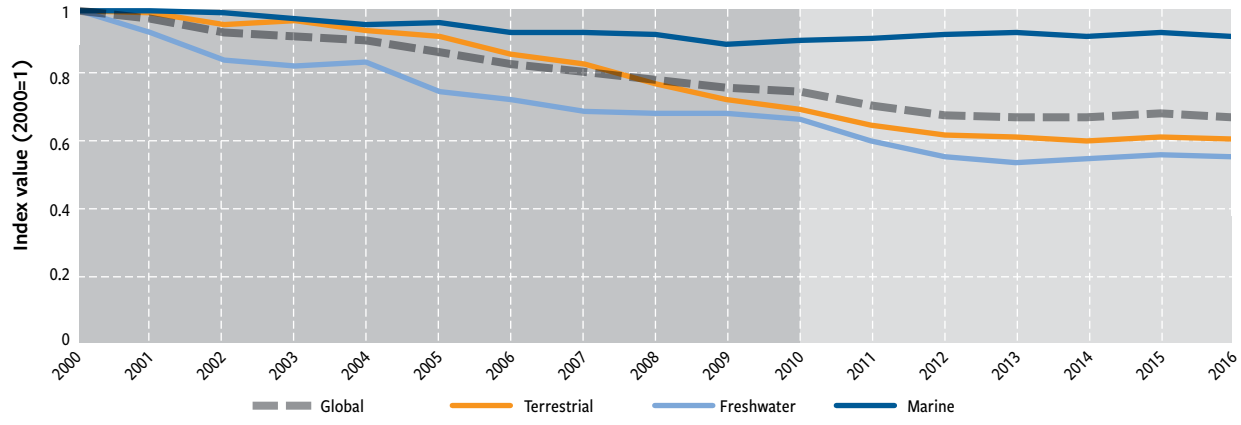
Target 15.7 - Take urgent action to end poaching and trafficking of protected species of flora and fauna and address both demand and supply of illegal wildlife products

Figure 12.2. Proportion of species in different extinction risk categories on the IUCN Red List across different taxonomic groups.



The red line indicates the total proportion of threatened species (assuming that data deficient species are as threatened as those with adequate data).[11]

Figure 12.3. The Living Planet Index (LPI) showing trends for 2000-2016 for all ecosystems (global), and separately for marine, terrestrial and freshwater ecosystems.



The Index is calculated relative to 2000 levels.[12]

Photo by Jane Rix/Shutterstock

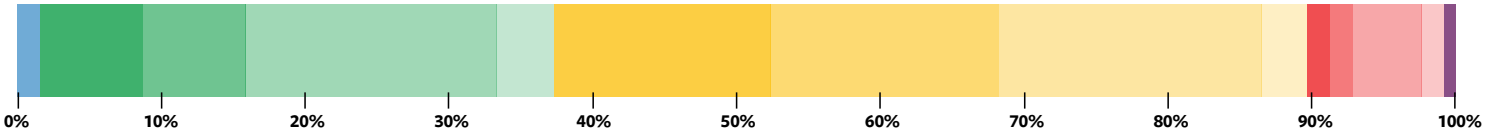
Looking at the more recent trend since 2000, the Living Planet Index has fallen by just under one-third overall (32%), with freshwater species populations continuing to decline the most (44%), followed by terrestrial species populations (39%), and marine species populations (8%). The recent trend shows overall rates of decline similar to those observed since 1970, with recent terrestrial declines faster than the long-term average, and the recent marine decline somewhat slower, but with a high level of uncertainty (Figure 12.3).

There have been significant efforts over the decade to take action to end poaching and trafficking of protected species (as called for by SDG 15.7). The poaching of both elephants and rhinoceroses has consistently declined since 2011, as have the prices paid for tusks and horns. However, the quantity of pangolin scales seized

Box 12.1. Examples of national experiences and progress

- **Japan:** The endangered Japanese crested ibis had disappeared from most of its original range. In order to help conserve the species, captive-bred birds have been released and habitat improvements have been promoted on Sado Island. As a result, the number of birds in the wild rose to 286 by March 2018, and chicks are being born in the wild.[13]
- **Malawi:** The Mulanje cedar is highly prized species because of its aromatic wood and is resistant to termites and fungal disease. It is important to the livelihoods of many rural communities, but Critically Endangered. The Mulanje Cedar Ecological Restoration Project is a community-based initiative to replant thousands of hectares of the species. The project will also develop a consensus-based management plan to coordinate appropriate conservation and restoration actions, to sustain the populations of the cedar and ensure its sustainable use. As part of the project the Mulanje Mountain Conservation Trust has been providing knowledge and improving horticultural methods for cedar restoration.[14]
- **Pakistan:**The Snow Leopard and Ecosystem Protection Program aims to improve the conservation status of the snow leopard by improving the management and condition of the Himalayan ecosystem. The project employs a landscape approach which, among other things, ensures the conservation of key biodiversity areas, creates buffer zones and corridors, supports the sustainable use of resources and improves the livelihoods of local communities. The project also promotes the sustainable management of alpine pastures and forests. Other species that are likely to benefit from the project are the Himalayan lynx, brown bear and Indian wolf.[15]
- **Paraguay:** The jaguar is under pressure from habitat loss and human-wildlife conflict. The Jaguar Conservation Strategy aims to better understand the behaviour, ecology and habitat patterns of jaguar populations through monitoring, and to reduce the incidence of human-wildlife conflicts. Camera traps have been installed to improve monitoring and a number of low-cost mitigation techniques, including the installation of mobile LED lights and electric fences, as well as hanging bells from the necks of cattle, were identified and found to be effective in reducing conflicts.[16]

Assessment of progress towards national targets



The colour bars show the percentage of Parties reporting a given level of progress towards their national targets. (Blue: exceeds target; Green: on track; Yellow: some progress; Red: no change; Purple: moving away from target). The intensity of the colour indicates alignment of national targets with the Aichi Target (Darker colours indicate close alignment).

has increased 10-fold in just five years, while the trade in 'red ivory' derived from the casques of helmeted hornbills has been increasing in recent years. Further new markets, such as the trafficking of European glass eels, have emerged in the wake of strengthened control.[17]

Most NBSAPs (86%) contain targets related to Aichi Biodiversity Target 12. However, only about a fifth of Parties (21%) have national targets with a scope and level of ambition similar to the global target. Of the Parties that have assessed progress, more than a third are on track to reach (36%) or exceed (2%) their national targets. Another half (52%) have made progress towards their targets but not at a rate that will allow them to be met. Several Parties (10%) report that they are making no progress towards the target or that they are moving away from the target (1%). Only 7% of reporting Parties have national targets of similar scope and ambition to Aichi Biodiversity Target 12 and are on track to meet them (see bar chart).

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SAFEGUARDING GENETIC DIVERSITY

By 2020, the genetic diversity of cultivated plants and farmed and domesticated animals and of wild relatives, including other socio-economically as well as culturally valuable species, is maintained, and strategies have been developed and implemented for minimizing genetic erosion and safeguarding their genetic diversity.

Summary of target achievement

Genetic diversity of cultivated plants, farmed and domesticated animals, and wild relatives, continues to be eroded. The wild relatives of important food crops are poorly represented in *ex situ* seed banks that help guarantee their conservation, important for future food security. The proportion of livestock breeds that are at risk or extinct is increasing, although at a slower rate than in earlier years, suggesting some progress in preventing the decline of traditional breeds. Wild relatives of farmed birds and mammals are moving closer to extinction. **The target has not been achieved** (*medium confidence*).[1]

Commonly reported actions in the sixth national reports related to this target are the creation and further development of gene banks, botanic gardens, germplasm plots, breeding facilities and research universities. Some Parties also report on actions to preserve animal breeds through breeding facilities, protection associated with national heritage recognition, and incentivizing farmers to maintain local breeds. Parties also indicate that they are taking action to conserve valuable crop species, including those used in medicines; to reintroduce neglected crops; and to provide training to farmers on issues associated with commercialization, development, and food security (Box 13.1). Some of the noted challenges to reaching this target are biases in which plant and crop species are the focus of conservation programmes, and a lack of financial and human resources to carry out conservation efforts.

Wild plants useful for economic, social or cultural reasons are in a poor state of conservation worldwide. An indicator recently developed to assess the conservation status of nearly 7,000 useful wild plant species found that fewer than three per cent were sufficiently conserved either through protected areas (*in situ*), or in seedbanks or botanic gardens (*ex situ*). These plants are used, among other purposes, for plant breeding (from wild relatives of crops), medicines, materials, foods, environmental services such as shade and erosion control. The lack of conservation across their range in the wild suggests an erosion of the plant genetic resources on which human societies depend (Figure 13.1).[2]

For domesticated breeds of livestock, the proportion categorized as at risk or extinct is increasing, indicating a decline in livestock diversity, but the rate of increase is slowing, suggesting that countries may be making some progress in safeguarding domesticated animals (Figure 13.2). Out of 7,155 local breeds (i.e. breeds occurring in only one country), 1,940 are considered to be at risk of extinction. However, for 4,668 of them, the risk status remains unknown due to a lack of data or updated data. Results between regions differ: in Europe among the breeds with known risk status, 84% are considered to be at risk, while this proportion is 44% for South America and 71% for Southern Africa. Due to the scarce information available, results for other regions are considered not to be representative. A large number of breeds that are used more

TARGET ELEMENTS

1. Genetic diversity of cultivated plants maintained
2. Genetic diversity of farmed and domesticated animals maintained
3. Genetic diversity of wild relatives maintained
4. Genetic diversity valuable species maintained
5. Strategies to minimizing genetic erosion in place

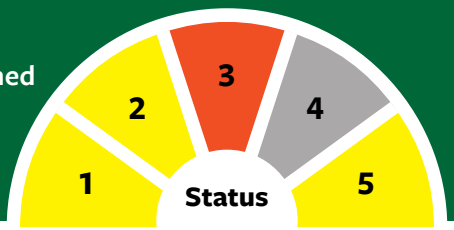
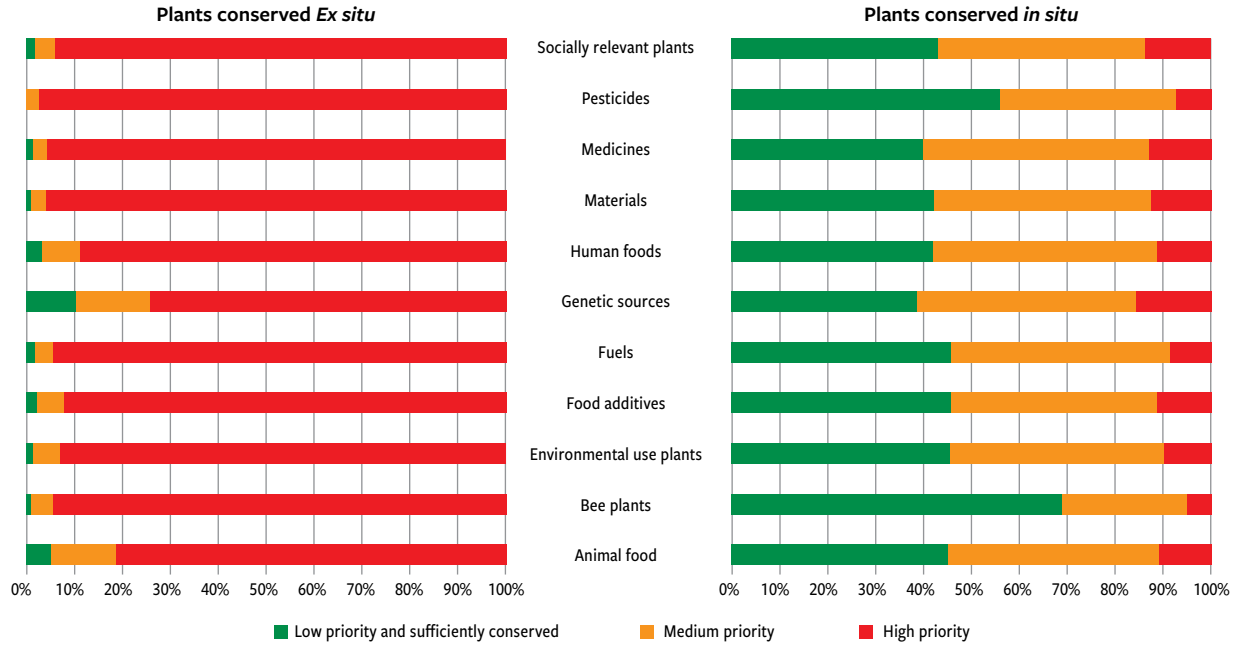
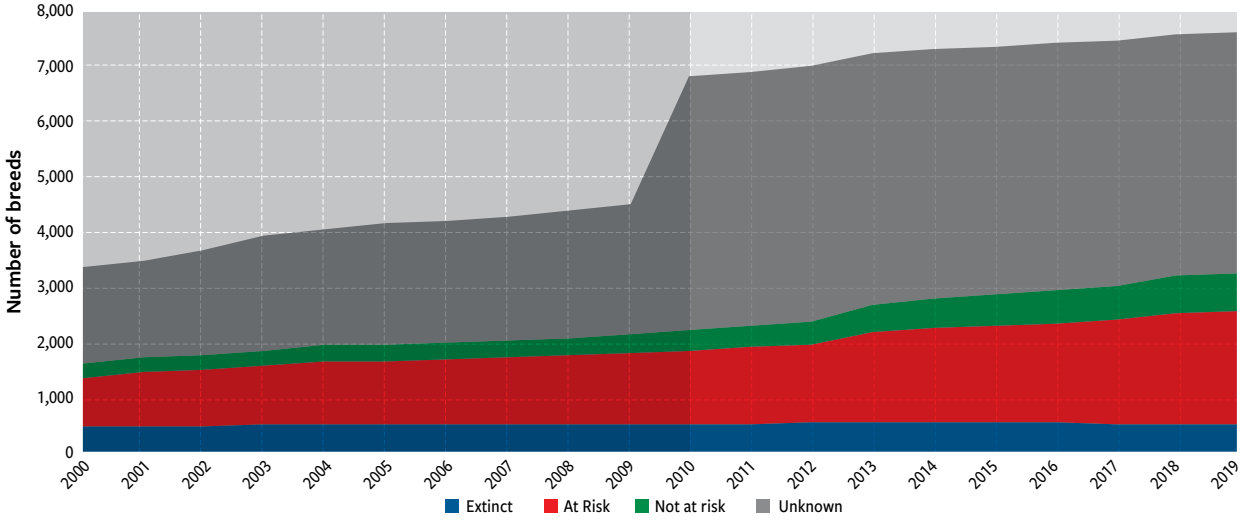


Figure 13.1. Conservation status of wild plants.



Proportion of useful wild plant species with low, medium and high priority for further conservation work, both in situ and ex situ, shown across 11 use categories[3].

Figure 13.2. Trends in status of local breeds according to risk categories.



As indicated in the figure, the total number of breeds assessed has increased over time.[4]

RELEVANT SDG TARGET

Target 2.5 - By 2020, maintain the genetic diversity of seeds, cultivated plants and farmed and domesticated animals and their related wild species...and promote access to and fair and equitable sharing of benefits arising from the utilization of genetic resources and associated traditional knowledge...

widely (transboundary breeds) are also at risk, but the numbers are stable and the relative proportion at risk is much lower than is the case for local breeds.[5]

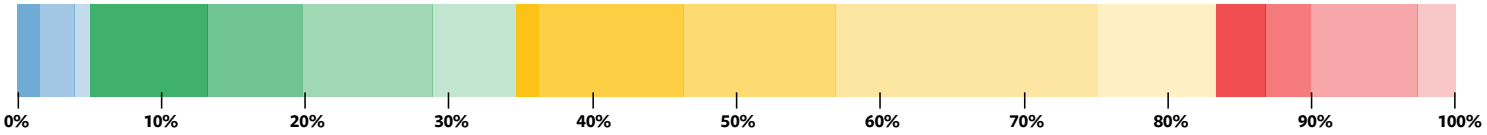
The extinction risk of wild relatives of domesticated or farmed birds and mammals is increasing. A Red List Index covering 55 wild mammal and 449 wild bird species, related to 30 domesticated mammals and birds that are sources of food, showed a decline of 2% from 1988 to 2016, suggesting that on average these species are moving closer to extinction. Fifteen of the wild relatives (seven mammals and eight birds) are currently Critically Endangered, indicating that the status of the wild relatives of farmed animals could deteriorate rapidly unless action is taken to reverse their decline.[6]

There are few studies of trends in genetic diversity of wild species more generally.[67] However, one recent study found no evidence of consistent effects of humans on animal genetic diversity worldwide, and consistent temporal trends between 1980 and 2016.[8]

About three quarters of NBSAPs (74%) contain targets related to Aichi Biodiversity Target 13. Of the Parties that have assessed progress towards their national targets, more than a third of the national targets are on track to be met (30%) or exceeded (5%). Fewer than half (49%) have made progress towards their targets but not at a rate that will allow them to be met. Fewer than a fifth of Parties (17%) report that they are making no progress towards the target. However, fewer than a fifth of national targets are similar to (18%) or exceed (1%) the scope and level of ambition of the Aichi Target. Most of the national targets refer to the conservation of genetic diversity generally. Few of the targets refer to specific elements of the target. In particular, the issues of conserving the genetic diversity of wild relatives and socio-economically and culturally valuable species, and the development of strategies to minimize genetic erosion, are not generally reflected in the targets set by Parties. Only 8% of reporting Parties have national targets of similar scope and ambition to Aichi Biodiversity Target 13 and are on track to meet them (see bar chart).

Photo by Marcos Castillo/Shutterstock

Assessment of progress towards national targets



The colour bars show the percentage of Parties reporting a given level of progress towards their national targets. (Blue: exceeds target; Green: on track; Yellow: some progress; Red: no change; Purple: moving away from target). The intensity of the colour indicates alignment of national targets with the Aichi Target (Darker colours indicate close alignment).

Box 13.1. Examples of national experiences and progress

- **Australia:** The Australian Seed Bank Partnership provided training on seed conservation techniques in Kakadu National Park. Experts from the Australian Grains Genebank, Australian National Botanic Gardens and George Brown Darwin Botanic Gardens joined Kakadu National Park Rangers to deliver training to Kakadu's traditional owners and scientists from Papua New Guinea and Indonesia. The project team collected seeds from crop wild relatives such as sorghum, cajanus and vigna and provided training on plant identification and seed collection, as well as techniques for cleaning, drying and storing seeds in the field. The Kakadu National Park is jointly managed by the Australian Government and traditional owners.[9]
- **Bosnia and Herzegovina:** Various actions have been taken to protect the genetic diversity of cattle breeds, including the adoption of a law on livestock breeding which recognized several indigenous species, breeds and varieties. Further, horse breeders who breed Bosnian Mountain Horses and Lipizzaners, among others, are entitled to incentives.[10]
- **Guatemala:** The Collaborative Programme on Participatory Plant Breeding in Mesoamerica (Programa colaborativo de Fitomejoramiento Participativo en Mesoamérica) and the Buena Milpa project, have developed maize descriptors, which are key tools for valuing, collecting and documenting the different local maize varieties used by farmers. Further, through the programme 400 accessions of corn, beans, potatoes and cucurbits have been made, and more than 1,500 farmers have been trained in plant breeding.[11]
- **Sweden:** A national Gene Bank for vegetatively propagated plants was established in 2016. Seeds are conserved in collaboration with the Nordic countries participating in the Nordic Genetic Resource Centre. Plants from both the national and the Nordic gene banks have been re-introduced to the market under the Green Cultural Heritage label.[12]
- **United Kingdom of Great Britain and Northern Ireland:** Genetic diversity provides trees with the potential to adapt to new environmental conditions, including climate change and novel pests and diseases. In 2013 the Royal Botanic Gardens, Kew launched the UK National Tree Seed Project in order to conserve the genetic diversity of the United Kingdom's forest genetic resources. In the first 5 years of the project, over 10 million seeds were conserved from approximately 7,623 maternal individuals across 60 native species of trees and shrubs. This represents approximately three-quarters of the United Kingdom's native trees and shrubs. Through the project, 60 separate collections of ash trees have been made from all over the United Kingdom, comprising seed from 674 separate trees. Each tree is geo-referenced and the seed from individual trees is kept separately in the Millennium Seed Bank. Results suggest that over 90% of the United Kingdom's genetic diversity of this species has been conserved by the project.[13]

ECOSYSTEM SERVICES

By 2020, ecosystems that provide essential services, including services related to water, and contribute to health, livelihoods and well-being, are restored and safeguarded, taking into account the needs of women, indigenous and local communities, and the poor and vulnerable.

Summary of target achievement

The capacity of ecosystems to provide the essential services on which societies depend continues to decline, and consequently, most ecosystem services (nature's contributions to people) are in decline. In general, poor and vulnerable communities, as well as women, are disproportionately affected by this decline. Mammal and bird species responsible for pollination are on average moving closer to extinction, as are species used for food and medicine. **The target has not been achieved** (*medium confidence*).[1]

In relation to this target, many Parties refer in their national reports to the inclusion of a gender perspective in the development of biodiversity policies (see Aichi Target 17) and raising awareness of the importance of ecosystem services (see Aichi Target 1). Several national reports also refer to support for research projects, including on issues related to economic valuation (see Aichi Target 2), and the convening of capacity-building workshops. Reported challenges to reaching this target were a lack of funding for research, programmes and green infrastructure projects (Box 14.1). A number of Parties note a lack of knowledge or data on how the needs of women may be taken into account in ecosystem management.

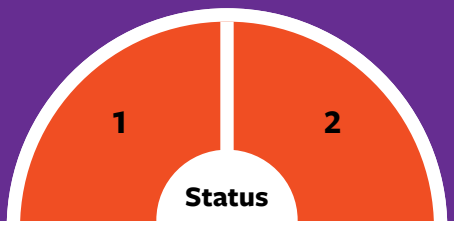
The degradation of ecosystems (see Aichi Target 5) is continuing to threaten the contributions that nature provides to people. Of 18 categories of nature's contributions analysed in the IPBES Global Assessment on Biodiversity and Ecosystem Services, 14 have shown a declining trend over the past 50 years (Figure 14.1). The only categories of contributions showing an increasing trend are those relating to material benefits such as provision of food, timber, fibre and energy. Almost all of the categories relating to the regulation of environmental processes are in decline, suggesting that the capacity of ecosystems to sustain contributions to people are being compromised. For example, the expansion in the production of food, feed, fibre and bio-energy has occurred at the cost of regulation of air and water quality, climate regulation, pollination, regulation of pests and diseases and provision of habitat. Moreover, the continued provision of food, feed, fibre and bio-energy may also be compromised by the decline in regulating contributions. Poorer groups are most likely to suffer the impacts of declining contributions of nature to people, and are least likely to benefit from increasing contributions such as food production.[2]

Loss of forests and native vegetation has affected smallholder subsistence systems by lowering yields, pollination, water provisioning, and access to animals and plants used as food, medicine and fuelwood, as well as aspects of human well-being including identity, autonomy, traditional lifestyles and knowledge. Deforestation and land degradation have had a negative impact on freshwater quality and quantity. Approximately half of the global population is expected to be living in water scarce areas by 2050, especially in Asia. Loss of native vegetation has also been linked to increase in flood-related disasters and soil erosion.[3]

Spatial analysis of the provision and need for ecosystem services shows that nature's contributions, for example to water quality regulation, coastal risk reduction and crop pollination, are not evenly distributed across the world. Human needs also vary depending on the location. Where the

TARGET ELEMENTS

1. **Ecosystems providing essential services restored and safeguarded**
2. **Actions take into account the needs of women, indigenous and local communities, and the poor and vulnerable**



two coincide, nature's contributions to people are highest. In some areas, however, people's needs are not adequately met (Figure 14.2).[4]

Protected areas, and other effective area-based conservation measures, are a key mechanism for safeguarding ecosystems that provide essential services, and hence potentially play a key role in achieving Target 14. Protected areas deliver 20% of the global total of continental runoff, providing freshwater to nearly two-thirds of the global population living downstream.[5] Co-management of protected areas, involving local communities, tends to be associated with delivery of greater local benefits than state management alone.[6]

Pollination by wild species is essential to crops and natural ecosystems; animal pollination is directly responsible for between 5-8% of current global agricultural production by volume. However, wild pollinators have declined in distribution and diversity (and in some cases, abundance) at local and regional scales in North West Europe and North America, the only regions with adequate data; local declines have been recorded elsewhere.[7] According to the IUCN Red List, 16.5% of vertebrate pollinators are threatened with global extinction, while the Red List Index for vertebrate pollinators is declining, indicating that their extinction risk is increasing.[8] Where national Red List assessments are available, they often show that more than 40% of bee species may be threatened.[9]

Wild species used for food and medicine are increasingly threatened with extinction, owing to a combination of unsustainable use and other pressures, such as habitat loss driven by unsustainable agriculture, logging and commercial and residential development. About 14% of the world's birds are thought to be used for food and/or medicinal purposes, and 23% are threatened with extinction

Figure 14.1. Global trends, over 50 years, in the capacity of ecosystems to sustain the provision of 18 categories of ecosystem services or Natures' Contributions to People.[10]

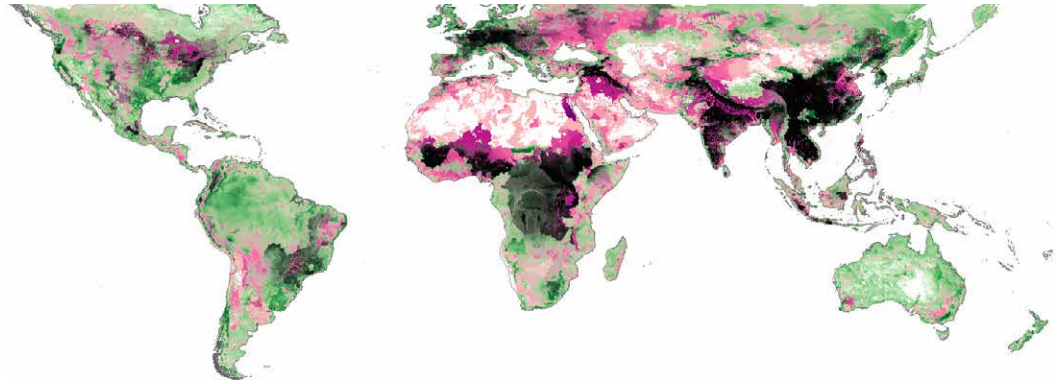
		Directional trend 50-year global trend			
Nature's contributions to people		Decrease	No change	Increase	Across regions
1	Habitat creation & maintenance	↓			Consistent
2	Pollination and dispersal of seeds	↓			Consistent
3	Regulation of air quality	↘			Variable
4	Regulation of climate	↘			Variable
5	Regulation of ocean acidification		→		Variable
6	Regulation of freshwater quantity	↘			Variable
7	Regulation of freshwater quality	↘			Consistent
8	Regulation of soils	↘			Variable
9	Regulation of hazards & extreme events	↘			Variable
10	Regulation of organisms	↓ ↘			Consistent
11	Energy	↘		↗	Variable
12	Food & feed	↓ ↘		↗	Variable
13	Materials & assistance	↘		↗	Variable
14	Medicinal, biochemical, & genetic resources	↓ ↘			Consistent
15	Learning & inspiration	↓			Consistent
16	Physical, & psychological experiences	↘			Consistent
17	Supporting identities	↘			Consistent
18	Maintenance of options	↓			Consistent

RELEVANT SDG TARGET

Target 6.6 - By 2020, protect and restore water-related ecosystems, including mountains, forests, wetlands, rivers, aquifers and lakes

Target 15.4 - By 2030, ensure the conservation of mountain ecosystems, including their biodiversity, in order to enhance their capacity to provide benefits that are essential for sustainable development

Figure 14.2. Water quality regulation, one of nature's contributions to people, mapped at a global scale.



Water quality regulation, one of nature's contributions to people, is decomposed into 1) nature's contribution (in green), here as nitrogen retained by vegetation and avoided being exported to streams (in Kg/year), and 2) people potentially benefiting (in pink), here as the number of people downstream of each pixel of vegetation. Low values of each are translucent, meaning that green shows where nature is contributing with few people benefitting and pink is where many people would benefit but nature is not contributing. High values of both are shown in black, where nature is contributing the most to the greatest number of people.[11]

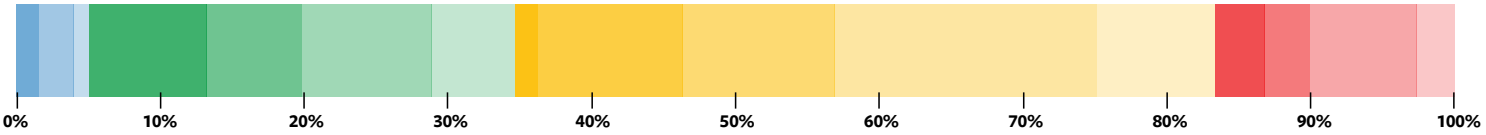
(compared with 13% of all bird species). Similarly, mammal species used for food and medicines (22% of all known mammal species) are more threatened on average than those not used in this way.[12]

A review of information provided by countries to the Food and Agricultural Organization (FAO) identified 4,323 cases of wild foods being used in 69 countries, representing 2,822 distinct wild species. In 24% of cases wild food species were decreasing in abundance, in 8% of cases they were stable and in 7% of cases they were increasing. Trends were unknown in 60% of cases. The main threats to wild food species identified by countries were overexploitation (see Aichi Target 12), habitat alteration or loss (see Aichi Target 5), pollution (see Aichi Target 8) and change in land use.[13]

There are numerous examples of the disproportionate impacts of a decline in ecosystem services on women and girls, although global information is limited. For example, women are more impacted by wetland degradation than men, due their use of wetlands for firewood, handicraft materials, water and herbal medicine.[14] Conversely considering gender dimensions in biodiversity management can lead to positive outcomes for biodiversity and gender equality. Despite important advances in legislation to strengthen women's land rights, significant gaps between countries and regions remain. To date, 164 countries explicitly recognize women's rights to own, use, make decisions and use land as collateral on equal terms with men. However, only 52 countries guarantee these rights both in law and practice.[15]

More than half (66%) of NBSAPs contain targets related to Aichi Biodiversity Target 14. Of the Parties which have assessed progress towards their national targets, fewer than a third report that they are on track to be met (27%) or exceeded (3%). Another 61% have made progress towards their targets but not at a rate that will allow them to be met; a few report no progress (7%) or that they are moving away from the target (3%). Only about a quarter (24%) of the national targets are similar in scope and level of ambition to the Aichi Target. Relatively few explicitly refer to taking into account the needs of women, indigenous peoples and local communities and the poor and vulnerable. Only 7% of reporting Parties have national targets of similar scope and ambition to Aichi Biodiversity Target 14 and are on track to meet them (see bar chart).

Assessment of progress towards national targets



The colour bars show the percentage of Parties reporting a given level of progress towards their national targets. (Blue: exceeds target; Green: on track; Yellow: some progress; Red: no change; Purple: moving away from target). The intensity of the colour indicates alignment of national targets with the Aichi Target (Darker colours indicate close alignment).

Box 14.1. Examples of national progress

- **Costa Rica:** Through a payment for ecosystem services programme economic incentives are provided to property owners with forests that provide ecosystem services. Between 2014 and 2018, contracts covered an average of 245,000 hectares per year. Many of the areas covered were in biological corridors, indigenous territories, and protected areas. The number of women benefiting from this programme increased from 25% in 2016 to 29% in 2017.[16]
- **Pakistan:** Through the Billion Trees Afforestation Project in Khyber Pakhtunkhwa, one billion seedlings have been planted, contributing to the restoration of 350,000 hectares of forests and degraded lands. In turn this has helped recharge springs and increased the availability of drinking water for local communities. The project has also created thousands of green jobs for the rural poor and has increased the availability of fuelwood. The project will have a positive impact on women, who are responsible for collecting forage, fuelwood and who bring water from springs and wells.[17]
- **Samoa:** The village of Vailoa is part of a large mangrove ecosystem in the Vaiusu Bay area bordering the western edge of the Apia Township. The mangroves ecosystem has been severely degraded and has decreased in size due to urban development and population pressure. The degradation of the mangroves led to significant loss of productive coastal fisheries and a filtering system for run-off into coastal waters. The Vailoa Village Council and Women's Committee established village rules to prevent further degradation of the mangrove. The United Nations Development Programme and the Global Environment Facility supported a biodiversity baseline audit, a mangrove management plan, and rehabilitation efforts. The project, which was spearheaded by the Women's Committee, resulted in the establishment of a mangrove protected area that is now the third largest in Samoa. The rehabilitation of the mangroves has replenished fish, mud crab and shellfish populations and generated income for the local community.[18]
- **India and Nepal:** Forest management groups in India and Nepal with larger proportions of women have recorded greater improvements in forest health conditions, and more sustained levels of firewood, a provisioning ecosystem service primarily the responsibility of women.[19] Other studies in India and Nepal have found that including women in resource management improves governance and conservation outcomes (regulating and supporting ecosystems services).[20]
- **South Africa:** The country has identified 22 strategic water source areas, that supply a disproportionate amount of mean annual runoff to substantial downstream economies and urban centres. These areas make up only 8% of the land area but provide 50% of the country's runoff, supporting at least 51% of its population and 64% of its economy. 13% of these areas are under formal protection. As of September 2018, there have been 47 integrated interventions in 5 key rural strategic water source areas. These interventions include a partnership to promote the integration of ecological and built infrastructure to improve water security in the uMngeni catchment which serves Durban and Pietermaritzburg, a programme to conserve the Umzimvubu River system and an improvement plan for the Berg River Catchment, which serves Cape Town and surrounding towns and agricultural areas.[21]

ECOSYSTEM RESTORATION AND RESILIENCE

By 2020, ecosystem resilience and the contribution of biodiversity to carbon stocks has been enhanced, through conservation and restoration, including restoration of at least 15 per cent of degraded ecosystems, thereby contributing to climate change mitigation and adaptation and to combatting desertification.

Summary of target achievement

Progress towards the target of restoring 15 per cent of degraded ecosystems by 2020 is limited. Nevertheless, ambitious restoration programmes are under way or proposed in many regions, with the potential to deliver significant gains in ecosystem resilience and preservation of carbon stocks. **The target has not been achieved** (*medium confidence*).[1]

Several recent large-scale assessments, including the IPBES assessment report on land degradation and restoration[2] and the IPPC special reports on climate change and land[3] and on the ocean and cryosphere,[4] demonstrate the continued and ongoing degradation of ecosystems and the impact of this on human well-being. However, they also demonstrate the range of approaches that are being taken across the world to restore ecosystems, and the range of benefits this can provide to ecosystems, climate change mitigation and adaptation, and human well-being generally. Indeed, there are numerous examples of successful approaches to restoration for most ecosystem types, including forests, grasslands, peatlands, mangroves and coral reefs.[5] An analysis of 400 studies documenting ecosystem recovery following large scale disturbances, found positive recovery rates in all cases, but also that ecosystems did not fully recover.[6] In 2016, an action plan for ecosystem restoration was adopted under the Convention.[7]

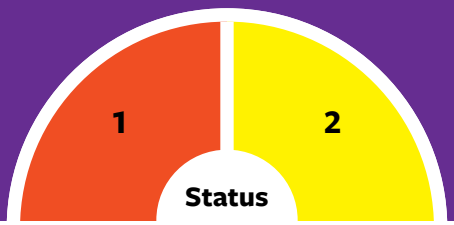
The actions reported by Parties to reach this target include reforestation, natural regeneration, increasing habitat connectivity, the rehabilitation of heavily-degraded sites and promoting urban green infrastructure. Parties referred to undertaking research, identifying and mapping priority areas for restoration, putting in place legal frameworks for restoration reflecting restoration in other strategies and plans, including national climate adaptation strategies, promoting citizen engagement and payments for ecosystem services schemes. Parties also referenced the establishment of protected areas, the control of invasive alien species, *ex situ* conservation and species reintroduction programmes (Box 15.1). References to resilience were few. Reported challenges to reaching this target include a lack of information and data on ecosystem health and quality, and a lack of monitoring systems.

Under the Convention, about 50% of Parties have established national targets towards Aichi Biodiversity Target 15, and included them in their NBSAPs. Of these, about 17% meet or exceed the 15% restoration level. Many of the Nationally Determined Contributions (NDCs) under the Paris Agreement also contribute to Aichi Biodiversity Target 15. 75% percent of NDCs contain forest-related targets, including restoration activities.[8] Under the United Nations Convention to Combat Desertification (UNCCD), 101 countries have set voluntary targets to achieve land degradation neutrality (LDN), and another 22 have committed to do so.[9]

It is estimated that major commitments for ecosystem restoration by countries total almost 300 million hectares to date.[10] These include pledges of

TARGET ELEMENTS

1. **Ecosystem resilience and carbon stocks enhanced**
2. **15% of degraded ecosystems under restoration**



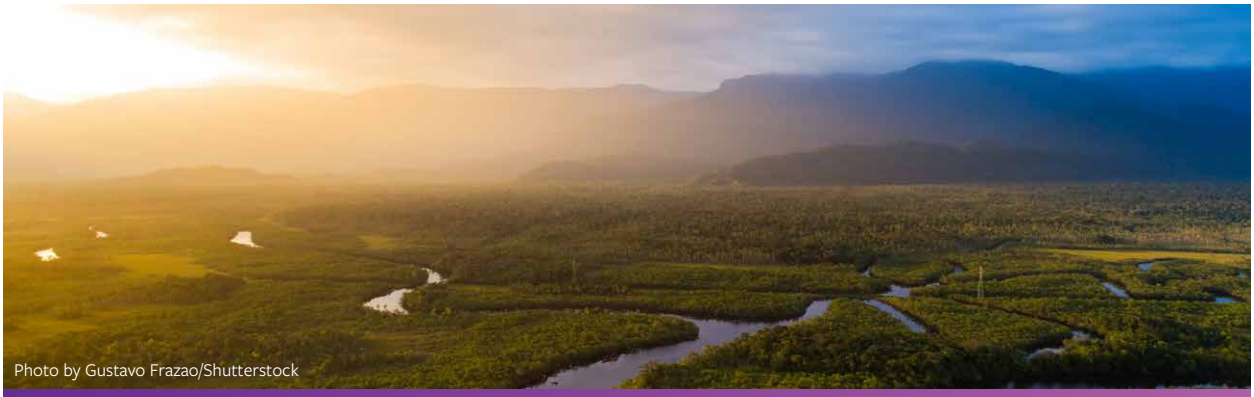


Photo by Gustavo Frazao/Shutterstock

Box 15.1. Examples of national experiences and progress

- **Brazil:** The Atlantic Forest Restoration Pact is a bottom-up, multi-stakeholder movement to restore 15 million hectares of degraded and/or deforested lands by 2050. Through the Pact, one million hectares were also pledged as a contribution to the Bonn Challenge. It is estimated that 673,510–740,555 hectares of native forests were under recovery from 2011 to 2015 in the Atlantic Forest, and it is expected that a total of 1.35–1.48 million hectares will be under recovery by 2020. The success of the Pact has been attributed to efforts to engage and connect multiple stakeholders, the establishment of effective monitoring systems combining remote sensing and field data, and the promotion of a vision and strategies to inform public polices and actions. The Atlantic Forest Law, which among other things prohibits deforestation of secondary Atlantic forest, provided an important enabling environment.[11]
- **Nigeria:** As part of the Great Green Wall Project, Nigeria has committed to restoring a 15 km wide shelter-belt across its nine northern states.[12] The Great Green Wall Project is an initiative of the African Union that aims to grow an 8,000 km long forested area at the southern edge of the Sahara Desert as a means to prevent desertification and tackle poverty in the Sahel-Sahara region.[13] Chad,[14] Mauritania[15] and Senegal[16] also report in their national reports that they are taking actions in relation to this project.
- **Estonia:** Alvar grasslands are semi-natural grasslands with thin lime-rich soil on a limestone bedrock. One third of all the alvar grasslands in Europe are situated in Estonia. Through the LIFE to Alvars project 2,500 hectares of alvar grasslands were restored. The restoration involved removing woody biomass and re-introducing grazing. Approximately 600 landowners in 25 project areas participated in the restoration activities and subsequent management.[17]
- **Poland:** In order to increase water retention and slow runoff in mountain catchments, more than 3 500 ponds, retention reservoirs, wetlands, and floodplains were created. Further waterways and wetlands were restored as part of the project. These actions resulted in a reduction in the damage caused by flood waters, and greater protection from drought.[18]

RELEVANT SDG TARGET

Target 15.1 - By 2020, ensure the conservation, restoration and sustainable use of terrestrial and inland freshwater ecosystems and their services, in particular forests, wetlands, mountains and drylands...

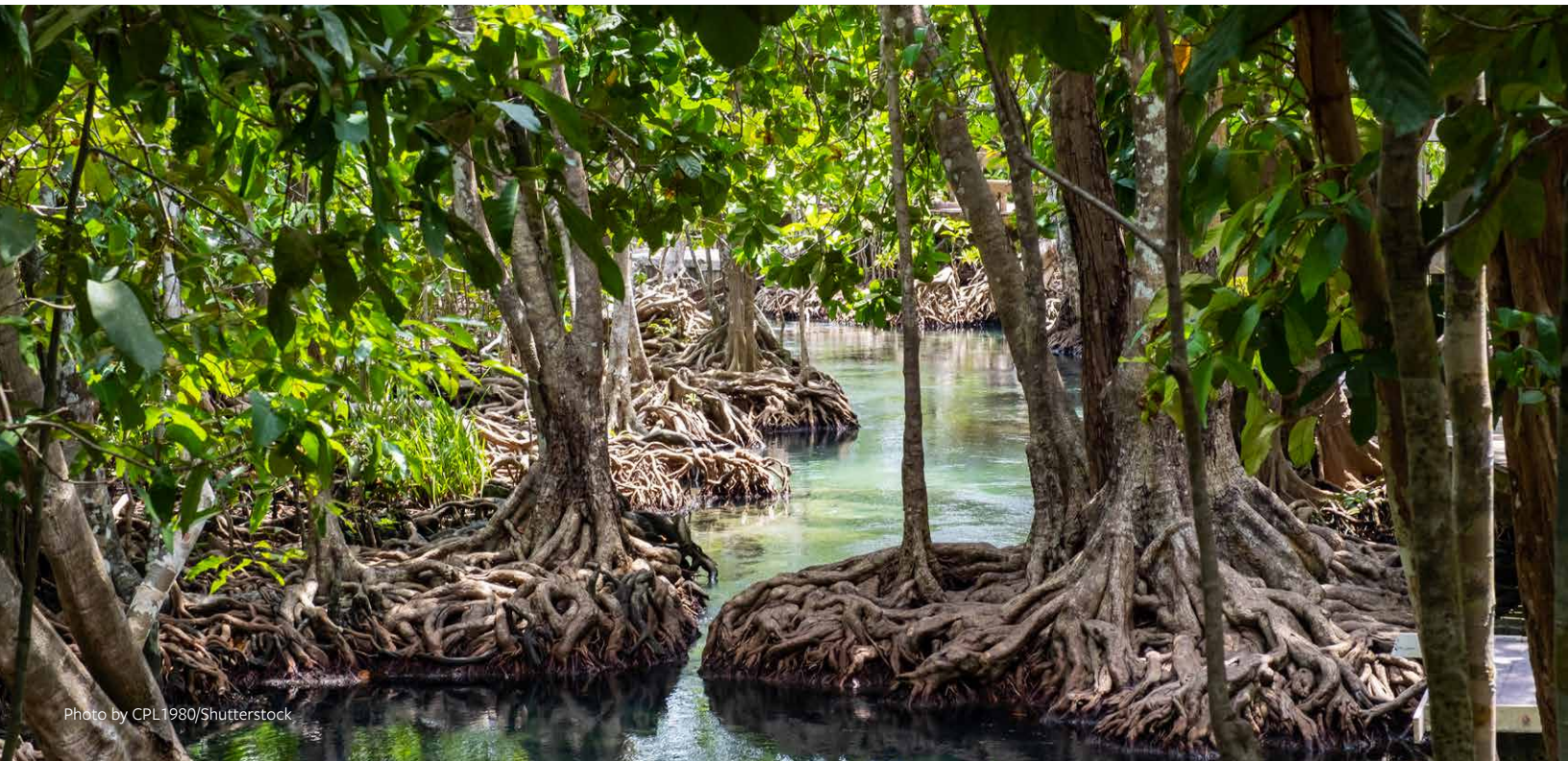
Target 15.3 - By 2030, combat desertification, restore degraded land and soil, including land affected by desertification, drought and floods, and strive to achieve a land degradation-neutral world

Target 14.2 By 2020, sustainably manage and protect marine and coastal ecosystems to avoid significant adverse impacts, including by strengthening their resilience, and take action for their restoration in order to achieve healthy and productive oceans

173 million hectares under the Bonn Challenge and the New York Declaration on Forests (NYDF), as well as pledges under additional national schemes, including some of the contributions under the Rio Conventions referred to above. Of the restoration commitments made, only about one third (34%) comprise regeneration of natural forest, with 45% of the planned areas comprising plantations and 21% agroforestry.[19] Collectively, the targets under the UNCCD would put 385 million hectares of land under restorative measures, ranging from conservation/protected areas to sustainable land management/agro-ecological practices and ecosystem rehabilitation/restoration;[20] the extent of overlap of these commitments with those reported above has not been analysed.

The Bonn Challenge and the NYDF has a target to bring 150 million hectares of deforested and degraded land into restoration by 2020, and 350 million hectares by 2030. However, as of April 2019, only about 26.7 million hectares of the commitments under these initiatives had been implemented, representing about 2% of the 1200 million hectares of lands estimated to be suitable for such restoration. Moreover, of this, only 3.1 million hectares has been reported since 2011.[21] Overall the information that is available suggests that restoration activities tend to be project-focused and that efforts for restoration need to be significantly scaled up if the 15% target is to be met. However, there is a large potential for natural regeneration, especially in humid tropical forest biomes. Data from the Brazilian Institute for Space Research (INPE) shows that tropical secondary vegetation in the Amazon increased from 10 million hectares to more than 17 million hectares between 2004 and 2014, indicating that tropical regeneration was underway in nearly a quarter of the total area cleared in the Brazilian Amazon throughout its history.

The concept of 'rewilding' is receiving growing attention in some regions, as a means of restoring particular features and functions of ecosystems in response to local and national choices. The return of some aspects of 'wildness' is not always popular, for example carnivores that threaten livestock, disruption caused by natural fire and flood regimes,



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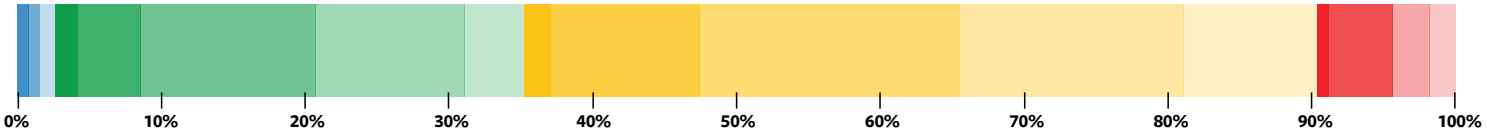
Assessment of progress towards national targets



The colour bars show the percentage of Parties reporting a given level of progress towards their national targets. (Blue: exceeds target; Green: on track; Yellow: some progress; Red: no change; Purple: moving away from target). The intensity of the colour indicates alignment of national targets with the Aichi Target (Darker colours indicate close alignment).

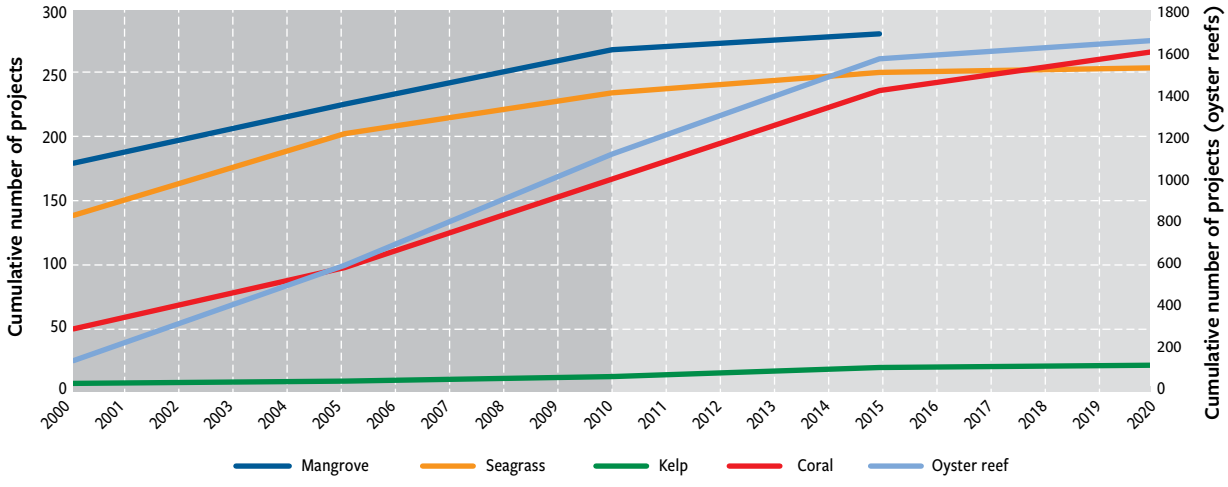
or the disappearance of traditional managed landscapes with strong cultural associations. On the other hand, successful rewilding can bring a range of economic, social and health benefits associated with the return of key ecosystem services. A framework for promoting the benefits of rewilding through a participatory process has recently been proposed.[22]

In recent years there have been increased efforts restore river flows including through the removal of dams. Between 1950 and 2016, there have been 3,869 dam removals, about a third of which have occurred in the Americas. Over the last two decades the rate of dam removal has increased exponentially and these removals are now occurring across the world.[23] However despite these efforts it is estimated that there are still 6374 large dams worldwide and an additional 3377 that are planned or proposed (see Aichi Target 5).[24]

In the past two decades, there has been a surge in projects to restore coastal ecosystems, including mangroves, seagrass meadows, kelp forests, and coral and oyster reefs, many of them close to coastal megacities (Figure 15.1).[25] These efforts have delivered benefits such as improved water quality following oyster reef restoration, and also, as 'Blue Carbon' strategies, contribute to mitigate climate change and improve coastal protection.[26] However, only a small proportion of such habitats have been restored. It is estimated that there are more than 800,000 hectares of mangroves which have potential for restoration.[27]

Of the Parties that have assessed progress towards their national targets, more than a third report that they are on track to reach (33%) or exceed (3%) them. Another 55% report progress towards their targets, while 9% report that they are making no progress towards the target. Only about a fifth of national targets are similar to (18%) or exceed (3%) the scope and level of ambition of the Aichi Target. The national targets tended to have a greater focus on the restoration element of the Aichi Target than on the elements focussing on ecosystem resiliency and carbon stocks. Only 6% of reporting Parties have national targets of similar scope and ambition to Aichi Biodiversity Target 15 and are on track to meet them (see bar chart).

Figure 15.1. Cumulative reported marine restoration projects between 2000 and 2020. The number of oyster reef restoration projects is plotted against the right axis.[28]



ACCESS TO AND SHARING BENEFITS FROM GENETIC RESOURCES

By 2015, the Nagoya Protocol on Access to Genetic Resources and the Fair and Equitable Sharing of Benefits Arising from their Utilization is in force and operational, consistent with national legislation.

Summary of target achievement

The Nagoya Protocol on Access to Genetic Resources and the Fair and Equitable Sharing of Benefits Arising from their Utilization entered into force on 12 October 2014. As of July 2020, 126 Parties to the CBD have ratified the Protocol and 87 of them have put in place national access and benefit sharing measures, as well as establishing competent national authorities. The Protocol can be considered operational. **The target has been partially achieved** (*high confidence*).[1]

The fair and equitable sharing of the benefits arising out of the utilization of genetic resources is one of the three objectives of the Convention on Biological Diversity. The Nagoya Protocol, adopted in 2010, provides a transparent legal framework for the effective implementation of this objective. The Protocol covers genetic resources and associated traditional knowledge, as well as the benefits arising from their utilization, by setting out core obligations for its contracting Parties to take measures in relation to access, benefit-sharing (ABS) and compliance. Other international instruments relevant to ABS are addressed in Box 16.1.

The sixth national reports commonly note that actions are ongoing to implement the Nagoya Protocol at a national level (Box 16.2), including efforts to modify or develop relevant legislation. Many reports also refer to undertaking workshops to build capacity and awareness related to the Nagoya Protocol. Some reported challenges include limited resources to operationalize the Protocol and a lack of necessary legislation.

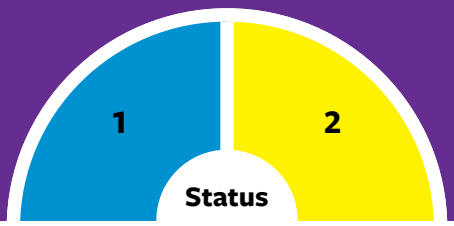
As of July 2020, 126 Parties to the Convention (64%) have ratified the Protocol, and a further 55 (29%) are known to be planning to ratify it. At the international level, the Access and Benefit-sharing Clearing-House and the Compliance Committee for the Nagoya Protocol are operational. At the national level, significant progress has been made in putting ABS measures in place (96 Parties and 24 non Parties)[2], establishing one or more competent national authorities (80 Parties and seven non-Parties)[3] and designating one or more checkpoints for collecting and receiving relevant information (80 Parties and 7 non-Parties).[4] In addition, several Parties (23) and non-Parties (23) are in the process of developing ABS measures or are planning to do so (Figure 16.1).

Thirty-two Parties to the Protocol have issued permits related to ABS and 21 of them have published this information as internationally recognized certificates of compliance in the ABS Clearing-House (a total of 1211 certificates have been published).[5] Some Parties that do not require prior informed consent in order to access genetic resources, have put all necessary measures and arrangements in place to implement the Protocol and are currently implementing their compliance measures (18 Parties). Thus, the Protocol may be considered operational in 87 countries as well as internationally.

Information on the monetary and non-monetary benefits generated through the implementation of the Nagoya Protocol is limited. However, 27 Parties have reported having received benefits from granting access to genetic resources and/or associated

TARGET ELEMENTS

1. **The Nagoya Protocol is in force**
2. **The Nagoya Protocol is operational**



Box 16.1. Progress made in other relevant ABS international agreements and initiatives

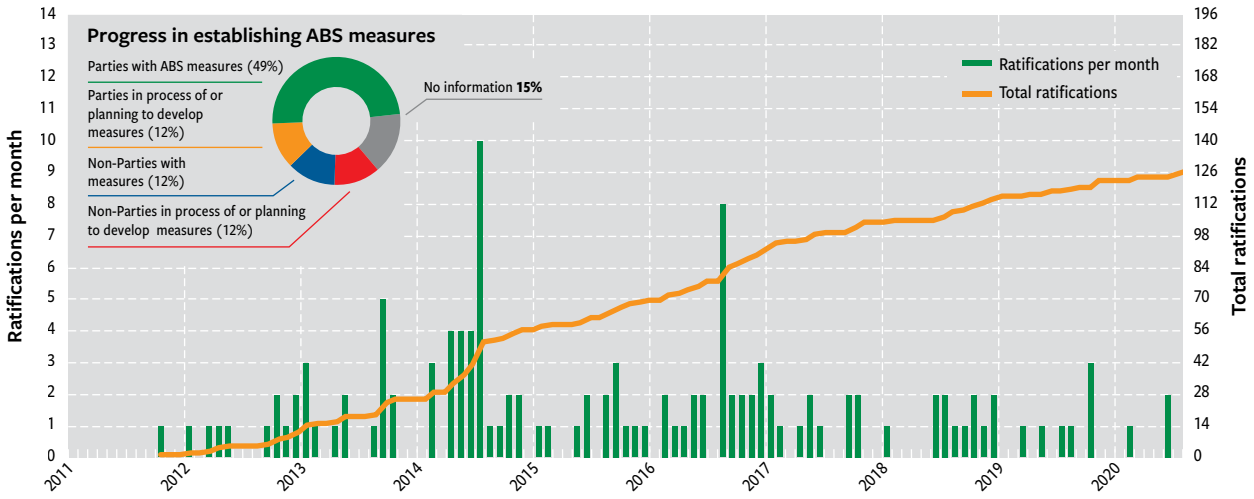
Beyond the Nagoya Protocol, progress has been made since 2010 under a number of international bodies and initiatives to extend access to genetic resources and the fair and equitable sharing of benefits from their utilization:

- The International Treaty on Plant Genetic Resources for Food and Agriculture facilitates access to plant genetic resources for farmers and plant breeders, helping to develop new crop varieties and adapt agricultural production to a changing environment. As of February 2020, over 5.5 million samples have been transferred globally, through more than 76,000 contracts known as Standard Material Transfer Agreements (SMTAs).[6]
- In 2015, the Commission on Genetic Resources for Food and Agriculture of the Food and Agriculture Organization (FAO) developed 'Elements to Facilitate Domestic Implementation of Access and Benefit-sharing for Different Subsectors of Genetic Resources for Food and Agriculture (ABS Elements)'.[7]
- In 2017, The Intergovernmental Conference on the Conservation and Sustainable Use of Marine Biodiversity of Areas Beyond National Jurisdiction (BBNJ) convened to develop the text of an international legally-binding instrument under the United Nations Convention of the Law of the Sea. The negotiating text addresses access and benefit-sharing for marine genetic resources, as well as traditional knowledge of indigenous peoples and local communities associated with marine genetic resources.[8]
- In 2011, the Pandemic Influenza Preparedness Framework for the Sharing of Influenza Viruses and Access to Vaccines and Other Benefits (PIP Framework) was adopted under the World Health Organization (WHO). WHO coordinates the sharing of influenza viruses through an international network of public health laboratories called the 'Global Influenza Surveillance and Response System' (GISRS). The laboratories in GISRS exchange viruses using standard material transfer agreements, binding contracts that established the conditions and obligations for benefit-sharing.
- The Global Initiative on Sharing All Influenza Data (GISAID) is a mechanism to promote and incentivize the rapid sharing of influenza virus data, permitting free and open access to anyone who provides positive identification, and agrees to respect the inherent rights of the contributor. GISAID requires users to acknowledge the origin and contributors in their publication, and to make best efforts to collaborate with them, thus making data-sharing beneficial for the submitter. In 2020, GISAID entered the global research effort to understand the virus responsible for the COVID-19 pandemic. As of 26 May 2020, more than 32,000 such SARS-CoV-2 sequences had been added to the GISAID database, thereby helping to detect viral mutations and track movement of the virus across the planet.[9]

RELEVANT SDG TARGET

Target 15.6 - Promote fair and equitable sharing of the benefits arising from the utilization of genetic resources and promote appropriate access to such resources, as internationally agreed

Figure 16.1. Trends in the ratification of the Nagoya Protocol and in the progress of establishing ABS measures



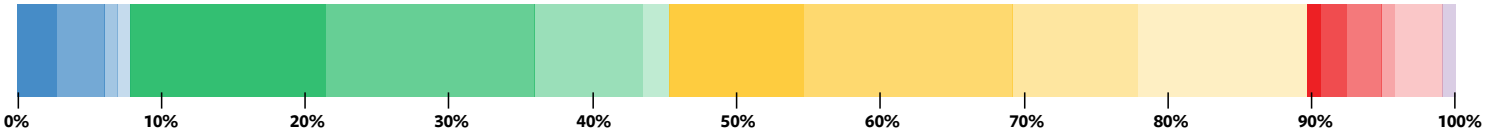
The pie chart illustrates the proportion of Parties to the Nagoya Protocol and non-Parties that have developed, are in the process of, or planning to put in place ABS measures as of July 2020. The trend line shows the total number of ratifications of the Nagoya Protocol. The bars illustrate the number of ratifications per month.

traditional knowledge for their utilization, and some of those benefits are contributing to the conservation and sustainable use of biodiversity. In addition, an analysis of corporate reports and websites of cosmetic and food companies found that references to ABS appear to be receiving increasing attention including by 17% of beauty companies (up from 2% in 2009) and 5% of food and beverage companies (up from 2% in 2012).[10]

The first assessment and review of progress in the implementation of the Nagoya Protocol revealed that Parties and non-Parties to the Protocol are at various levels of implementation, and that there are a number of areas requiring further work.[11] These include the need to develop ABS measures, to enhance implementation of the provisions on compliance and monitoring the utilization of genetic resources, including the designation of checkpoints, as well as the provisions to support the full and effective participation of indigenous peoples and local communities in the implementation of the Protocol, and to raise awareness among relevant stakeholders and encourage their participation in its implementation.

Fewer than three quarters (69%) of NBSAPs contain targets related to Aichi Biodiversity Target 16, of which about a quarter (28%) are similar to the overall scope and level of ambition set out in the Aichi Biodiversity Target. Many of the targets that were set were general and referred to access and benefit-sharing broadly, and several did not make an explicit reference to the Nagoya Protocol. Almost half of Parties to the Convention indicate in their sixth national reports that they are on track to reach (38%) or exceed (8%) their national targets. Most others (44%) have made progress towards their targets but not at a rate that will allow them to be met. Few Parties report that they are making no progress towards the target (9%) or are moving away from it (1%). One in seven Parties (15%) have national targets similar to Aichi Biodiversity Target 16 and are on track to meet them (see bar chart).

Assessment of progress towards national targets



The colour bars show the percentage of Parties reporting a given level of progress towards their national targets. (Blue: exceeds target; Green: on track; Yellow: some progress; Red: no change; Purple: moving away from target). The intensity of the colour indicates alignment of national targets with the Aichi Target (Darker colours indicate close alignment).


Photo by Lina Loos on Unsplash

Box 16.2. Examples of country experiences and national progress

- **India:** As of May 2020, India has published a total of 928 internationally-recognized certificates of compliance in the ABS Clearing-House.[12]
- **Bhutan:** The national ABS framework encourages ABS agreements to include support for national capacities, to adopt sustainable cultivation and the use of collection methods, and secure premium prices for communities. It also ensures that a portion of the monetary benefits received are channelled into the Bhutan ABS fund which has been established to support conservation efforts. ABS agreements supported capacity-building on laboratory techniques for plant analysis, natural product development and documentation of traditional knowledge.[13]
- **Ethiopia:** The value chain which was part of the initial phase of an ABS agreement created job opportunities for 857 young people in local communities.[14]
- **Finland:** The Sami Parliament manages a database enabling the recording of traditional knowledge of the Sami people associated with genetic resources that is intended for research and development purposes. Applications to access the knowledge in the database can be submitted to the competent authority, which notifies the Sami Parliament. The mutually agreed terms between the Sami Parliament and the user must be approved by the competent authority.[15]
- **Madagascar:** Users of genetic resources have financed research institutions, masters students and the installation of a new arboretum of endemic species.[16]
- **South Africa:** has carried out many activities to raise awareness of ABS, and how ABS and the Nagoya Protocol are being implemented nationally. These activities include biodiversity awareness workshops with Muthi traders and traditional healers, development of an Indigenous Knowledge System Bioprospecting and Product Development Platform, a bioprospecting forum, and workshops for stakeholder engagement.[17]

BIODIVERSITY STRATEGIES AND ACTION PLANS

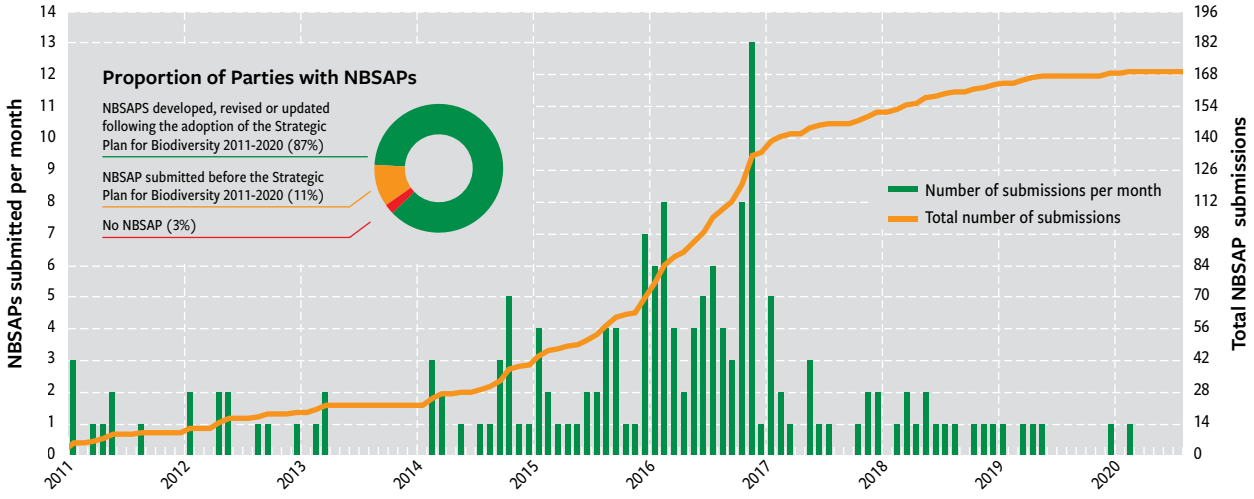
By 2015 each Party has developed, adopted as a policy instrument, and has commenced implementing an effective, participatory and updated national biodiversity strategy and action plan.

Summary of target achievement

By the December 2015 deadline established in this target, 69 Parties had submitted an NBSAP prepared, revised or updated after the adoption of the Strategic Plan. An additional 101 Parties have since submitted their NBSAP, so that by July 2020, 170 Parties had developed NBSAPs in line with the Strategic Plan. This represents 85% of the Parties to the Convention. However, the extent to which these NBSAPs have been adopted as policy instruments and are being implemented in an effective and participatory manner, is variable. **The target has been partially achieved** (*high confidence*).[1]

National biodiversity strategies and action plans (NBSAPs) are the principal policy instrument for the implementation of the Convention at the national level. The majority of Parties have gone through a process to align their NBSAPs with the Strategic Plan for Biodiversity 2011-2020. This represents a significant effort of Parties to apply the Strategic Plan to national circumstances, and to support implementation of the Convention. However, for many Parties, the time lag between the adoption of the Strategic Plan and the development of updated NBSAPs likely delayed actions for achievement of the Aichi Biodiversity Targets (Figure 17.1). To support Parties in updating their

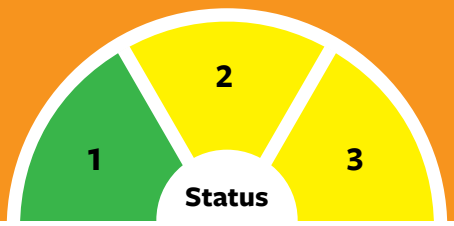
Figure 17.1. Extent and timing of submission of national biodiversity strategies and action plans[2]



The pie chart illustrates the proportion of Parties that have developed, revised or updated an NBSAP before and after the adoption of the Strategic Plan for Biodiversity 2011-2020. The trend line shows the cumulative number of NBSAPs prepared, revised or updated after the adoption of the Strategic Plan for Biodiversity 2011-2020. The bars illustrate the number of such NBSAPs submitted in a given month.

TARGET ELEMENTS

1. Submission of NBSAPs by 2015
2. Effective policy instruments
3. NBSAPs are being implemented



Box 17.1. Examples of country experiences and national progress[3]

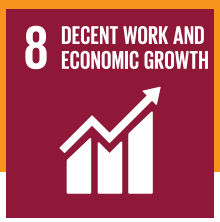
- **Federated States of Micronesia:** A highly consultative programme was used to develop the country's NBSAP, involving representatives from the national, state and municipal levels, the United Nations Development Programme, non-governmental organizations, community-based organizations, women's groups as well as the science and education communities. The themes identified in the NBSAP have been mapped to relevant Aichi Biodiversity Targets and the Sustainable Development Goals. Climate change and gender are recognized as specific themes underpinning the entire NBSAP.
- **Panama:** The country's NBSAP will be used as an instrument for mainstreaming biodiversity in relevant policies and strategies. Its 2050 vision is to achieve 'Un Panamá Verde' ('A Green Panama') and enhance well-being for all Panamanians. The vision is underpinned by a paradigm shift towards a development model that combines the three dimensions—social, economic and environmental—of sustainable development.
- **South Sudan:** One of the principles of the country's NBSAP is that biodiversity management will purposely contribute to poverty reduction and economic development. There is a specific target in the NBSAP related to the mainstreaming of biodiversity values in national development plans and budget framework papers, as well as in state and county development plans. In addition, there is another target calling on the national and state governments to review relevant legislation, policies and programs to maximize synergies with the NBSAP.

NBSAPs and aligning them the Strategic Plan a series of regional and sub-regional workshops were held, supported by the Japan Biodiversity Fund. Through the Fund and other sources, subsequent capacity building activities supported implementation of NBSAPs.[4]

Actions to reach this target frequently reported in national reports include undertaking mainstreaming activities to support NBSAP implementation, including workshops, inter-agency cooperation and aligning work on other sectoral strategies and action plans (Box 17.1). Some Parties also referred to initiating regional and provincial level biodiversity plans to more effectively translate the NBSAPs into local action (Box 17.2). Commonly reported challenges to reaching this target were the lack of indicators to monitor the use of the NBSAP as a policy instrument, limited resources to implement NBSAPs, and the fact that many NBSAPs were only recently adopted.

Several additional challenges related to the development, revision or update of NBSAPs remain. The number of Parties that have adopted their NBSAPs as policy instruments is limited. Only 69 NBSAPs have been adopted as whole-of-government instruments and another eight have been adopted as instruments applying to the environmental sector. Few of the revised NBSAPs contain resource mobilization strategies (25 Parties), communication and public awareness strategies (38 Parties), capacity development strategies (97 Parties) or reflect gender considerations (76 Parties) (Box 17.3). In

RELEVANT SDG TARGET



Target 15.9: By 2020, integrate ecosystem and biodiversity values into national and local planning, development processes, poverty reduction strategies and accounts

Box 17.2. Examples of subnational planning processes

While NBSAPs are national instruments, many Parties[5] have reported that sub-national authorities, such as states, provinces and cities have also developed biodiversity strategies. Examples of these include:

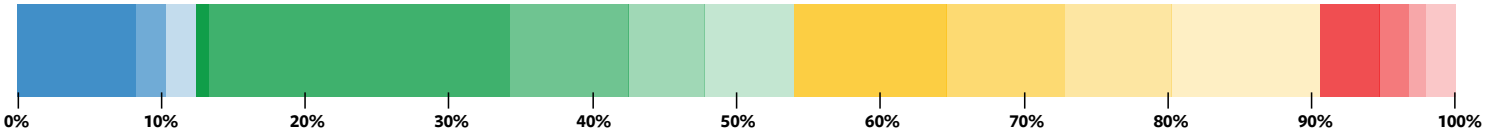
- **Canada:** The provinces of Ontario, New Brunswick and Quebec, the Northwest Territories, the cities of Edmonton and Montreal, as well as the Fraser Valley Region of the province of British Columbia, have all developed biodiversity strategies and action plans.
- **China:** By May 2016, 18 provinces had completed and released provincial biodiversity conservation strategies and action plans.
- **Republic of Korea:** Nine sub-national governments have established regional biodiversity strategies, and eight have produced action plans for conservation or wildlife protection.
- **Mexico:** Seventeen states, as well as Mexico City, have developed biodiversity strategies.

addition, few NBSAPs address the mainstreaming of biodiversity into cross-sectoral plans and policies, poverty eradication policies, or into sustainable development plans. However, most Parties also report that different government ministries and departments have been involved in the development of their NBSAP. The government ministries that were most commonly involved were agriculture, fisheries, forestry, development or planning, tourism, education, finance, trade, industry, infrastructure and transport. Many Parties have also indicated that indigenous peoples and local communities (40 Parties), non-governmental organisations and civil society (100 Parties), the private sector (51 Parties) and academia (70 Parties) have been involved in the preparation of their NBSAP.[6]

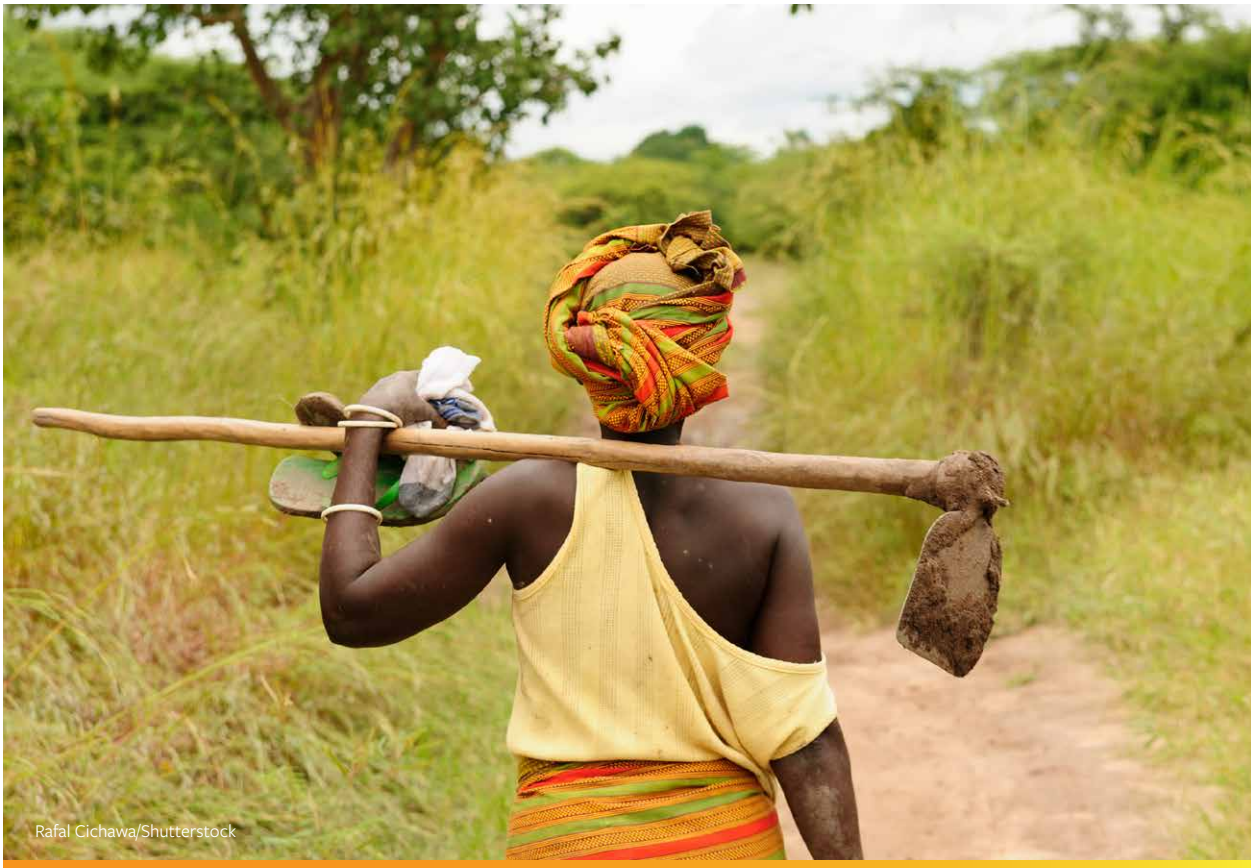
Significant efforts have been made to translate the Aichi Biodiversity Targets into national commitments and the majority of NBSAPs incorporate targets related to the global targets. Aichi Biodiversity Targets 1, 9, 16, 17, 19 and 20 are most widely reflected in NBSAPs with broadly similar national targets or commitments, while Targets 3, 6, 10 and 14 are the least reflected. Overall, the national targets contained in the NBSAPs tend to be less ambitious than the corresponding Aichi Targets or have a narrower scope. Therefore national targets, in aggregate, are not commensurate with the level of ambition set out in the Strategic Plan for Biodiversity 2011-2020.[7]

More than half (54%) of the NBSAPs contain targets related to Aichi Biodiversity Target 17 and of these about a third (36%) are similar to the scope and level of ambition set out in Aichi Target 17. More than half of Parties report that they are on track to reach (42%) or exceed (13%) their national targets associated with the Aichi Target and many others (36%) have made progress towards them but not at a rate that will allow them to be met. Few Parties (9%) report that they are making no progress towards the target. Fewer than a third (28%) of Parties have national targets similar to Aichi Biodiversity Target 17 and are on track to meet them. (see bar chart).[8]

Assessment of progress towards national targets



The colour bars show the percentage of Parties reporting a given level of progress towards their national targets. (Blue: exceeds target; Green: on track; Yellow: some progress; Red: no change; Purple: moving away from target). The intensity of the colour indicates alignment of national targets with the Aichi Target (Darker colours indicate close alignment).



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Box 17.3. Gender and the NBSAPs

Mainstreaming gender in NBSAPs is an objective of the Convention's 2015-2020 Gender Plan of Action, and a number of Parties have included specific activities on gender in their NBSAPs. For example, Eritrea has identified the National Union of Eritrean Women to be responsible for mobilizing women to participate in biodiversity planning and implementation, building on the Union's role in mobilizing local communities in programmes and projects related to natural resources management and sustainable development. Liberia has allocated $500,000 to micro-credit projects to support women's empowerment in the budget for its NBSAP.[9] However, despite such positive examples, reviews have found that only about half of NBSAPs contain references to gender and women. This represents a missed opportunity to integrate gender into biodiversity policy.[10] Recommended actions to better reflect gender in NBSAPs include: collecting and applying sex-disaggregated data; ensuring equitable participation; enhancing women's agency and leadership; ensuring equal access to, control over and benefits from biological resources; building awareness and capacity; and ensuring adequate resources for gender-responsive biodiversity initiatives.

TRADITIONAL KNOWLEDGE

By 2020, the traditional knowledge, innovations and practices of indigenous and local communities relevant for the conservation and sustainable use of biodiversity, and their customary use of biological resources, are respected, subject to national legislation and relevant international obligations, and fully integrated and reflected in the implementation of the Convention with the full and effective participation of indigenous and local communities, at all relevant levels.

Summary of target achievement

There has been an increase in the recognition of the value of traditional knowledge and customary sustainable use, both in global policy fora and in the scientific community. However, despite progress in some countries, there is limited information indicating that traditional knowledge and customary sustainable use have been widely respected and/or reflected in national legislation related to the implementation of the Convention or on the extent to which indigenous peoples and local communities are effectively participating in associated processes. **The target has not been achieved** (*low confidence*).[1]

In comparison with the fifth national reports, the sixth national reports show a significant increase in information about the implementation of Aichi Target 18, and the contribution of traditional knowledge and the collective actions of indigenous peoples and local communities to the achievement of other targets, for example through customary sustainable use and traditional agriculture. Actions commonly reported by Parties in their national reports to reach their targets include efforts to better document traditional knowledge, efforts to protect traditional knowledge and to ensure that indigenous peoples and local communities are fairly compensated for the use of their knowledge, and capacity-building programmes with a focus on traditional knowledge. Some national reports also refer to actions to improve the legal recognition of the rights of indigenous peoples and local communities. A general challenge noted in the reports is the lack of capacity and resources for incorporating and reflecting traditional knowledge and customary sustainable use in issues related to conservation.[2]

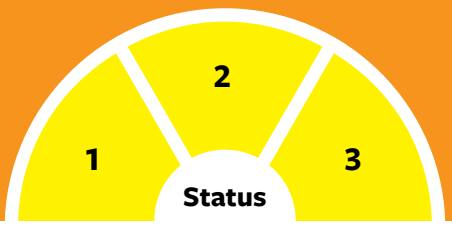
Despite the increasing number of positive examples of national progress (Box 18.1), the role of traditional knowledge and of indigenous peoples and local communities in conserving and sustainably using biodiversity generally remains poorly recognized in national processes. For example, only 40 Parties reported that indigenous people and local communities were involved in the revision processes of their national biodiversity strategies and action plans.[3]

There is limited global level information on the extent to which traditional knowledge and customary use are being integrated in the implementation of the Convention. Despite growing documentation on the potential value of traditional knowledge to conservation and sustainable use, there is often a lack of communication between indigenous peoples and local communities and the scientific community[4] and assessments of biodiversity often do not take local and traditional knowledge into account.[5]

Numerous examples have demonstrated the ways in which bringing traditional knowledge together with science can lead to constructive solutions to various challenges,[6] and lead to the development of policies which are more tailored

TARGET ELEMENTS

1. **Traditional knowledge, innovations and practices respected**
2. **Traditional knowledge, innovations and practices integrated**
3. **Indigenous peoples and local communities participate effectively**



Box 18.1. Examples of country experiences and national progress

- **Australia:** The Environment Protection and Biodiversity Conservation Act established the Indigenous Advisory Committee (IAC) to provide advice to the Minister for Environment and the Australian Government on policy and implementation matters relating to indigenous land and sea management, specifically in relation to the implementation of the Act. The IAC has contributed advice ensuring recognition of and support for the transfer and integration of indigenous traditional knowledge with national biodiversity policy, programmes and regulatory decision processes. The Threatened Species Scientific Committee has engaged member expertise to improve indigenous engagement and understanding relating to the on-the-ground implications of their decisions on indigenous Australians.[7]
- **Eswatini:** Ethno-botanical surveys are conducted, in consultation with traditional healers, to identify plant species commonly used in traditional medicine and rituals. These surveys help to inform decisions on sustainable use.[8]
- **Canada:** Some indigenous communities protect and manage land and marine resources through Indigenous Guardians programmes. While these programs have existed for several decades, they have mostly worked in isolation. In 2017 Canada invested 25 million Canadian dollars over five years to support a pilot initiative to establish a national network of existing Indigenous Guardians programmes. The objective of this initiative is to give indigenous peoples greater responsibility and resources to manage their traditional lands and waterways. It will facilitate partnership with indigenous communities and provide additional funding to existing indigenous programmes to support their activities related to monitoring ecological health, maintaining cultural sites, and protecting sensitive areas and species. In addition, Canada is supporting the implementation of a pilot Guardian programme in Arctic Bay, Nunavut. The funding will support the Qikiqtani Inuit Association to explore how Inuit can be engaged in the management of the Tallurutiup Imanga National Marine Conservation Area, the newest and largest marine protected area in Canada.[9]
- **Costa Rica:** In 2018, a mechanism for consultation with indigenous peoples was established. The objective of this mechanism is to ensure consultation with indigenous peoples through appropriate procedures and through their representative institutions, whenever administrative measures or bills are likely to affect them. To help operationalize this mechanism the Costa Rican Government and 22 indigenous peoples' representatives developed a guide that indicates to government institutions how to comply with the obligation to consult these peoples when a measure or project is likely to affect their collective rights.[10]

RELEVANT SDG TARGETS

Target 1.4: By 2030, ensure that all men and women, in particular the poor and the vulnerable, have equal rights to economic resources, as well as access to basic services, ownership and control over land and other forms of property, inheritance, natural resources, appropriate new technology and financial services, including microfinance

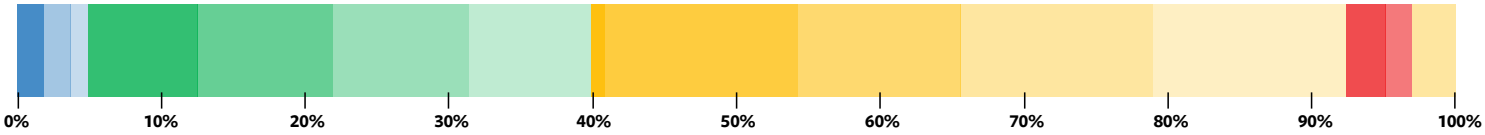
Target 16.7: Ensure responsive, inclusive, participatory and representative decision-making at all levels

to on-the-ground realities.[11] One indication of progress in this regard is the conceptual framework of the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services (IPBES) which gives explicit consideration of diverse scientific disciplines, stakeholders, and knowledge systems, including indigenous and local knowledge.[12] Indigenous knowledge holders also contributed significantly to the IPBES Global Assessment on Biodiversity and Ecosystem Services. Another example of an attempt to bring issues related to indigenous peoples and local communities into decision making processes at the international level is the Local Biodiversity Outlooks (Box 18.2).

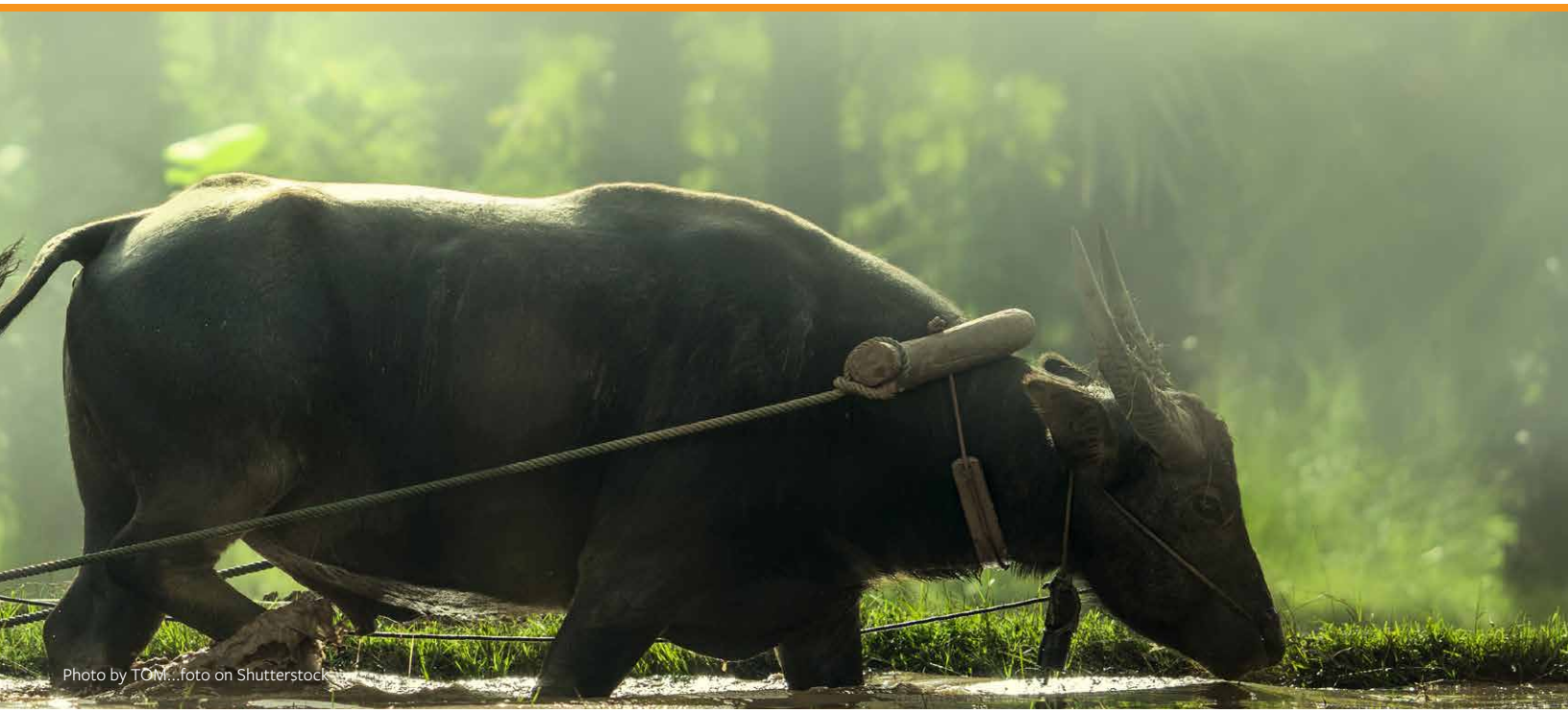
A number of tools have been developed under the Convention to guide actions to promote respect for traditional knowledge during the past decade. These include the Mo'otz Kuxtal Voluntary Guidelines on prior informed consent for the use of traditional knowledge, innovations and practices, and the Rutzolijirisaxik Voluntary Guidelines for the repatriation of traditional knowledge.[13]

More than two thirds (67%) of NBSAPs contain national targets related to Aichi Biodiversity Target 18. More than a third of Parties are on track to reach (35%) their national targets or exceed (5%) them. More than half of Parties (52%) have made progress towards their targets but not at a rate that will allow them to be met. A few Parties (8%) report that they are making no progress towards the target. However, only about a fifth (21%) have national targets that are similar to the scope and level of ambition set out in the Aichi Target. Many of the targets focus on respecting traditional knowledge, innovations and practices and their integration in the implementation of the Convention, but fewer focus on ensuring the full and effective participation of indigenous peoples and local communities. Of the reporting Parties, fewer than a tenth (9%) have national targets that are similar to Aichi Biodiversity Target 18 and are also on track to be met (see bar chart).[14]

Assessment of progress towards national targets



The colour bars show the percentage of Parties reporting a given level of progress towards their national targets. (Blue: exceeds target; Green: on track; Yellow: some progress; Red: no change; Purple: moving away from target). The intensity of the colour indicates alignment of national targets with the Aichi Target (Darker colours indicate close alignment).



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Box 18.2. Key Messages from the second edition of the Local Biodiversity Outlooks

The Second edition of the Local Biodiversity Outlooks identified four high level and cross-cutting messages related to indigenous peoples and local communities and biodiversity:

1. Indigenous peoples and local communities make vital contributions to biodiversity conservation and sustainable use. Disregarding these contributions, including their limited recognition in national biodiversity strategies and action plans, is a missed opportunity. Better recognition and support for these actions will help to secure the future of both nature and cultures.
2. Securing customary land tenure and rights over knowledge and resources is fundamental to realizing community well-being as well as achieving goals on biodiversity, sustainable development and climate change.
3. Sustained interactions, collaboration and partnerships between the sciences and indigenous and local knowledge systems would enrich problem-solving and result in more effective and holistic decision making and reciprocity. Indigenous ways of knowing and being can evoke and inspire new narratives and visions of living in harmony with nature.
4. The values, ways of life, knowledge, resource governance and management systems, economies and technologies of indigenous peoples and local communities have much to offer in reimagining global systems that leave no one behind.

SHARING INFORMATION AND KNOWLEDGE

By 2020, knowledge, the science base and technologies relating to biodiversity, its values, functioning, status and trends, and the consequences of its loss, are improved, widely shared and transferred, and applied.

Summary of target achievement

Significant progress has been made since 2010 in the generation, sharing and assessment of knowledge and data on biodiversity, with big-data aggregation, advances in modelling and artificial intelligence opening up new opportunities for improved understanding of the biosphere. However, major imbalances remain in the location and taxonomic focus of studies and monitoring. Information gaps remain in the consequences of biodiversity loss for people, and the application of biodiversity knowledge in decision making is limited. **The target has been partially achieved** (*medium confidence*).[1]

Many Parties in their national reports refer to actions to promote education and training programmes on biodiversity, the development and promotion of scientific research programmes, undertaking species inventories, identifying key biodiversity areas and generally increasing the amount and quality of biodiversity information (Box 19.1). Some reports also refer to the development of national biodiversity databases, clearing-house mechanisms, the preparation of publications and the promotion of community-based monitoring (Box 19.2). Overall, the majority of actions appear to be related to the documentation and generation of knowledge on biodiversity, in particular in terrestrial ecosystems. By comparison there appear to be fewer actions related to the generation of biodiversity-related information for marine and inland-water environments, and for sharing information and applying it in decision-making.

The clearing-house mechanism (CHM) of the Convention on Biological Diversity helps to promote technical and scientific cooperation by facilitating the exchange of information, expertise, tools and technologies. It comprises a global network of national CHMs and of partners and a central platform hosted by the CBD Secretariat. The number of national CHM websites has grown from 89 in 2010 to 101 in 2020 and more countries are in the process of developing sites and/or linking them to the central CHM.[2] Parties are also making use of the Bioland Tool[3], a turnkey solution developed by the Secretariat, to help Parties establish or improve their national CHMs.

The establishment of the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services (IPBES) in 2013 and the production of its various assessments including the Global Assessment on Biodiversity and Ecosystem Services represents a major advance in the information available to support policy and decisions on biodiversity.[4]

The number of indicators available to monitor changes relating to biodiversity, at varying spatial and temporal scales, and brought together under the Biodiversity Indicators Partnership (BIP), has increased.[5] Further on average, the number of indicators used in sixth national reports was 84, compared to 49 in the fifth national reports.[6]

The development of Essential Biodiversity Variables (EBVs) through the Group on Earth Observations Biodiversity Observation Network

TARGET ELEMENTS

1. **Biodiversity knowledge, science and technologies improved**
2. **Biodiversity knowledge, science and technologies shared**

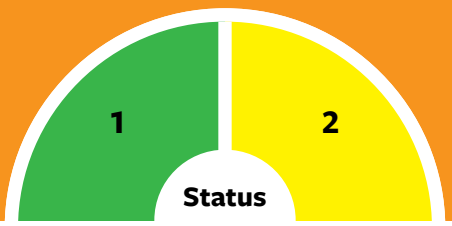
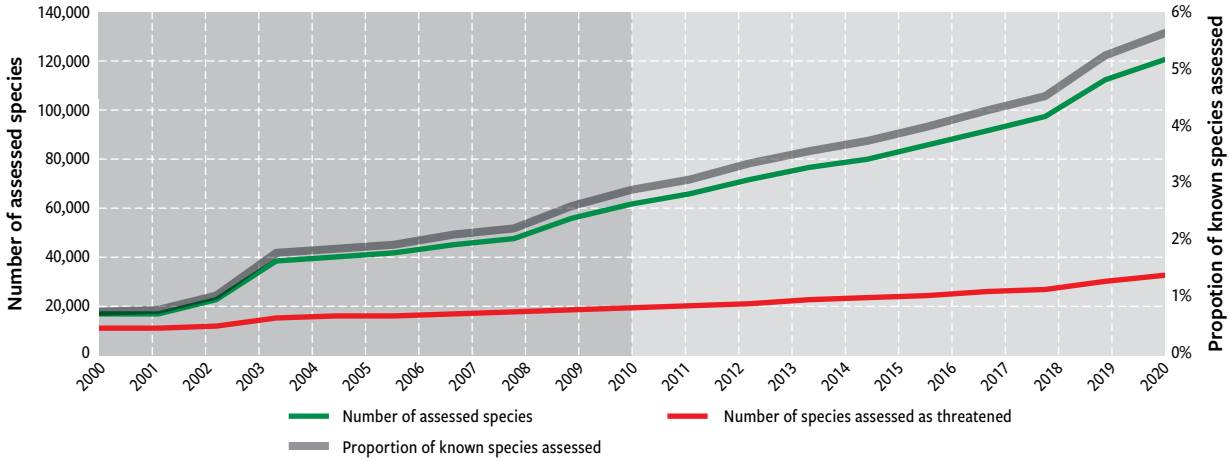


Figure 19.1. Growth in the number of species assessed through the IUCN Red List[7]



(GEO BON), along with associated processes and tools for their application, has helped to define the components of biodiversity that must be monitored and measured in order to study, report and manage biodiversity change. The variables are grouped into six classes, measuring genetic composition, species populations, species traits, community composition, ecosystem function and ecosystem structure.[8] Biodiversity Observation Networks are being established in the Asia-Pacific region, the Arctic, Europe and throughout the Americas, as well as thematic networks for marine, freshwater and soil biodiversity.

The growth in the availability of data and information on biodiversity is demonstrated by a number of metrics. For example, the number of species assessed for extinction risk in the IUCN Red List has doubled in the past decade, passing 120,000 species during 2020. Nevertheless, the Red List assessments still only covers 6% of described species (Figure 19.1).

The number of species occurrence records freely accessible through the Global Biodiversity Information Facility (GBIF) passed one billion during 2018, and stood at more than 1.4 billion by May 2020, a seven-fold increase over the decade (Figure 19.2). Such data are widely used in research relating to conservation, impacts of climate change, invasive alien species, food security and human health, among other policy-relevant areas.[9] Nevertheless, this data is still strongly biased towards animal species, especially birds and higher plants, and many of the most diverse ecosystems, especially in the tropics, are still greatly under-represented.[10] The Ocean Biodiversity Information System (OBIS), which specializes in mobilizing data to support research and policy on marine biodiversity, provided access to nearly 60 million occurrence records relating to more than 131,000 species in 2020, compared with 22 million records in 2010.[11]

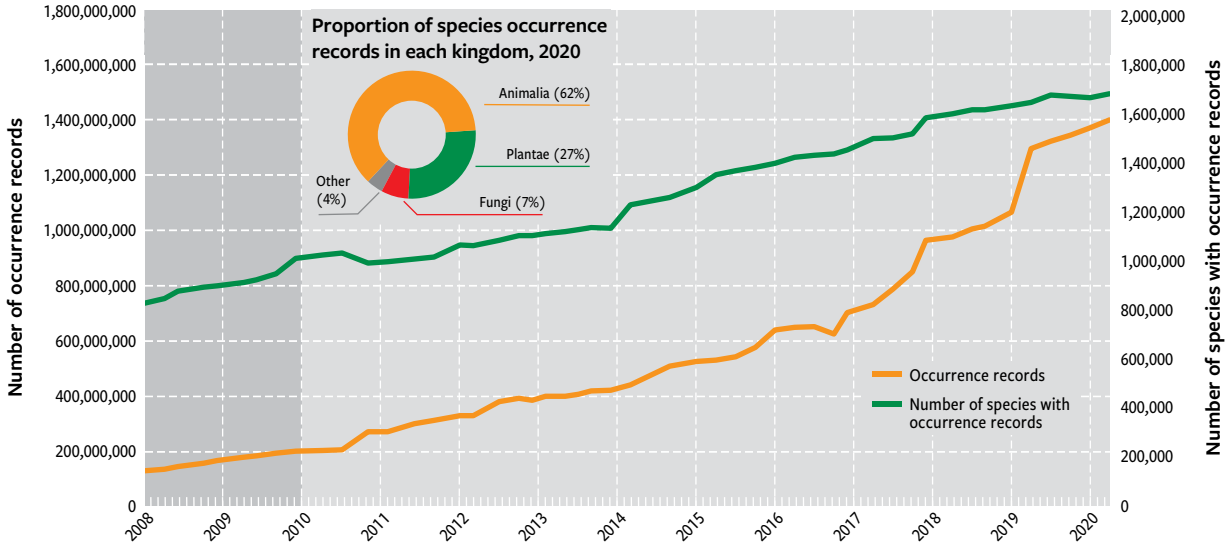
Emerging technologies are greatly enhancing capacity to explore and understand biodiversity. The use of environmental DNA (eDNA) and metagenomic sampling enables monitoring of biodiversity without observation or collection of individual organisms. The Barcode of Life Data System (BOLD) has established a library of more than half a million

RELEVANT SDG TARGET

17 PARTNERSHIPS FOR THE GOALS

Target 17.18 - By 2020, enhance capacity-building support to developing countries... to increase significantly the availability of high-quality, timely and reliable data...

Figure 19.2. Growth in GBIF-mediated species occurrence records[12]



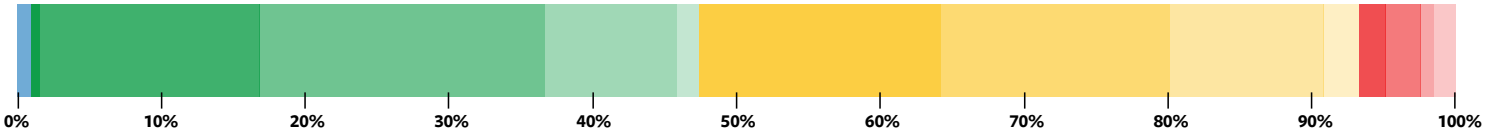
Mobilization of open-access data through the Global Biodiversity Information Facility (GBIF). The lines show the number of species occurrence records over time, and the number of species having occurrence records.

public 'Barcode Index Numbers', clustering genetic sequences into units corresponding with known species, thus helping with identification to support a range of research and policy applications.[13] Artificial intelligence is already supporting species recognition through citizen science platforms such as iNaturalist, and is being applied to support near real-time monitoring of wildlife through images captured by camera traps.[14] Bioacoustic monitoring and satellite-based animal tracking are among a range of other technological applications enabling rapid expansion of the data available to support biodiversity knowledge.

A current challenge related to the development of biodiversity knowledge is the lack of socio-economic data relevant to biodiversity, including gender-specific data. Such gaps can lead to misleading information and compromise effective management. For example, a review of small-scale fisheries found that the absence of quantitative data on the catch size of women fishers led to an underestimate of the total catch, and of the diversity of animals and habitats targeted by fishers.[15]

The majority of NBSAPS (84%) contain targets related to Aichi Biodiversity Target 19. Of the Parties that have assessed progress towards their national targets, almost half are on track to reach (47%) or exceed (1%) them. Most others (46%) have made some progress towards their targets and only 7% report no progress. However, fewer than a third of national targets are similar to (28%) or exceed (1%) the scope and level of ambition of the Aichi Target. Few targets address the sharing of biodiversity information and technology, or its application. Of the reporting Parties, fewer than a fifth (15%) have national targets with similar scope and ambition to the Aichi Biodiversity Target and are on track to meet them (see bar chart).[16]

Assessment of progress towards national targets



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Box 19.1. Examples of country experiences and national progress

- **Cambodia:** In order to improve the accessibility and sharing of biodiversity information a web portal was created in 2018 which brings together information relevant to the three Rio Conventions. The information in the portal is based around key indicators. Data gathered through the portal is used to populate the national clearing house and support the work of focal points to the Rio Conventions as well as help to raise awareness of biodiversity, its values and its status and trends generally.[17]
- **Canada:** The NatureWatch programme brings together several citizen based monitoring programmes, including progammes related to frogs, ice, plants, worms, milkweed, and Arctic wildlife. The progamme was initially launched in 2000, but since 2014 has been significantly expanding through engagement with new partners and collaborations, including partnerships with the National Hockey League, eco-tourism companies, Inuit youth groups, primary school teachers, Scouts Canada and the Canadian Museum of Science and Technology.[18]
- **Malawi:** Through the Mapping Biodiversity Priorities Project, the country is conducting spatial biodiversity assessments and engaging stakeholders to identify and develop evidence related to trade-offs and policy impacts in 36 different sectors. As part of the project, which is being supported through the Japan Biodiversity Fund, the country is developing map products and identifying mainstreaming opportunities with relevant sectors.[19]

Box 19.2. Community-based biodiversity monitoring

The role of indigenous peoples and local communities in monitoring the status, trends and threats to biodiversity is being increasingly recognized. For example:

- **Guatemala:** Indigenous communities monitor community forests for forest health and for endangered birds, mammals and plants. They maintain a community-based monitoring and information system (CBMIS) that tracks status, trends, cultural values and practices associated with threatened species, and provides information to support forest management.[20]
- **Russian Federation:** The Bikin National Park is the largest protected natural forest in Eurasia's pre-temperate zone. The park was created with the joint objectives of preserving and restoring biodiversity, and of protecting the forest culture of the indigenous peoples of this territory - the Udege and the Nanai. 114 people work in the park, of whom 70 are indigenous. Indigenous park employees undertake various tasks, including community-based monitoring which makes use of traditional knowledge, practices and rituals together with modern technologies and information systems.[21]

MOBILIZING RESOURCES FROM ALL SOURCES

By 2020, at the latest, the mobilization of financial resources for effectively implementing the Strategic Plan for Biodiversity 2011–2020 from all sources, and in accordance with the consolidated and agreed process in the Strategy for Resource Mobilization, should increase substantially from the current levels. This target will be subject to changes contingent to resources needs assessments to be developed and reported by Parties.[1]

Summary of target achievement

There have been increases in domestic resources for biodiversity in some countries, with resources remaining broadly constant for others over the past decade. Financial resources available for biodiversity through international flows and official development assistance has roughly doubled. However, when all sources of biodiversity finance are taken into account, the increase in biodiversity financing would not appear to be sufficient in relation to needs. Moreover, these resources are swamped by support for activities harmful to biodiversity (see Aichi Target 3). Progress on identifying funding needs, gaps and priorities and the development of national financial plans and assessments of biodiversity values has been limited to relatively few countries (see Aichi Target 2). **The target has been partially achieved** (*high confidence*).[2]

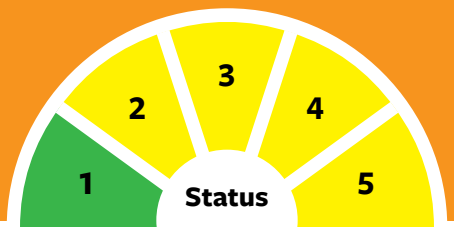
While it is difficult to assess changes in global finance flows to biodiversity over time, due to data gaps and different methodologies, available data suggest that global biodiversity finance is on the order of $ 78 – 91 billion per year (2015-2017 average).[3] Governments spend substantially more on support that is potentially harmful to biodiversity.[4] While estimates of biodiversity finance needs vary significantly, they are conservatively estimated to be in the hundreds of billions of US dollars.[5] Most biodiversity funding is from domestic sources: about $ 67.8 billion per year from 2015 to 2017.[6]

Many Parties in their sixth national reports refer to efforts to increase domestic biodiversity financing and note the importance of partnerships and programmes, including with the Biodiversity Finance Initiative (BIOFIN).[7] While funding from foreign sources is typically delivered on a project basis, some Parties have organized partnerships and funding mechanisms to provide more sustained funding (Box 20.1). Some Parties refer to undertaking tax reforms and putting in place incentives to provide funding to biodiversity projects, such as a tourism tax to fund the operation of protected areas. Despite the actions that have been taken, the availability of resources is frequently identified as a challenge to implementation. The fragmentation of funding and the lack of holistic funding strategies have also been noted as a challenge by some Parties.

Information provided through the financial reporting framework related to Aichi Biodiversity Target 20 indicates that 28 Parties had increasing trends in their domestic biodiversity resources while 24 had no change and 13 had decreasing trends. For 13 Parties, trends could not be detected or were inconclusive.[8] The same source shows some progress by Parties with respect to including biodiversity in national priorities and development plans: 53 Parties (60% of those reporting, but only 27% overall) indicated comprehensive inclusion and the remaining 25 Parties reported some progress.

TARGET ELEMENTS

1. Double international financial flows
2. Biodiversity included in national plans
3. Expenditures, needs, gaps, and priorities reported
4. Finance plans and valuations prepared
5. Domestic financial resources mobilized



Box 20.1. Examples of country experiences and national progress

- **Guinea-Bissau:** The BioGuinea Foundation, a sustainable financing mechanism for biodiversity conservation activities, was created in partnership with the national government, civil society, the private sector and with other national and international support, including from the GEF, the World Bank, IUCN, the Mava Foundation for Nature and the European Union. The foundation is a public utility, apolitical and was established to make the use of resources more efficient, effective and transparent.[9]
- **Panama:** A trust was established through a partnership with the Ministry of Environment and the National Bank of Panama, with $ 1.5 million in seed capital from the Global Environment Facility. This trust provides a permanent source of funding for environmental initiatives undertaken by the public and private sectors as well as through international cooperation.[10]

As noted above, 78 Parties (40% of Parties overall) have reported on spending, but fewer have reported on funding needs, gaps and priorities. Less progress has been made in in preparing national financial plans and in the assessments of biodiversity values, with only 23 Parties having developed elements of a finance plan (and two thirds of those reporting indicating inadequate resources to do so). However, 83% had undertaken some valuation.

International public biodiversity finance, which includes official development assistance (ODA) and non-concessional flows (both bilateral and multi-lateral), was estimated to be about $ 3.9 billion per year between 2015 and 2017 for finance that has biodiversity as a principal focus, and $ 9.3 billion per year if other finance with significant elements related to biodiversity is included, reflecting roughly a doubling over the decade.[11] Comparing the averages for 2006-2010 and 2015-2018, bilateral ODA alone increased by almost 76% for finance principally related to biodiversity, and by over 100% if all finance is considered (Figure 20.1). Weighting the two categories (principal at 100%; significant at 40%) shows an increase of almost 100% between the same two periods.

Table 20.1. Funding provided through the biodiversity focal area and other relevant investments

	GEF-4 (*2006-2010*)	GEF-5 (*2010-2014*)	GEF-6 (*2014-2018*)	GEF-7 (*2018-2022*)
Biodiversity focal area	880,380,000	1,080,000,000	1,101,000,000	1,291,981,305
Other biodiversity relevant GEF investments	326,110,000	830,000,000	1,041,000,000	901,025,165
Total	1,206,490,000	1,910,000,000	2,142,000,000	2,193,006,470

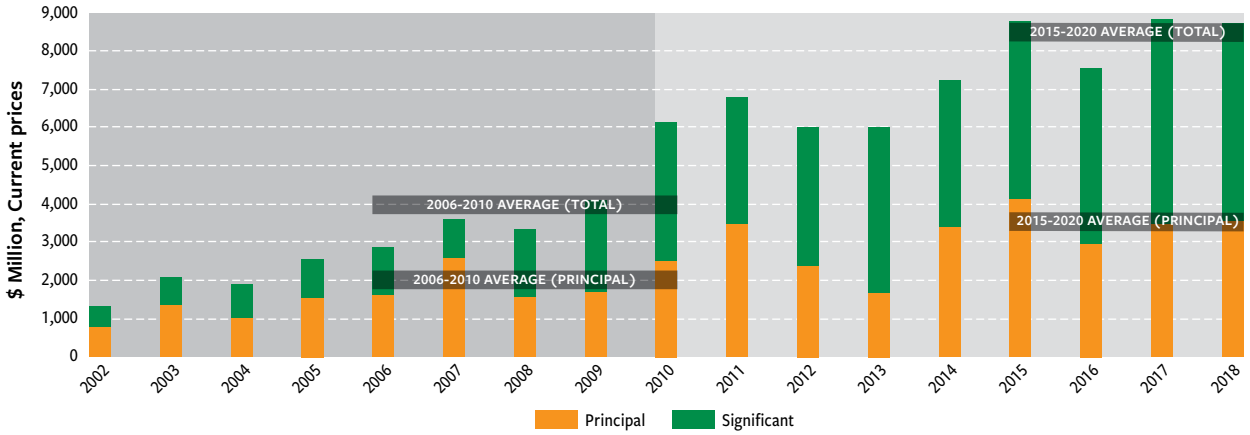
RELEVANT SDG TARGET

Target 10.b - Encourage official development assistance and financial flows, including foreign direct investment, to States where the need is greatest...

Target 17.3 - Mobilize additional financial resources for developing countries from multiple sources

Parties that are members of the OECD Development Assistance Committee (DAC) collectively increased their support to international public biodiversity finance by 130% between 2006-2010 and 2015.[12] This is consistent with information provided by Parties through the financial reporting framework related to Aichi Biodiversity Target 20 which shows that ten Parties had at least doubled their international aid flows for biodiversity by 2015. The financing made available as official development assistance through DAC member countries has in turn generated an estimated $ 200 million to $510 million

Figure 20.1. Trends in biodiversity related bilateral official development assistance[13]

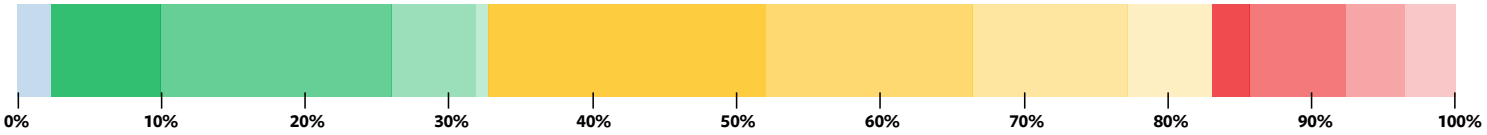


The bars illustrate principal and significant biodiversity-related bilateral official development assistance. The lines show the 2006-2010 and 2015-2018 averages of principal and significant ODA.

Box 20.2. The Green Climate Fund[14]

The Green Climate Fund (GCF), established in 2010 under the United Nations Framework Convention on Climate Change, plays a crucial role in supporting developing countries to raise their climate ambitions and to realize their Nationally Determined Contributions towards the targets of the Paris Agreement. The Fund supports projects by developing countries to mitigate climate change and adapt to its impacts. In 2014, as part of its initial round of resource mobilization, pledges totalling $10.3 billion were made, of which GCF has received $7.2 billion. In 2019, a further round of pledges was made bringing the total to $9.8 billion, with a number of countries doubling their original contributions for the 2020-2023 programming period. GCF also uses public investment to stimulate private sector finance for climate action. As of June 2020, the total value of the GCF's portfolio is $19 billion, comprised of 128 projects and programmes worldwide, and including co-financing from project partners. About $2.9 billion of this total has been invested to support 41 projects related to ecosystem-based mitigation and adaptation activities (32% of the GCF portfolio by number of projects, or 15.2% by value). Within these projects, investment directly channeled to supporting and restoring ecosystems and ecosystem services amounts to $700 million.

Assessment of progress towards national targets



The colour bars show the percentage of Parties reporting a given level of progress towards their national targets. (Blue: exceeds target; Green: on track; Yellow: some progress; Red: no change; Purple: moving away from target). The intensity of the colour indicates alignment of national targets with the Aichi Target (Darker colours indicate close alignment).


Photo by Aljoscha Laschgari on Unsplash

private biodiversity finance in 2018. However, most international public biodiversity finance is focused on terrestrial and freshwater biodiversity, with only about 4% of bilateral biodiversity-related ODA addressing marine biodiversity.[15]

The Global Environment Facility (GEF) is the financial mechanism of the Convention on Biological Diversity. Between 2006-2010 and 2018-2022, funding directly relevant to biodiversity[16] provided through the GEF increased by more than 30%, reaching about $1.3 billion (Table 20.1).[17] Further the amount of other biodiversity relevant investments has also increased over this period.[18] The funding provided through the GEF has leveraged an additional $323 million per year between 2015 and 2017 in private co-financing.[19]

Funding to support other international objectives, such as combatting climate change, often directly or indirectly also supports biodiversity objectives (Box 20.2). Making more of these potential synergies is one way of increasing the amount of resources for biodiversity activities.

Between 2015 and 2017 the private sector spent $6.6 - 13.6 billion per year on biodiversity, based on conservative estimates. This spending takes various forms, including biodiversity offsets, sustainable commodities, forest carbon finance, payments for ecosystem services, water quality trading and offsets, philanthropic spending, private contributions to conservation non-governmental organizations, and private finance leveraged by bilateral and multilateral public development finance.[20]

Three quarters of Parties have established national targets related to Aichi Biodiversity Target 20 and included them in their NBSAPs. A third of Parties report that they are on track to reach their national targets (30%) or to exceed them (3%). Another half of Parties (50%) have made progress towards their targets but will not meet the targets. Fewer than a fifth of Parties (17%) report no progress. However, little more than a quarter of the national targets are similar to (26%) or exceed (1%) the scope and level of ambition set out in the Aichi Target. Most are general, do not specify that resources should be increased substantially, or refer to all sources. Few reporting Parties (7%) have national targets similar to Aichi Biodiversity Target 20 and are on track to meet them (see bar chart).[21]

THE GLOBAL STRATEGY FOR PLANT CONSERVATION

The Global Strategy for Plant Conservation (GSPC), originally adopted by the Conference of the Parties to the Convention in 2002[1], aimed at achieving a series of 16 outcome-oriented and measurable targets by 2010. A revised set of targets for 2020 were agreed at COP-10[2] in 2010, with a decision that implementation of the GSPC should be pursued as part of the broader framework of the Strategic Plan for Biodiversity 2011-2020.

The GSPC has been instrumental in mobilizing efforts for plant conservation in recent years. Implementation has stimulated collaboration and synergies and provided an entry point for many institutions and non-governmental organizations into the implementation of the Strategic Plan for Biodiversity 2011-2020 and the Convention on Biological Diversity more generally. The GSPC has also encouraged the development of target-specific support groups and champions which are linked together through the Global Partnership for Plant Conservation (GPPC), established in 2004. Table 21.1 provides an overview of progress made in the achievement of the GSPC targets, and further information is contained in the Plant Conservation Report 2020.[3]

At the national level, a number of countries have developed responses to the GSPC, including many of the world's most biodiverse countries. Collectively, these countries include more than 50% of the world's plant species within their borders. Other countries are implementing the GSPC through their National Biodiversity Strategies and Action Plans (NBSAPs). While reporting on progress towards the GSPC targets is voluntary, 61 countries reported on national progress towards the GSPC in their sixth national reports to the CBD by May 2020. Most countries report at least some progress towards all the targets, with GSPC Targets 1 (e-floras), 2 (red listing) and 14 (public awareness of plant diversity) being most likely to be achieved at the national level (Box 21.1).

Despite these successes, a number of challenges have also been identified:

- Poor alignment between the GSPC and Aichi Targets has meant that in some cases, plant conservation activities have been seen as an additional burden rather than a contribution to higher level targets and the results obtained are only poorly captured in NBSAP reporting.
- Mechanisms to ensure that information from global datasets feeds back to national programmes are not well developed.
- Lack of coordination and information sharing across sectors (e.g. between agriculture and environment, and between government and non-governmental bodies), has constrained both efficient implementation and accurate reporting of progress.
- Government commitment to achieving plant conservation goals through the development of national plant conservation strategies has been demonstrated by relatively few countries.

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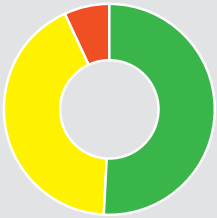
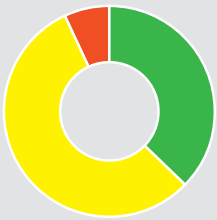
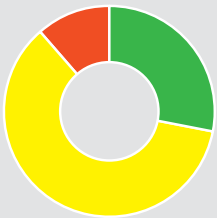
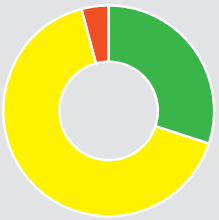
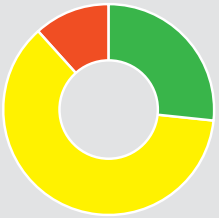
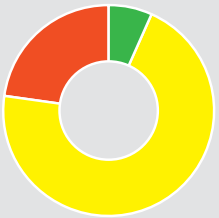
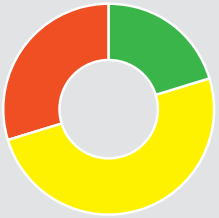
Box 21.1. Examples of national experiences and progress

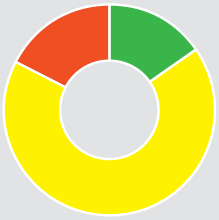
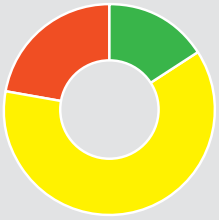
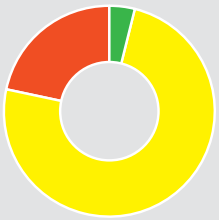
- **China:** In recognition of the importance of its plant diversity, China's Strategy for Plant Conservation was adopted in 2008 as a joint initiative of the Chinese Academy of Sciences, the State Forestry Administration (now, National Forestry and Grassland Administration) and the State Environmental Protection Agency (now, Ministry of Ecology and Environment). A review of progress was carried out in 2018 showing that five of the GSPC targets had been achieved in China (Targets 1, 2, 4, 5, and 7), and substantial progress had been made toward another five (Targets 3, 8, 9, 14, and 16). Further in 2019 China, at an international forum on the GSPC, launched an updated Chinese Strategy for Plant Conservation 2021-2030.[4]
- **Mexico:** A National Plant Conservation Strategy has been developed which includes six strategic goals and 33 targets with a time frame extending beyond 2020. A Coordination Committee has been established to support the implementation of the Strategy, with a coordinator responsible for each of the six objectives.[5]
- **South Africa:** Following a review of progress towards the GSPC targets in 2006, a country-specific strategy was developed to focus attention on gap areas. A partnership between the Botanical Society of South Africa and the South African National Biodiversity Institute provided the foundation to produce the strategy, which was endorsed by the Ministry of Environmental Affairs in 2016. The South African strategy maintains the same set of 16 targets as the GSPC, but with some targets modified to suit the national situation. An alignment between the plant conservation targets and the NBSAP targets has also been carried out. Through the development of the strategy a strong network of botanists has been developed that includes conservation agencies, non-governmental organizations and academic institutions.[6]

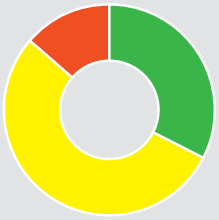
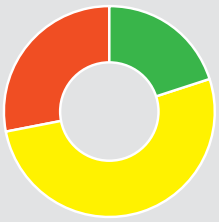
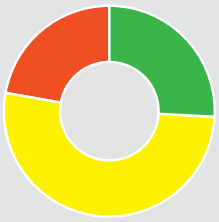
Table 21.1. Overview of progress in achieving the GSPC targets at global and national level.

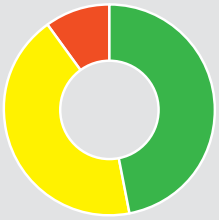
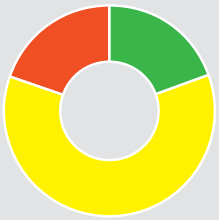
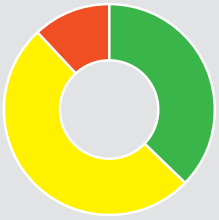
The background colour shows the level of progress towards the target at a global level. Green indicates that the target has been met. Yellow indicates that some progress has been made but not at a level sufficient to conclude that the target has been met. Pie charts show the percentage of countries that reported being on track to achieve target (green), making progress but not sufficient to achieve the target (yellow) or making no progress towards the target (red), as reported though the sixth national reports.

GSPC Target and global progress	National progress	Overview of progress
1. An online flora of all known plants		At the global level, the target is considered achieved, with the World Flora Online searchable website.[7] This currently includes 1,325,205 names, 350,510 accepted species, 55,272 images, 129,400 descriptions, 31,683 distributions and 1,154,754 references. Many countries are also on track to meet this target at the national level, including a number of megadiverse countries.
2. An assessment of the conservation status of all known plant species, as far as possible, to guide conservation action.		Global conservation assessments listed by IUCN are available for little more than 10% of known plant species of which 41% are threatened with extinction. The ThreatSearch database developed by Botanic Gardens Conservation International and partners includes over 340,000 assessments representing more than 180,000 taxa (35% of known plant species) covering global, regional and national assessments. The results to date show that one third of the species that have been assessed are threatened at some level.[8] The Global Tree Assessment which aimed to have a conservation assessment for all of the world's 60,000 tree species by 2020, had reached 61% of this goal by July 2020.[9]
3. Information, research and associated outputs and methods necessary to implement the Strategy developed and shared		An online GSPC toolkit has been developed and is available in the six official UN languages. This provides a platform for sharing information, methodologies and resources.[10] At the national level, a number of areas where further tools and resources are required have been identified.

GSPC Target and global progress	National progress	Overview of progress
4. At least 15 per cent of each ecological region or vegetation type secured through effective management and/or restoration		Members of the Global Partnership for Plant Conservation contribute scientifically to large-scale ecosystem restoration efforts including the African Forest Landscape Restoration Initiative and the Great Green Wall across the African Sahel. The establishment of the Ecological Restoration Alliance of Botanic Gardens has brought together partners with a focus on the use of native species in restoration.[11]
5. At least 75% of the most important areas for plant diversity of each ecological region protected, with effective management in place for conserving plants and their genetic diversity		Guidelines to support the identification of Important Plant Areas (IPAs) have been developed and an online database of IPA sites and projects is available. IPAs have now been identified across large sections of Europe, Africa and the Middle East with 1,994 IPAs in 27 countries identified and documented to date. In some countries, IPA networks have been integrated into national conservation planning and monitoring schemes.[12] In addition, over 1,500 Key Biodiversity Areas have been identified for plants. Of these, just 16% are completely covered by protected areas, and almost half (47%) are entirely outside protected areas. On average, 37% of each KBA identified for plants is covered by protected areas.
6. At least 75% of production land in each sector managed sustainably, consistent with the conservation of plant diversity		Increasingly, sustainable production and management practices are being applied in agriculture and forestry. However, there are questions concerning the extent to which plant conservation specifications are incorporated into such schemes and there needs to be more cross-sectoral collaboration.
7. At least 75 per cent of known threatened plant species conserved *in situ*.		The number of threatened plants in the world remains to be determined through the achievement of GSPC Target 2. Assessments to date suggest that 30% of plant species are threatened.[13] However, rapid progress in the Global Tree Assessment under Target 2 has resulted in the collection of a significant amount of data related to the world's 60,000 tree species. Of 48,486 tree species analysed, 11,003 are threatened either nationally or globally, and of these, 71% can be found in at least one protected area. At the national level, progress towards this target is closely linked to progress with GSPC Target 2.

GSPC Target and global progress	National progress	Overview of progress
8. At least 75 per cent of threatened plant species in *ex situ* collections, preferably in the country of origin, and at least 20 per cent available for recovery and restoration programmes 		The combined living plant collections of the world's botanic gardens include around 30% of all known plants and 41% of known threatened plant species. However, 93% of these species are held in the Northern Hemisphere and an estimated 76% of species absent from living collections are tropical in origin. Furthermore, over half of endemic threatened species are not held *ex situ* within their country of origin, implying reduced availability for ecological or species restoration. At the national level, many countries have found this target challenging due to lack of capacity to maintain or store large numbers of plant species.
9. 70 per cent of the genetic diversity of crops including their wild relatives and other socio-economically valuable plant species conserved, while respecting, preserving and maintaining associated indigenous and local knowledge 		According to the latest reports, there are some 7.4 million accessions of Plant Genetic Resources for Food and Agriculture stored in 1,750 genebanks around the world. However, the material held in these crop genebanks is overwhelmingly of domesticated origin, with wild species being significantly under-represented. At the national level, one of the major challenges is to identify the many thousands of species that are of socio-economic importance as well as managing the indigenous knowledge associated with these species.
10. Effective management plans in place to prevent new biological invasions and to manage important areas for plant diversity that are invaded 		Increasing global trade and the multiple pathways of introduction represent a major challenge to preventing new biological invasions. Actions taken by many countries include the establishment of inventories of invasive plant species and the development of national strategies on invasive alien species.

GSPC Target and global progress	National progress	Overview of progress
11. No species of wild flora endangered by international trade 		The implementation, monitoring and review of this target is through linkages with the Convention on the International Trade in Endangered Species of Wild Fauna and Flora (CITES) under its Plants Committee. In total, over 30,000 plant species are listed in the CITES Appendices, but monitoring trade in these species globally is challenging due to the circumvention of CITES regulations by claiming 'lookalike' species, poor records of plants traded, and the porosity of international borders. At the national level, around a third of countries reporting on this target, have reported progress sufficient to meet the target by 2020.
12. All wild harvested plant-based products sourced sustainably 		Up to 90% of plant species in trade with medicinal or aromatic uses are wild collected. Of the 7% that have been assessed, one in five are threatened with extinction. The FairWild sustainable harvest certification scheme has been operational since 2010. So far, 25 species have been certified from more than ten source countries. A certification scheme is also offered by the Union for Ethical Biotrade. At the national level countries report difficulties with monitoring progress towards this target with information on existing harvesting levels not available, and limited scientific data on 'safe' levels of harvesting.
13. Indigenous and local knowledge innovations and practices associated with plant resources maintained or increased, as appropriate, to support customary use, sustainable livelihoods, local food security and health care 		There is a growing appreciation of the value of traditional knowledge, not only to those who depend on it in their daily lives, but also to modern industry and agriculture. While the adoption of the Nagoya Protocol (Aichi Target 16) has given added impetus to the need to document and record traditional knowledge, progress towards this target is difficult to measure as baselines have not been quantified. A wide range of initiatives have been developed at national and local levels to collect and preserve traditional knowledge.

GSPC Target and global progress	National progress	Overview of progress
14. The importance of plant diversity and the need for its conservation incorporated into communication, education and public awareness programmes		Engaging the public in new and innovative ways is key to raising awareness of plant conservation issues. Citizen-science projects focussed around plant monitoring are increasing in popularity. Furthermore, plant identification apps are attracting huge numbers of users globally. National reports indicate significant progress towards this target in anumber of countries.
15. The number of trained people working with appropriate facilities sufficient according to national needs, to achieve the targets of this Strategy		Available information suggests that plant conservation capacity building opportunities are declining in some areas/ countries. If this is the case, it will have a significant impact on the ability of Parties to meet their commitments on biodiversity conservation. A number of countries note that no national assessments have been carried out to gauge the capacity needed to achieve the GSPC goals.
16. Institutions, networks and partnerships for plant conservation established or strengthened at national, regional and international levels to achieve the targets of this Strategy		At the global level, the Global Partnership for Plant Conservation has brought together the plant conservation community, and now includes some 58 partners.[14] However, greater efforts are still needed to engage other sectors. At the national level, there is a lack of cross-sectoral networks, with limited institutional integration and a lack of mainstreaming of plant conservation. However, where national responses to the GSPC have been developed, these have helped provide a focus for networking amongst the stakeholders.

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TAKING STOCK OF PROGRESS IN IMPLEMENTING THE STRATEGIC PLAN FOR BIODIVERSITY 2011–2020

Assessment of progress at the global level

The overall assessment at global level for each Aichi Biodiversity Target shows that none of the 20 targets have been fully achieved, though six targets have been partially achieved (Targets 9, 11, 16, 17, 19 and 20). The global-level assessment examines progress for 60 elements of the 20 targets. Of these, only seven elements have been achieved, although 38 show progress. Thirteen elements show no progress or indicate a move away from the target. The progress towards two elements is unknown.

Figure 21.1 presents an analysis of global indicators across all targets, updating the analysis prepared for GBO-4. While indicators relating to policies and actions in support of biodiversity (responses) show overwhelmingly positive trends (22 of 34 indicators showing significant increases), those relating to the drivers of biodiversity loss are increasing (9 out of 13 showing significantly worsening trends), and indicators of the current state of nature itself also show negative trends (12 out of 16 indicators getting significantly worse).[1]

Among the clear outcomes of this analysis are that indicators for targets within Goal B of the Strategic Plan (Reduce Direct Pressures) are mostly in a negative direction, and that all of the associated targets (Aichi Biodiversity Targets 5-10) have been missed, with the exception of Target 9 for which there was partial achievement due to progress in the identification of priority invasive alien species. This suggests that despite all the measures taken to date in support of conservation, sustainable use and sharing the benefits of biodiversity, a continuing decline in biodiversity can be expected based on the pressures currently faced by the world's ecosystems. It also supports the conclusion that an improvement in current trends requires a fundamental change of approach that addresses the underlying drivers of change.[2]

Progress as reported by countries in their sixth national reports to the CBD

Another view of the implementation of the Strategic Plan for Biodiversity 2011-2020 is provided from the progress towards national targets reported by Parties in their sixth national reports. Figure 2.2 compiles the bar charts summarizing reported progress towards national targets from

each of the Aichi Biodiversity Targets. The overall picture is one of progress, but at levels generally insufficient to achieve the Aichi Biodiversity Targets.

On average, countries report that more than a third of all national targets are on track to be met (34%, green bars) or even exceeded (3%, blue bars). For another half of the national targets (51%, yellow bars), progress is being made but not at a rate that will allow the targets to be met. Only 11% of countries report no significant progress (red bars) and only 1% report that they are moving in the wrong direction (purple bars). Progress is reported to have been greatest towards the national targets related to Aichi Biodiversity Targets 1, 11, 16, 17 and 19. Much less progress is reported towards the national targets related to Aichi Biodiversity Targets 5, 8, 9, 10, 13, 14 and 20.

However, as noted in the target assessments, national targets are generally poorly aligned with the Aichi Biodiversity Targets, in terms of scope and the level of ambition. Fewer than a quarter (23%) of the targets are well aligned with the Aichi Targets (darker shades of colour in the chart) and only about a tenth of all targets are similar to the Aichi Biodiversity Targets and are on track to be met. National targets were better aligned with Aichi Biodiversity Targets 1, 9, 16, 17, 19 and 20 than for others. Even for these targets, however, only about of one-fifth of countries with well-aligned targets reported that they were on track to meet them.

Taking into account both the levels of progress towards the national targets and their alignment with the Aichi Biodiversity Targets, the nationally-based assessment is broadly consistent with the global-level assessment.

Examples of success

Despite the limited progress globally towards the Aichi Biodiversity Targets, this Outlook has also documented some important examples in which actions in support of the goals and targets of the Strategic Plan for Biodiversity 2011-2020 have generated successful outcomes.

Notably, recent conservation actions have ***reduced the number of extinctions***. It is estimated that without such actions, extinctions of bird and mammal species would have been between two and four times their actual level over the past decade (see Aichi Target 12). These successes were achieved by a range of measures, including protected areas, hunting restrictions and the control of invasive alien species, as well as through ***ex situ*** conservation and re-introduction. Examples of species likely to have been saved from extinction between 2011 and 2020 include the Fatu Hiva monarch (*Pomarea whitneyi*), black stilt (*Himantopus novaezelandiae*), Javan rhinoceros (*Rhinoceros sondaicus*) and black-footed ferret (*Mustela nigripes*). All of these species remain Endangered or Critically Endangered, however, so the success of the past decade in preventing their extinction will only be sustained with continuing, additional conservation efforts.[3]

There has also been significant ***expansion of the protected area*** estate increasing over the 2000-2020 period, from about 10% to 15% terrestrially, and from about 3% to 7% in marine areas (see Aichi Target 11). The protection of areas of particular importance for biodiversity (key biodiversity areas) has also increased from 29% to 43% over the same time period.

There are some notable examples of progress in addressing the ***direct drivers of biodiversity loss***:

- **Land-use change.** The rate of deforestation has fallen globally by about a third compared to the previous decade (Aichi Target 5).
- **Overexploitation.** Where good fisheries management policies have been introduced, involving stock assessments, catch limits, and enforcement, the abundance of fish stocks has been maintained or rebuilt (Aichi Target 6).
- **Pollution.** There have been examples of reducing pollution from excess nitrogen-based fertilizers, for example in the European Union and China (Aichi Target 8).
- **Invasive alien species.** There have been an increasing number of successful cases of eradication of invasive alien species from islands, and the targeting of priority species and pathways, including through international agreements, to avoid future introductions (Aichi Target 9).

Other examples of progress identified in the analysis of target achievement include:

- An apparent increase in awareness of biodiversity (Aichi Target 1).
- An increasing number of countries incorporating biodiversity values into national accounting systems (Aichi Target 2).
- Successful programmes to restore degraded ecosystems in many countries (Aichi Target 15).
- The bringing into force of the Nagoya Protocol on Access to Genetic Resources and the Fair and Equitable Sharing of Benefits Arising from their Utilization (Aichi Target 16).
- The development of national biodiversity strategies and action plans (NBSAPs) by 85% of Parties to the CBD (Aichi Target 17).
- An increased recognition of the value of traditional knowledge and customary sustainable use of biodiversity in many countries (Aichi Target 18).
- A substantial increase in the data and information on biodiversity available to citizens, researchers and policy makers, including through the efforts of citizen science (Aichi Target 19).
- A doubling of financial resources available for biodiversity through international flows and official development assistance (Aichi Target 20).

These examples, and others documented in the target assessments, provide a strong justification to maintain and enhance investments in the conservation and sustainable use of biodiversity, as well as measures to address both indirect and direct drivers of biodiversity loss. They also provide some important lessons as discussed below.

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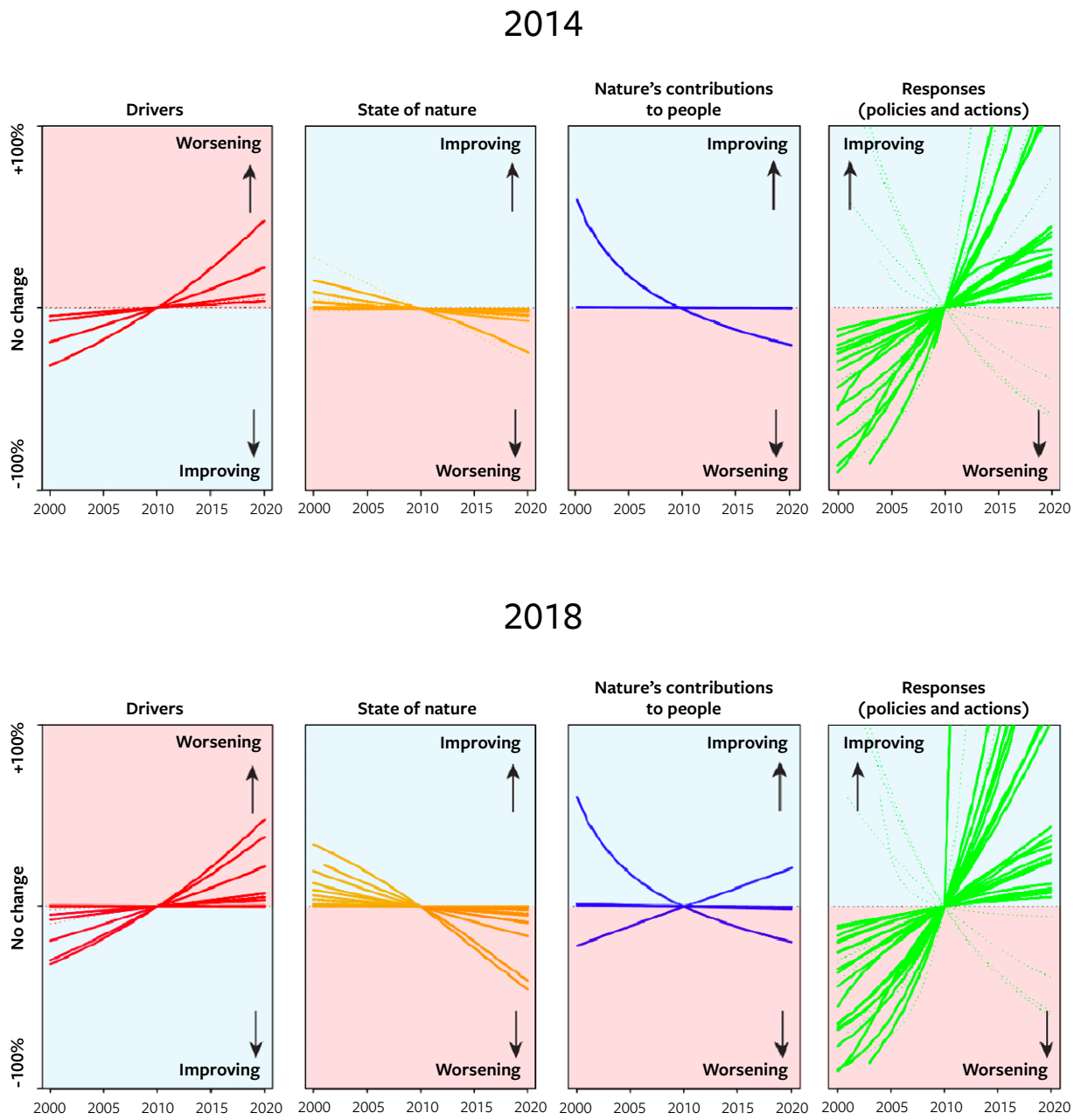
Figure 21.1. Trends in indicators of drivers, the state of nature, nature's contributions to people, and responses (policies and actions of institutions and governance) across all Aichi Targets, as assessed in 2014, and for the IPBES Global Assessment in 2018.[8]



In the 2014 assessment 55 indicators were used while in the 2018 assessment 68 were used, may of which had updated time series. Despite the difference in indicators, both assessments show similar patterns and trends. However, in the 2018 assessment the increase in the drivers of biodiversity loss and the responses to it are clearer as is the decline in state of biodiversity.

Lessons learned from the implementation of the Strategic Plan for Biodiversity 2011-2020

Several overarching lessons from the experiences in implementing the Strategic Plan for Biodiversity 2011-2020 help to inform the development of the post-2020 global biodiversity framework. These lessons suggest that there is no single solution to improving the design and implementation of the post-2020 global biodiversity framework, and that a range of changes may be required:[4]

- **Increasing efforts to address the direct and indirect drivers of biodiversity loss** – Reducing the rate of biodiversity loss and ultimately halting it will require that the drivers of biodiversity loss are addressed, requiring greater interaction between ministries responsible for biodiversity and those addressing issues related to other sectors, as well as greater engagement across society. Most successful plans involve a package of actions comprising legal or policy frameworks, socioeconomic incentives, public and stakeholder engagement, monitoring and enforcement. Many of the issues addressed under the Convention are interrelated, and accordingly, they require integrated and holistic approaches to planning and implementation.

- **Strengthening the integration of gender, the role of indigenous peoples and local communities and stakeholder engagement** – Analysis has shown that opportunities for effective action in support of the Strategic Plan for Biodiversity 2011-2020 were missed due to insufficient involvement of women, indigenous peoples and local communities, and a broad set of stakeholders in the design and implementation of NBSAPs (see especially Aichi Targets 14, 17 and 18). The new global framework can set stronger requirements for future action on biodiversity to include all of these considerations as foundational prerequisites.

- **Strengthening national biodiversity strategies and action plans and associated planning processes** – National biodiversity strategies and action plans have evolved to include issues beyond the direct drivers of biodiversity loss, and towards holistic approaches to biodiversity governance. However, few countries have adopted NBSAPs as whole-of-government policy instruments, limiting their effectiveness in addressing other sectors and weakening the level of implementation (see Aichi Target 17).

- **Well-designed, 'SMART' goals and targets** – Aichi Biodiversity Targets which are formulated with clear, unambiguous, simple language, with quantitative elements, (i.e. according to 'SMART' criteria)[5] have, in general, seen greater levels of progress.[6] At the same time, more progress appears to have been made for targets focussed on process, rather than those defining specific outcomes. Targets focussed on the intended outcome are important, but it may be difficult to monitor progress within the required time-frame, and to clearly attribute responsibility for achieving the targets. Thus, a combination of process and outcome targets may be useful, each supported by indicators to allow effective monitoring of progress. It is also important to formulate targets such that they do not lead to perverse outcomes.[7]

- **Increasing the ambition of national commitments** – The Strategic Plan for Biodiversity 2011-2020 provided for the establishment of national biodiversity targets in support of the global Aichi Biodiversity Targets. However, the majority of national targets were lower in scope and levels of ambition than the Aichi Targets. There is a need to promote future national commitments that are commensurate with the aims of the global framework, and that align with its goals and targets.

- **The need to reduce time lags in planning and account for time lags in implementation** – Progress towards the Aichi Biodiversity Targets was hindered by various time lags. In most cases, updated national biodiversity strategies and action plans were not developed until well after the Strategic Plan was adopted, delaying action to implement the Plan (Figure 17.1). At the global level, many years elapsed before indicators were identified. In addition, given the dynamics of natural systems, when positive actions are taken, the impacts on biodiversity may not be visible for several years or decades.

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- **The need for effective review and sustained and targeted support to countries** – More progress has been made towards the achievement of targets which have been subject to regular review involving national experts, and for which sustained and ongoing support has been provided through capacity-building activities and through support networks at the regional and subregional levels. There is also a need to ensure adequate funding.

- **The need for learning and adaptive management** – Greater efforts are needed to facilitate technical and scientific cooperation among countries to learn from the experience and to understand the reasons for the effectiveness or otherwise of policy measures. There is also an opportunity to make use of available policy support tools and methodologies, including those developed under the Convention, and to adapt them to national circumstances.

- **The need for attention to implementation** – The Strategic Plan for Biodiversity 2011-2020 includes a rationale, vision, mission, goals and targets (the Aichi Biodiversity Targets) as well as provisions for implementation, monitoring, review and evaluation, and support mechanisms. In practice, while the Aichi Biodiversity Targets have received the most visibility, some of the other elements, though equally important, have received less attention. This has arguably contributed to the poor levels of achievement of the targets.

Conclusions

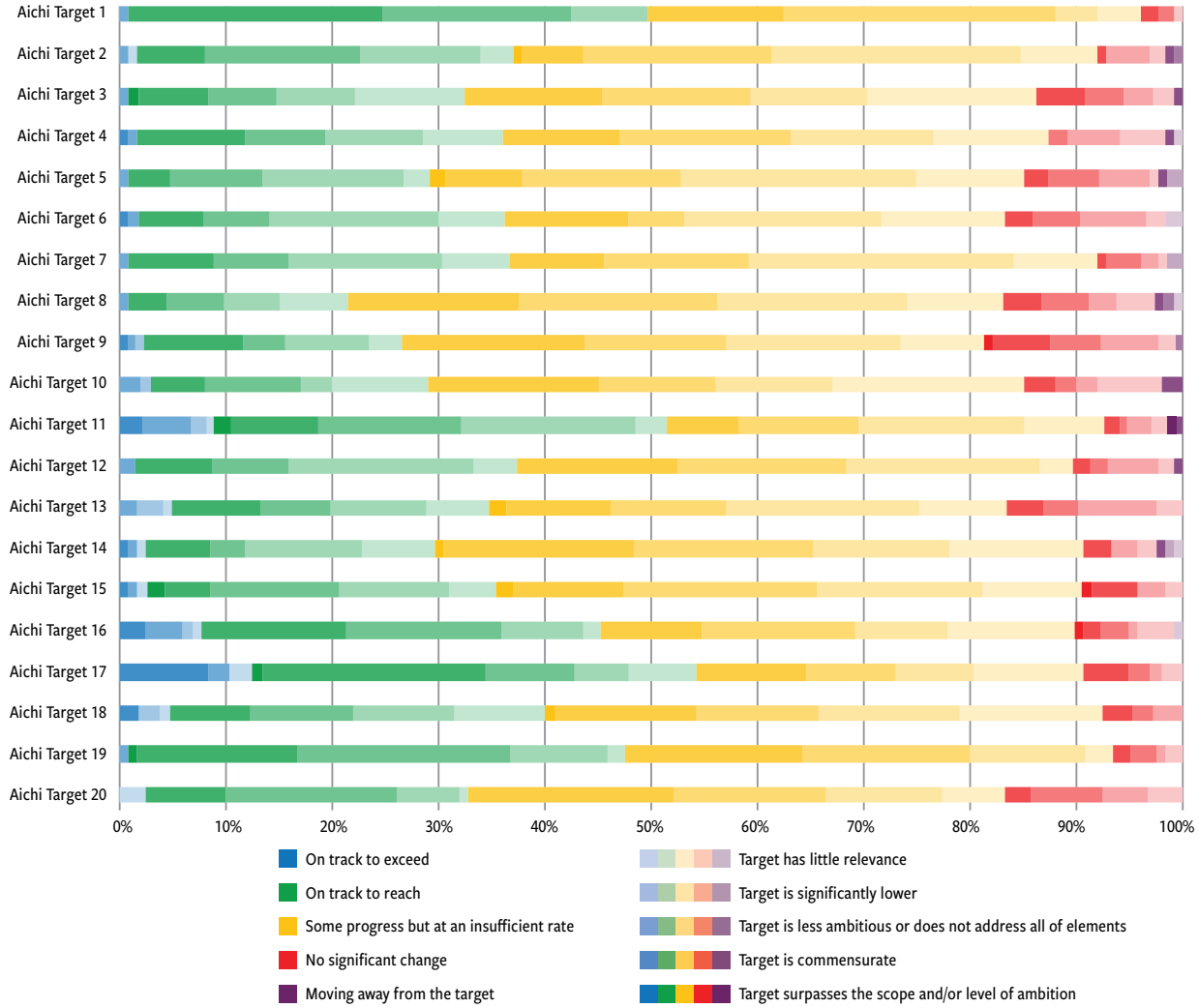
The overall message of the assessment in GBO-5 remains similar to that of the mid-term assessment in GBO-4. It is also reinforced by more recent analysis in the IPBES Global Assessment. In summary: while there has been significant progress towards most of the Aichi Biodiversity Targets, none has been fully achieved.

Overall, biodiversity loss is continuing, despite substantial ongoing efforts for biodiversity conservation and sustainable use. While current conservation and management actions are having positive impacts, their effects are overwhelmed by the growing pressures on biodiversity, which, in

turn, are related to increased levels of consumption of food, energy and materials and to the development of infrastructure.

Consequently, the world is not on track to achieve most of the current globally agreed targets for biodiversity, or for land degradation or climate change, nor the other Sustainable Development Goals. However, this assessment provides further evidence that when well implemented, conservation actions and broader policy measures are effective. There is an urgent need to build upon the progress made, learning from the examples of success, so as to tackle the direct and indirect drivers of biodiversity loss and realize the benefits of biodiversity conservation and sustainable use for people. Potential pathways towards the goal of 'living in harmony with nature' are explored in Part III of this Outlook.

Figure 21.2. Assessment of progress towards national targets and the alignment of these to the Aichi Biodiversity Targets.



The colour bars show the percentage of Parties reporting a given level of progress towards their national targets. Blue: exceeds target; Green: on track; Yellow: some progress; Red: no change; Purple: moving away from target. The intensity of the colour indicates alignment of national targets with the Aichi Target. Darker colours indicate closer alignment. Further information is provided in Box 0.3.

PART III.

Pathways to the 2050 Vision for Biodiversity

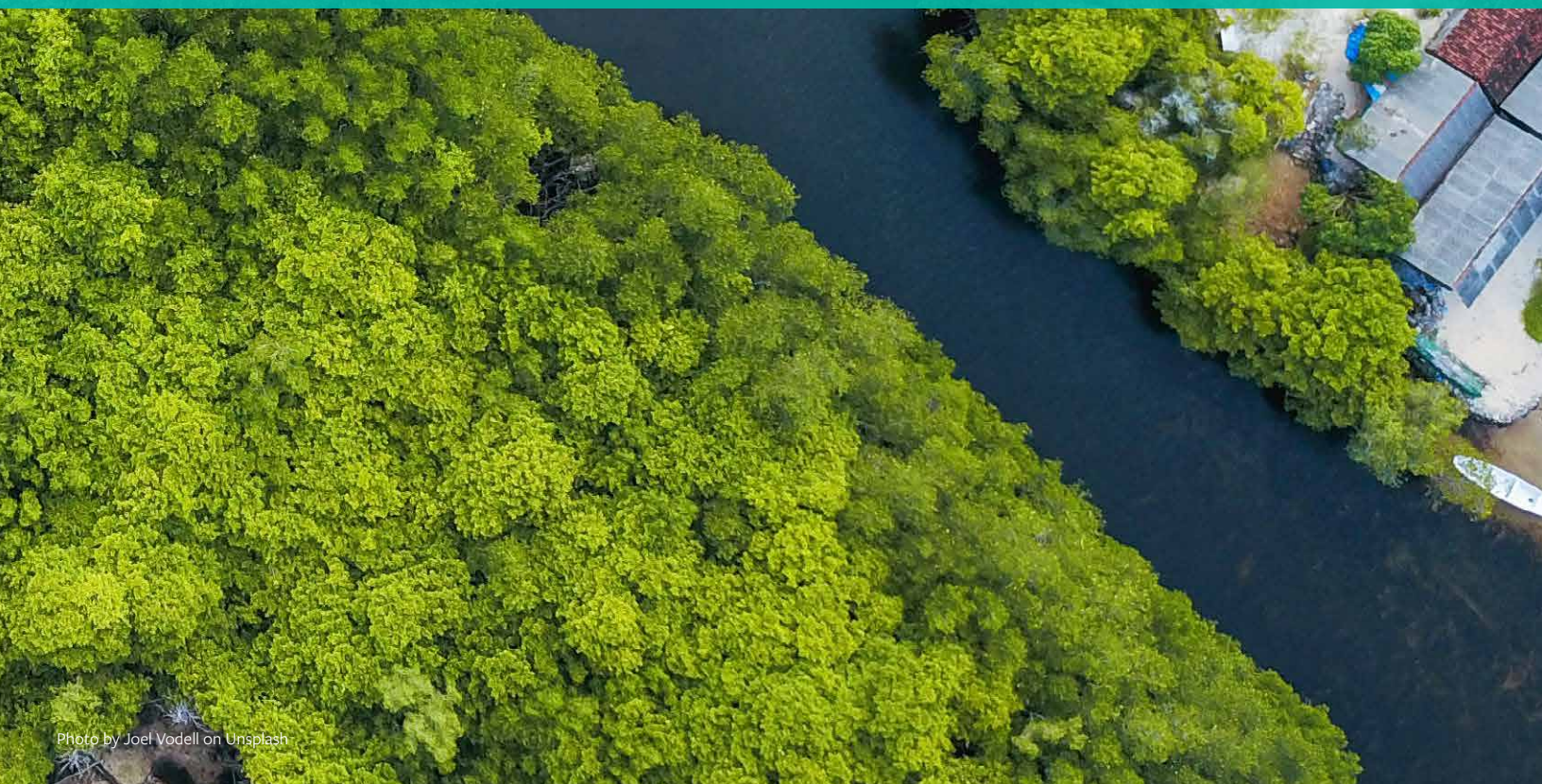


Photo by Joel Vodell on Unsplash

The Strategic Plan for Biodiversity 2011-2020 set the context for short and medium-term action by describing an agreed long-term 2050 Vision for Biodiversity, under the title 'Living in harmony with Nature'. Specifically, the Vision was for a world in which *"by 2050, biodiversity is valued, conserved, restored and wisely used, maintaining ecosystem services, sustaining a healthy planet and delivering benefits essential for all people"*.

Despite the limited progress towards the goals and targets set for the last decade, the 2050 Vision for Biodiversity remains the benchmark guiding global action on biodiversity in the coming years. The final section of this Outlook examines the combination of actions required for the Vision still to be attainable, and the transformative changes and transitions they imply.

DEPARTING FROM BUSINESS AS USUAL

The review of the Aichi Biodiversity Targets set out in Part II of this Outlook makes clear that based on current trends and progress towards the goals of the Strategic Plan, continuing with 'business as usual' will put the Vision for Biodiversity out of reach, with serious consequences not only for the future of biodiversity, but for all of the Sustainable Development Goals and targets for limiting climate change.

Under current 'business as usual' trajectories, each of the main pressures driving the loss of biodiversity, and the depletion of nature's contributions to people, would continue to intensify.[1] Examples include:

- **Land-use change and habitat conversion.** 'Middle of the road' scenarios result in large continuing declines in the global area of forest and other natural land by the middle of the 21st century. Such scenarios anticipate an increase of approximately 200 million hectares in the global area of cropland between 2015 and 2050, despite continuing intensification and increased crop yield, to meet the demands of a growing and wealthier population and current dietary trends. Together with urban expansion and other changes, this would lead to the loss of around 300 million hectares of forests and other natural ecosystems over the same period.[2]

- **Climate change.** Currently the world is on track for temperatures to rise by around 3 degrees C or more above pre-industrial levels by the end of the century if current commitments made by countries under the Paris Climate Change Agreement are implemented, and to even higher levels if implementation falls short.[3] Such changes would have extremely serious consequences for biodiversity, increasing extinction rates and leading to the virtual disappearance of some ecosystems such as coral reefs.[4]

- **Over-exploitation.** 'Business as usual' scenarios of fishing effort around the world would cause continued depletion of fish stocks, leading to a reduced and unprofitable harvest by 2050 (Figure 22.4 and Sustainable Fishing and Oceans Transition).[5]

- **Invasive alien species.** The projected growth in global shipping traffic is likely to increase the risk of alien species invasions by between three and 20 times the current level by 2050. The increased risk is forecast to be especially high in middle-income countries, notably in Northeast Asia. Shipping growth is anticipated to have a far greater effect on marine invasions than climate-driven environmental change.[6]

- **Pollution.** The rate at which plastic pollution enters aquatic ecosystems is projected to increase by 2.6 times the level of 2016 by 2040, under a 'business as usual' scenario. Over the same period, the rate of plastic pollution retained in terrestrial environments would increase 2.8 times. Even if current commitments to reduce plastic pollution were implemented in full, the reduction in pollution rates would only fall by 6.6% below these levels.[7] Based on the latest available trends, the deposition of nitrogen from the atmosphere is

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projected to increase substantially in some regions for the remainder of this century, with significant negative impacts on biodiversity. By 2030, the rate of nitrogen deposition is projected to increase in Asia, Africa and Central and South America, while decreases are projected for North America, Europe and the Middle East. By 2100, particularly large increases are projected for South Asia, with 2100 levels more than double the rate for 2000.[8]

Clearly 'business as usual' trajectories are incompatible with any interpretation of a future in which human societies are living in harmony with nature by 2050. The foregoing examples, and the global scenarios examined by the IPBES Global Assessment, project significant negative impacts on biodiversity at all levels, from genetic diversity to biomes. A significant fraction of wild species is projected to be at risk of extinction during the 21st century due to climate change, land use, natural resource extraction and the impact of other direct drivers. These potential impacts are shown to apply to terrestrial, inland water and marine ecosystems.

In turn, these pressures would result in a major decline in nature's contributions to people. The role of nature in regulating water quality, reducing coastal risk and pollinating crops will be significantly compromised by 2050 under a 'business as usual' scenario, especially in regions where the need for such contributions is greatest. Up to five billion people face higher water pollution and insufficient pollination for nutrition under future scenarios of land use and climate change, particularly in Africa and South Asia. Hundreds of millions of people face heightened coastal risk across Africa, Eurasia and the Americas.[9]

Losses from 'business as usual' can also be expressed in economic terms. For example, the first results of the Global Futures Initiative estimate conservatively that the loss of ecosystem services resulting from a such a scenario would represent a cost of nearly $10 trillion dollars to the global economy by 2050. Poorer countries would bear most of the costs, with Eastern and Western Africa, Central Asia, and parts of South America experiencing losses of up to 4% of GDP.[10]

SCENARIOS AND PATHWAYS TO 2050

The fourth edition of the Global Biodiversity Outlook presented scenarios demonstrating the actions needed to slow and halt the decline of biodiversity.[11] More recently, researchers have explored feasibility of reversing current trends to allow a recovery of biodiversity that would be truly consistent with moving towards the 2050 Vision of living in harmony with nature,[12] and also consistent with the goals and targets set out under the 2030 Agenda for Sustainable Development and the Paris Climate Change Agreement.[13]

The IPBES Global Assessment and subsequent modelling studies (Boxes 22.1 and 22.2) demonstrate that such 'bending the curve' of biodiversity loss may indeed be possible, at least for some biodiversity metrics, but that it would require transformative change in the way humans manage the planet.[14]

Multiple lines of evidence suggest that realizing the 2050 Vision for Biodiversity depends on a portfolio of actions in the following areas, each of which is necessary but none on its own sufficient:

- Efforts to conserve and restore biodiversity need to be scaled up at all levels using approaches that will depend on local context. These need to combine major increases in the extent and effectiveness of well-connected protected areas and other effective area-based conservation measures, large-scale restoration of degraded habitats, and improvements in the condition of nature across farmed and urban landscapes as well as inland water bodies, coasts and oceans;
- Efforts to keep climate change well below 2 degrees C and close to 1.5 degrees C above pre-industrial levels are needed to prevent climate impacts from overwhelming all other actions in support of biodiversity. The conservation and restoration of ecosystems can play a substantial role in this. Such 'nature-based solutions' can also be an important part of adaptation to climate change;
- Effective steps need to be taken to address all remaining pressures driving biodiversity loss, including invasive alien species, pollution and the unsustainable exploitation of biodiversity especially in marine and inland water ecosystems;
- Transformations need to be achieved in the production of goods and services, especially food. This will include adopting agricultural methods that can meet growing global demand while imposing fewer negative impacts on the environment, and reducing the pressure to convert more land to production;
- Transformations are similarly needed to limit the demand for increased food production by adopting healthier diets and reducing food waste, and also in limiting the consumption of other material goods and services affecting biodiversity, for example in forestry, energy and provision of fresh water.

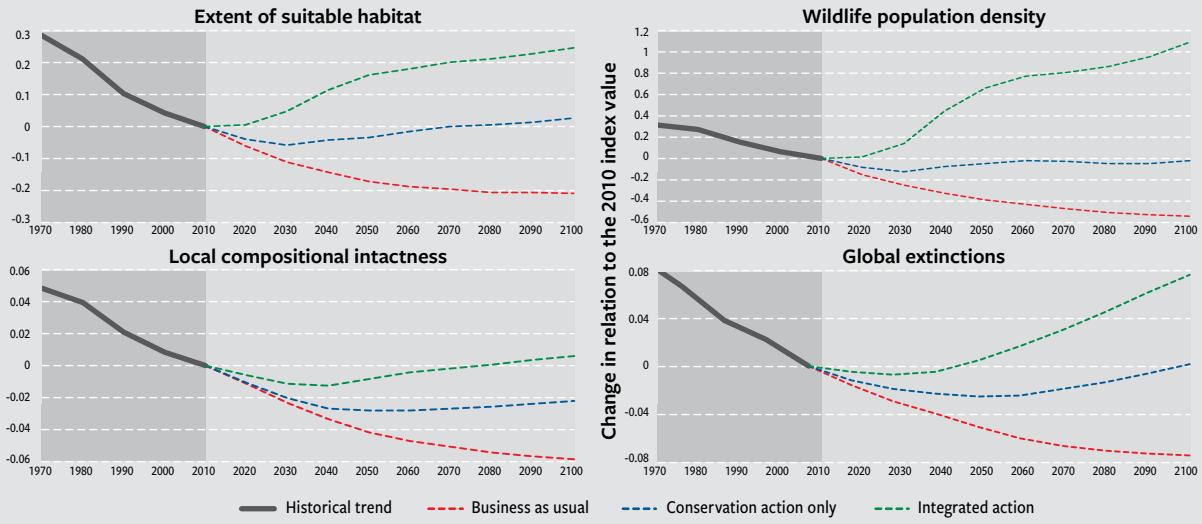
Each of these areas of action relies on very substantial changes and innovations, involving a wide range of actors at all scales and in all sectors of society (see transitions described below). However, even the most intensive efforts in each of these areas will not succeed in 'bending the curve' of biodiversity loss, and meet global objectives on food security, unless tackled alongside action in the other areas. For example, scenarios that involve bold conservation and restoration efforts enable a future pathway in which the essential components of the 2050 Vision for Biodiversity may be realized, but only if coupled with simultaneous measures to transform the current food system, thus addressing the underlying drivers of further conversion of habitats to meet food demand (Box 22.2).[15]

Addressing actions in all of the areas described above is not only necessary to achieve the overall objective of 'bending the curve' of biodiversity loss: it also makes action in each category easier. Actions in one area will remove barriers impeding change in another, so that multiple interventions across the whole range of activity actually become more feasible than attempting to focus interventions in isolated parts of the action portfolio. For example,

Box 22.1. Bending the curve of biodiversity loss

A key question facing decision makers is whether it is possible to 'bend the curve' of historical and projected trends such that global biodiversity loss is halted and nature is on the road to recovery by the middle of the 21st century – and what combination of actions is necessary to bring this about, while ensuring that other global goals, such as ensuring food security, are also achieved. Focussing on the major driver of converting habitats to increase agricultural production, a recent study[16] used multiple models to assess the likely outcomes on terrestrial biodiversity trends resulting from a mix of bold and immediate conservation measures, combined with other interventions. The models show that a combination of increasing land under effective conservation management to 40% of terrestrial areas, restoring nearly 100 million hectares of degraded land, and widespread adoption of landscape-level conservation approaches, could reduce and halt biodiversity loss by 2050, although not for all modelled indicators of biodiversity (see 'conservation action only' in Figure 22.1). Such action would prevent little more than half of projected biodiversity loss compared with 'business as usual', and would likely increase food prices, threatening food security. On the other hand, bold conservation combined with sustainable intensification of agricultural production, increased trade in agricultural goods, more sustainable and healthier human diets (especially reduced meat consumption) and reduced food waste, could prevent more than two-thirds of projected biodiversity loss while avoiding conflict with affordable provision of food. As shown in the 'integrated action' trends in Figure 22.1, this package of measures would likely reverse negative trends of all key biodiversity indicators by the middle of the century. The analysis does not, however, take into account other threats to biodiversity – such as climate change or biological invasions – which would also need to be addressed to truly reverse biodiversity decline. Nevertheless, the analysis suggests that an integrated combination of bold conservation measures and transformation of the food system is central to achieving the 2050 Vision for Biodiversity.

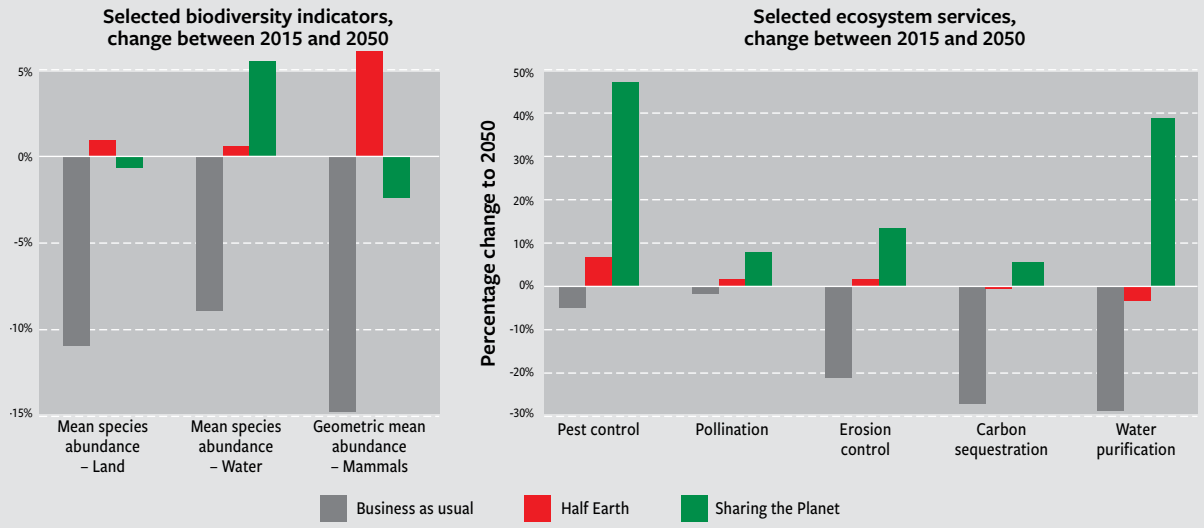
Figure 22.1. Historical and modelled future trends in four selected terrestrial biodiversity indicators, based on a 'business as usual' approach, a package of bold conservation and restoration measures ('conservation action only'), and an integrated package combining such conservation and restoration action with additional measures to address both supply-side and demand-side pressures on habitat conversion for food production (integrated action).[17]



Box 22.2. Contrasting approaches to reducing and reversing biodiversity decline

While radically-increased ambition for nature conservation is a prerequisite for achieving the 2050 Vision for Biodiversity, countries may adopt a range of different approaches to address biodiversity loss. A study by the PBL Netherlands Environmental Assessment Agency designed two contrasting, ambitious global conservation strategies and evaluated their ability to restore terrestrial and freshwater biodiversity, and to provide ecosystem services while also mitigating climate change and ensuring food security. One strategy, entitled 'Half Earth', prioritized protection of nature for its own sake, with a focus on protected areas, restoration and other area-based conservation measures to preserve remaining wilderness, combined with sustainable intensification of agriculture to reduce the pressure to convert additional habitats. The second strategy, entitled 'Sharing the Planet', prioritized conservation measures that support and enhance provision of ecosystem services and nature's contributions to people, favouring landscapes that are a mosaic of patches of natural habitat and agriculture. These approaches were each compared with a baseline scenario equating to 'business as usual'. While both approaches could achieve a reduction in the loss of biodiversity and ecosystem services by 2050, additional measures to limit climate change and reduce overall consumption of animal products were needed to allow biodiversity and ecosystem services to recover, and to meet climate and food security goals. Conservation-only strategies would see a large trade-off with food security. The 'Half Earth' scenario, combined with strong climate change mitigation and additional sustainability measures, would have the most success in protecting biodiversity in areas currently still in a natural state, and achieve the greatest improvements in global biodiversity indicators (Figure 22.2). The 'Sharing the Planet' scenarios, on the other hand, also in combination with strong climate change mitigation and additional sustainability measures, would generate greater improvements for biodiversity in areas used for human activity, in aquatic biodiversity, and in the provision of ecosystem services such as pest control, pollination and erosion control. While not suggesting a single, 'ideal' approach to achieving maximum conservation gains, these scenarios help to demonstrate the considerations that can inform decisions on biodiversity based on global, regional, national and local priorities.

Figure 22.2. Outcomes in projected change to biodiversity and ecosystem services between 2015 and 2050, for 'business as usual', 'Half Earth' and 'Sharing the Planet' scenarios, including additional measures for climate change mitigation and sustainable consumption.[18]



actions to limit food demand will make reform of agricultural production more feasible; and both of these combined will remove barriers from implementing necessary conservation measures. On the other hand, coordinated action also means taking account of and minimizing trade-offs – not all potential actions across these areas are 'win-win' solutions.[19]

A range of proposals has been put forward for stepping up the protection of land, inland water ecosystems and oceans for nature, and restoration of degraded ecosystems, in ways that greatly increase the ambition of past goals and targets (see Land and Forest, and Sustainable Fisheries and Oceans Transitions).[20] Applying such solutions needs to take account of potential negative impacts on food security if areas protected or restored for nature add further pressure on the land available for food production, thereby driving up prices and potentially leading to significant food shortages.[21]

Alternative, ambitious approaches to conservation can lead to very different outcomes both for biodiversity and for nature's contributions to people. For example, while a focus on protecting intact ecosystems can yield the greatest gains for terrestrial biodiversity, an emphasis on improving biodiversity in 'shared' landscapes such as farmed land generates greater gains for services such as pest control, erosion control and pollination, as well as for aquatic biodiversity (Box 22.2).[22]

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TRANSITIONS TO LIVING IN HARMONY WITH NATURE

The broad requirements for meeting the 2050 Vision for Biodiversity, outlined in the previous section, may be further clarified by examining the kind of transitions needed in particular realms and areas of human activity. This section of the Outlook focusses on eight distinct but closely inter-related aspects of the interface between people and nature: the use of land, forests and other ecosystems; the management of freshwater ecosystems; marine fisheries and other uses of the ocean; the production of agricultural products from the landscape; the food system, including diets, demand, supply chains and waste; the footprint and requirements of cities and infrastructure; the interaction between ecosystems and climate change; and the multi-faceted connections between nature and human health (Figure 22.3). The selection of these areas of transition is largely based on the 'nexus' approach outlined in the IPBES Global Assessment,[23] with the addition of the biodiversity-inclusive One Health transition in view of the global relevance of the links between nature and health highlighted by the COVID-19 pandemic.

Transitions in each of these areas are fundamental to a realignment of people's relationship with nature and a move to sustainability. In the following sections, a number of components are summarized in each case, that together represent a shift from the current unsustainable path, and if applied widely, would enable a new level of harmony between human activities and the natural capital on which they depend. Common to the transitions in each area is the recognition of people's dependency on biodiversity for all of these aspects of human activity and well-being, and of the negative impacts upon biodiversity from current models of economic and other behaviour. As shown in Figure 22.3, there are multiple linkages between transitions to sustainability in each area, and these dependencies and contributions are explored in more detail in each of the upcoming sections.

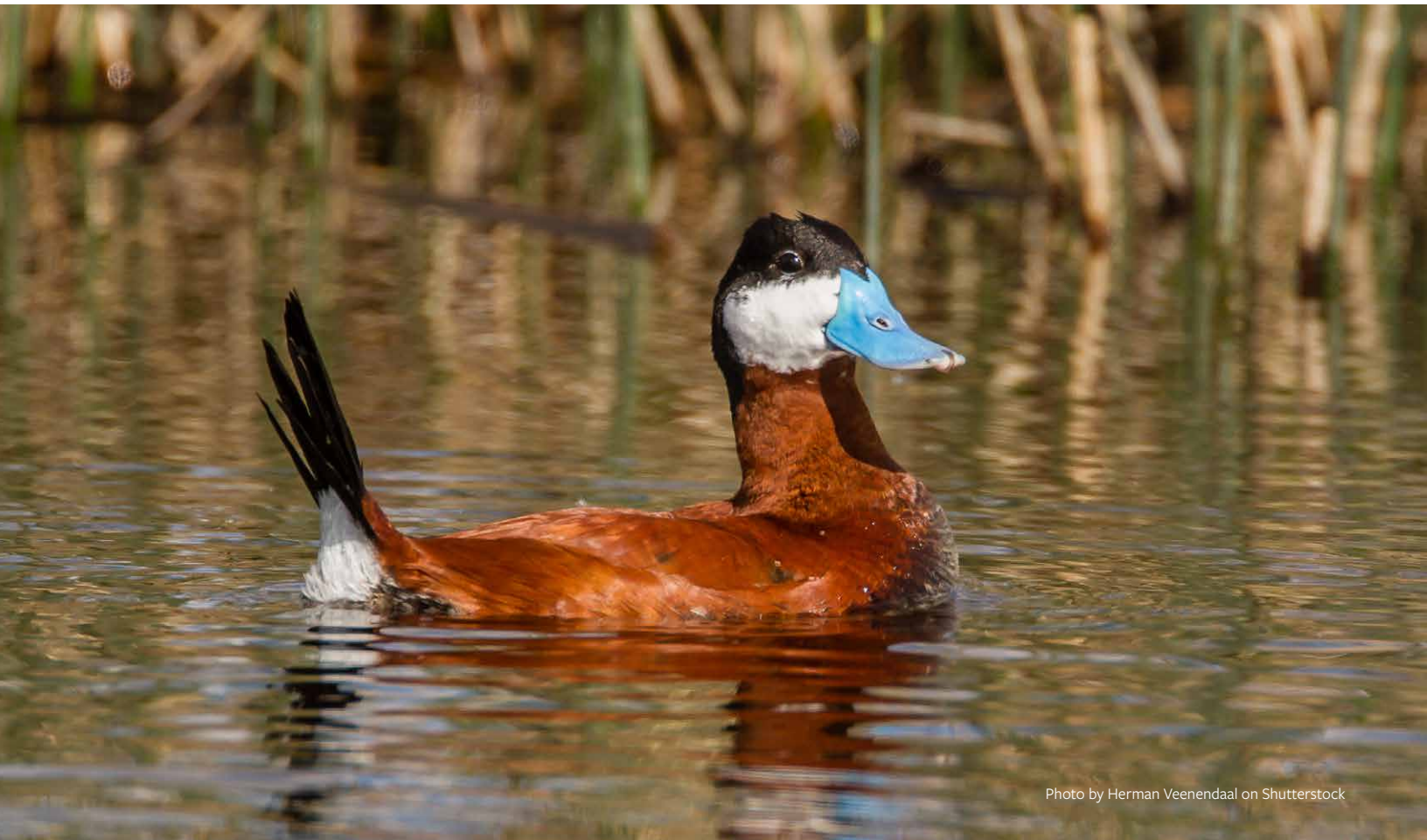

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Figure 22.3. Transitions in eight aspects of the interface between human activity, human well-being and nature examined in this Outlook, showing some of the linkages among them. The linkages, both contributions and dependencies, are described in the sections on each transition below.

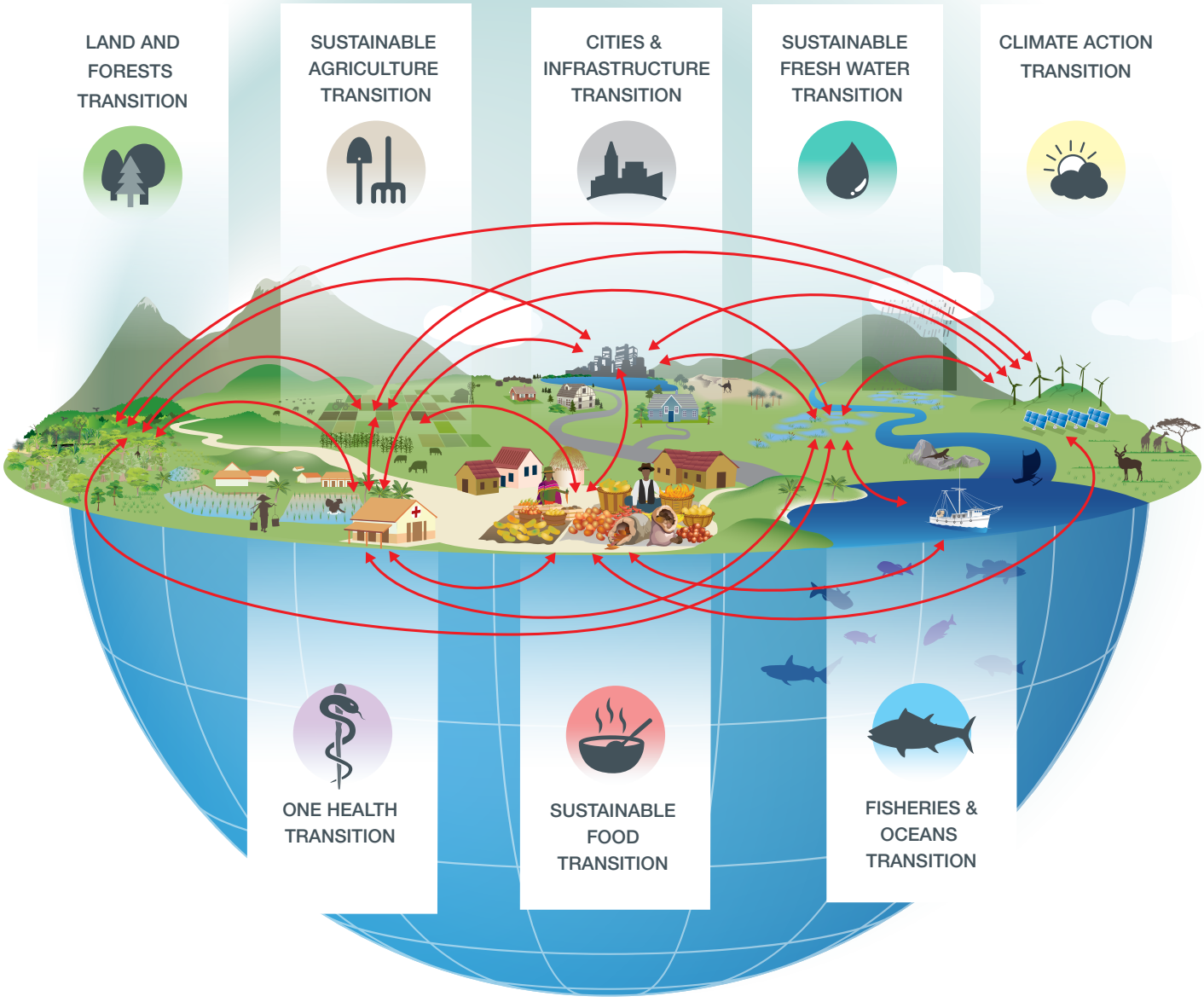


Figure by Yuka Otsuki Estrada

THE LAND AND FORESTS TRANSITION

Summary of the transition

Conserving intact ecosystems, restoring ecosystems, combatting and reversing degradation, and employing landscape-level spatial planning to avoid, reduce and mitigate land-use change. This transition recognizes the essential value of well-conserved habitats for the maintenance of biodiversity and the provision of ecosystem services for the benefit of people, and the need to move to a situation in which maintaining and improving food security no longer involves the large-scale conversion of forests and other ecosystems.

Rationale and Benefits

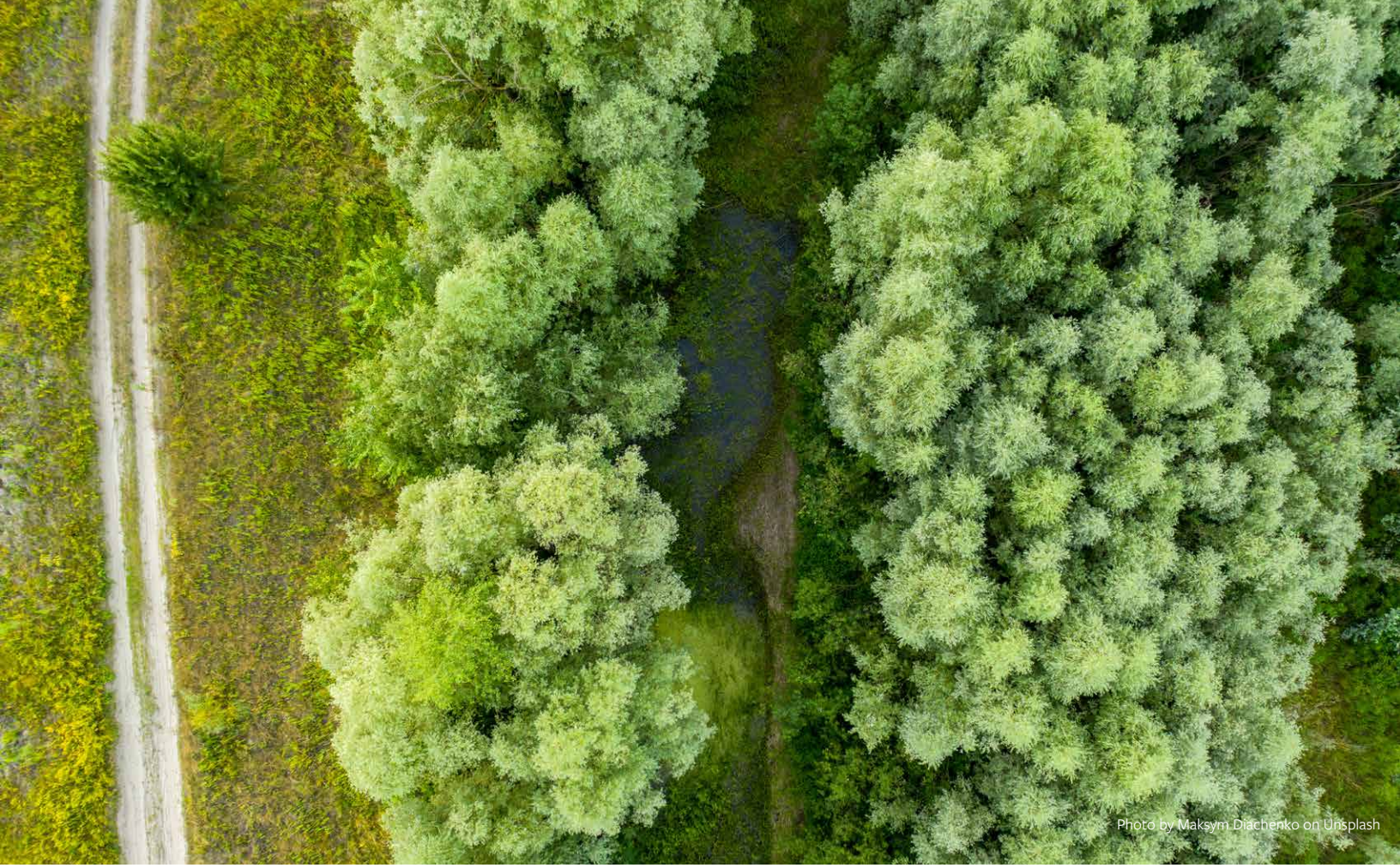
Land-use change is the largest direct driver of terrestrial biodiversity loss.[1] The loss and degradation of forests and other natural ecosystems is continuing globally, and especially in tropical areas (see Aichi Biodiversity Target 5). The main cause of forest loss is expansion of agriculture (for example, primarily by commercial agriculture in South America, and by small-scale agriculture in central Africa),[2] though urbanization[3] and infrastructure development[4] are increasingly important (see Cities and Infrastructure transition). Scenarios of land-use change demonstrate that a range of futures are possible, depending on decisions taken globally, nationally and locally (Box 22.2).[5] As noted in the foregoing section (see Pathways), achieving such changes is essential to reduce and reverse biodiversity loss.

Reduction of land pressure on forests and other natural ecosystems would reduce the risk of extinction for many species by avoiding further loss of habitat and creating conditions for more habitat to be restored. It will preserve and enhance sources of income and nutrition for people who depend on living forest ecosystems. Many cultural connections with forest species and landscapes will be protected, along with benefits to health and well-being. Broader benefits to society at local, regional and global scales will flow from maintenance of the role of natural ecosystems in harbouring pollinator species, supporting air and water quality as well as in moderating climate change through capture and storage of carbon.

Key components of the transition

ADOPT INTEGRATED APPROACHES TO LAND USE AND LAND-USE CHANGE. This entails: coherent policies on agriculture, forestry, and on rural, urban and infrastructure development, and comprehensive spatial planning, applying the ecosystem approach or landscape approach,[6] with strong community engagement and supported by land tenure, data and monitoring; investing in research and development to improve the productivity, sustainability and integration of agricultural, pastoral and forestry systems;[7] developing and implementing legislation or policy frameworks on land use, land-use change and spatial planning, including, as appropriate, limits on deforestation or land-use change, requirements for minimum areas under native vegetation, or for no-net-loss or net gain of biodiversity;[8] and strengthening monitoring and enforcement of legal requirements domestically and through supply chains.[9]

CONSERVE BIODIVERSITY through protected areas and other effective area-based measures,[10] ensuring protection of the most intact ecosystems and the most important sites for biodiversity and ecosystem services, and the full involvement of indigenous peoples and local communities (Box 22.3).



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RESTORE AND REHABILITATE ECOSYSTEMS,[11] including converted and degraded natural and seminatural ecosystems, giving priority to contributions to conserving biodiversity, enhancing the provision of ecosystem services, mitigating and adapting to the effects of climate change, recovering connectivity, improving ecosystem resilience, combating desertification and land degradation, and improving human well-being, including the reintroduction of keystone species and rewilding of ecosystems where appropriate (Box 22.4).[12] Ensure the full involvement of indigenous peoples and local communities in the development and implementation of restoration activities.[13]

MANAGE LANDSCAPES to balance needs for the conservation and restoration of biodiversity, production of food, timber and other needs, the provision of ecosystem services and urban and rural development, promoting ecological connectivity, and enhancing biodiversity in agricultural and urban landscapes.[14] (see Agriculture, Freshwater, Cities and Infrastructure, and Climate Action transitions)

Progress towards the transition

In a number of countries, food security has improved while forest cover has increased or remained stable. The UN Food and Agriculture Organization (FAO) identified 22 countries in which this has occurred since 1990, 12 of which showed forest cover increases of more than 10%, including Chile, Costa Rica, The Gambia, Georgia, Ghana, Tunisia and Viet Nam. Common factors in these countries include increased productivity in the agricultural sector, provision of finance and technical support, secure land tenure, stakeholder involvement and reform of forest and agricultural policies, recognizing the value of forests for society and promoting policy coherence.[15] A number of other countries have demonstrated significant reductions in forest loss (see Aichi Biodiversity Target 5) and many have invested in protected areas (see Aichi Biodiversity Target 11)

and ecosystem restoration (see Aichi Biodiversity Target 15).

Countries employ a range of approaches and tools for spatial planning. Some, including Germany[16] and South Africa,[17] have developed comprehensive national planning frameworks that integrate biodiversity. Many countries have biodiversity offset and 'no net loss' policies and programmes in place, among them Brazil, Cameroon, Guinea, Madagascar, Mexico and Mongolia. A recent assessment of such policies identified more then 12,000 offset projects covering more than 15 million hectares across 37 countries.[18] China has developed a series of 'red lines',

Box 22.3. Protected areas

Protected areas and other effective area-based conservation measures, if well sited and designed, and managed effectively and equitably, remain essential measures to conserve biodiversity.[19] Conservation objectives may prioritize areas of high biodiversity, high irreplaceability, large intact landscapes with a high degree of ecological integrity and/or highly vulnerable areas under immense threat from human pressure.[20] All are important, but require different, or complementary, approaches.

Estimates of recommended percentage targets for area-based conservation range from 10% to 100%, depending on the taxa and landscapes analysed.[21] For example, 85% of plant species could be represented with around one-third of Earth's land surface protected,[22] while providing adequate coverage for all terrestrial mammals would require approximately 60% of non-Antarctic land area.[23] Covering all currently-identified Alliance for Zero Extinction sites[24] and other Key Biodiversity Areas,[25] hotspots of range rarity, and other areas with a high density of threatened species from the IUCN Red List, would require just 2.4% additional to the current terrestrial protected area coverage.[26] However, for maintaining ecological functions and supporting nature's contributions to people (for example carbon sequestration and provision of fresh water), much more area would be needed.[27] One modelling study showed that implementing current international targets for biodiversity, climate change, forests and land degradation would imply protection of 28% of the terrestrial area, as well as restoration.[28] Many recent proposals converge on protecting about 30% of the land surface by 2030, with the possibility of higher targets established subsequently.[29] However, the importance of focussing on biodiversity outcomes rather than spatial area, including through ecological connectivity, has been emphasized.[30]

Remaining wilderness areas cover approximately 23% of non-Antarctic terrestrial areas,[31] but significant declines (more than 3 million square kilometres) have occurred over the last two decades (see Aichi Biodiversity Target 5).[32] However, formal protected area status or active conservation action may not be necessary to maintain ecological integrity in all wilderness areas or in all intact areas.[33] It should also be noted that indigenous peoples have rights to and/or manage an estimated 30 million square kilometres of land that falls outside reported protected areas, accounting for a significant portion of Earth's remaining natural lands.[34]

delimiting areas to safeguard (Box 11.1).[35] Mexico's new Law on Sustainable Forestry established limits to the agricultural frontier.[36] Brazil's Forest Code (the Law on the Protection of Native Vegetation) has since the 1960s mandated the protection of minimum areas of native vegetation in rural properties, ranging from 80% in the Amazon forest biome to 20% in other biomes, and including environmentally-sensitive areas such as river banks and steep slopes. A nationwide register of all rural properties has been established to record such areas. Brazil has also developed a National Plan for the Restoration of Native Vegetation.[37]

Some linkages with other transitions

AGRICULTURE: *depends* on reducing land pressure on ecosystems through avoiding further expansion of cropland; *contributes to* ecological processes essential for agriculture

CITIES AND INFRASTRUCTURE: *depends on* reducing land pressure on ecosystems through improved planning of urban expansion and infrastructure development; *contributes to* ecosystem services essential to urban populations

CLIMATE ACTION: *depends on* reducing land pressure from land-based climate mitigation; *contributes to* carbon sequestration through conserving and restoring high-carbon ecosystems, as well as increasing resilience and safeguarding ecosystem services from climate impacts

FRESHWATER: *depends on* reducing land pressure from large hydropower schemes and other water infrastructure development; *contributes to* water purification and supply

ONE HEALTH: *contributes to* reduction of disease risk through maintaining healthy ecosystems

Box 22.4. Potential for ecosystem restoration

Extensive ecosystem restoration, including the restoration of lands previously converted to agriculture as well as the restoration of degraded ecosystems, is central to conserving biodiversity and stabilizing the Earth's climate, and the United Nations has declared 2021-2030 as the UN Decade on Ecosystem Restoration.

A new analysis of restoration opportunities[38] shows that restoring 15% of converted lands across multiple biomes could reduce extinction debts (predicted future extinction based on current pressures) by about 60%, while sequestering up to 300 GtCO2. Most of these benefits could be realized while maintaining or increasing agricultural production in each country, through progress in closing crop and livestock yield gaps.

Good spatial planning is essential, in order to optimize outcomes for biodiversity and climate change objectives at reasonable cost. The analysis demonstrates the importance of international cooperation to support restoration in the places that will generate the largest environmental benefits.

THE SUSTAINABLE FRESHWATER TRANSITION

Summary of the transition

An integrated approach guaranteeing the water flows required by nature and people, improving water quality, protecting critical habitats, controlling invasive species and safeguarding connectivity to allow the recovery of freshwater systems from mountains to coasts. This transition recognizes the importance of biodiversity in maintaining the multiple roles of freshwater ecosystems to support human societies and natural processes, including linkages with terrestrial, coastal and marine environments.

Rationale and Benefits

Freshwater ecosystems host a significant diversity of life. Covering less than 1% of Earth's surface, these habitats are home to approximately one third of vertebrate species and 10% of all species[1], and provide ecosystem services to billions of people. Moreover, freshwater systems integrate terrestrial ecosystems, and their river basins or catchments, with coastal, and ultimately marine ecosystems. For example, coral reefs are impacted by activities on land, mediated by freshwater and groundwater systems.[2] The exploitation of freshwater resources for agricultural, industrial and domestic consumption has taken place with little regard to freshwater ecosystems and the services they provide.[3] Coastal areas, wetlands and other areas near river courses, have been particularly subject to conversion or development. As a result, the current rate of wetland loss is three times that of forest loss[4] with an estimated 30% of natural freshwater ecosystems disappearing since 1970, and 87% of inland wetlands since 1700 (see Aichi Biodiversity Target 5).[5] Populations of freshwater vertebrate species have declined at more than twice the rate of land or ocean vertebrates[6] (see Aichi Biodiversity Target 12). An estimated 1.8 billion people are likely to live under conditions of regional water stress by 2050.[7] Many inland water and coastal ecosystems are threatened by eutrophication due to excess run-off of soil and nutrients from terrestrial areas, especially from agricultural areas and degraded ecosystems (see Aichi Biodiversity Target 8). Safeguarding freshwater ecosystems and the services they provide for nature and humanity is therefore an urgent challenge.[8]

Key components of the transition[9]

INTEGRATE ENVIRONMENTAL FLOWS[10] INTO WATER MANAGEMENT POLICY AND PRACTICE. This requires communication, stakeholder participation, awareness-raising, adaptive management and demonstration of the benefits of flows for people and nature.[11] The flows of water and nutrients are important in maintaining the overall health of the ecosystem, and many species depend on connectivity for their migration and reproduction.[12] Environmental flows provide tools to coordinate upstream-downstream water allocations to maintain healthy ecosystems, while taking socio-economic and cultural objectives into consideration. Applying environmental flows in practice, policy and law allows a society to build the knowledge, capacities and institutions needed to implement integrated water resource management, and to adapt to climate change.

COMBAT POLLUTION AND IMPROVE WATER QUALITY. This needs to be done at the source to protect public health and the environment, and to increase water availability[13], including through wastewater treatment and re-use, regulation of polluting industries, market-based solutions,


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improved agricultural practices especially with regard to fertilizer use, manure management and erosion control, integrated river-basin management and nature-based solutions such as floodplain and coastal wetland restoration and riparian buffer zones.[14]

PREVENT OVEREXPLOITATION OF FRESHWATER SPECIES, through improved biological assessments, science-based management and development of freshwater fisheries action plans as described in the 2016 Rome Declaration;[15] and by preventing bycatch through identifying and using the temporal and spatial differences between target species and bycatch, and by mandating reporting on bycatch.[16]

PREVENT AND CONTROL INVASIVE ALIEN SPECIES IN FRESHWATER ECOSYSTEMS to eliminate their impacts on native populations. This can be done by identifying and regulating major introduction pathways such as trade and ballast water transfers, as well as through the removal of existing invasive alien species.

PROTECT AND RESTORE CRITICAL HABITATS. This can be done through the establishment of protected areas, land-use planning and habitat restoration programs,[17] all requiring stakeholder engagement to identify synergies and resolve trade-offs between biodiversity goals and other priorities, thereby improving the outcomes for biodiversity and ecosystem services, and making them more resilient to future conditions;[18] and by addressing threats from riverine sand and gravel mining, including through lifting demand-side pressures by using recycled materials for construction, avoiding over-design and improving the supply chain process (see Land and Forests and Cities and Infrastructure transitions).

Progress towards the transition

While overall progress on more sustainable policies and practices relating to freshwater ecosystems has remained low, innovative approaches in this direction have been successfully implemented in different contexts and regions across the world,

demonstrating the feasibility of such actions and providing guidance on scalability and replicability. For example, in South Africa environmental flows have been incorporated into water-related legislation, implemented through legally-mandated catchment management agencies.[19] A similar policy is followed in Mexico, where a water reserves programme aims to preserve sufficient water supplies for millions of people taking environmental flows into account, resulting in sustainable water allocation limits for 189 rivers.[20] Bulgaria has adopted a National Action Plan for Conservation of Wetlands of High Significance comprised of cross-cutting and specific measures including the restoration of water regimes and wetlands, provisions to control poaching and invasive alien species, improvements in data and monitoring and education, and support for climate change adaptation and to limit pollution, nutrient runoff and eutrophication.[21] In Germany, through the federal Blue Belt Programme, federal waters and riparian zones are being re-naturalized, and a greater emphasis is being placed on nature conservation, water protection, flood prevention and tourism, recreational sport and leisure activities.[22] In Kenya, a Presidential Task force was created to oversee interventions to achieve Blue Economy objectives, including the development and implementation of sub-catchment management plans to assist local communities in protecting wetlands, lakes, and other water catchment areas.[23]

Some linkages with other transitions

LAND AND FORESTS: *depends on* well-preserved terrestrial ecosystems to regulate water purification and supply; *contributes to* reducing land pressure from large hydropower schemes and water infrastructure development

AGRICULTURE: *depends on* more sustainable agricultural practices to reduce water abstraction and pollution

FOOD: *contributes to* nutritious and lower-impact diets through provision of sustainably-harvested freshwater fish and other biodiversity

FISHERIES AND OCEANS: *contributes to* healthy coastal and marine ecosystems through transport of nutrients and sediments, reduced pollution and conservation of migratory fish species; *depends on* sustainable marine harvest of fish that spawn in freshwater environments.

CITIES AND INFRASTRUCTURE: *depends on* reduced water consumption in urban areas, controlled urban expansion and use of green infrastructure; *contributes to* supply and quality of water for urban populations

CLIMATE ACTION: *depends on* sustainable climate change mitigation to maintain freshwater ecosystems including through snow and ice melt, and avoiding further fragmentation of rivers from large dams; *contributes to* climate change mitigation through carbon storage in wetlands, and to adaptation through ecosystem resilience

ONE HEALTH: *contributes to* physical and mental health by safeguarding clean water supplies and maintaining freshwater environments important for leisure, cultural and spiritual activities.

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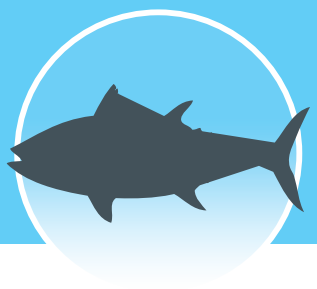

THE SUSTAINABLE FISHERIES AND OCEANS TRANSITION

Summary of the transition:

Protecting and restoring marine and coastal ecosystems, rebuilding fisheries and managing aquaculture and other uses of the oceans to ensure sustainability, and to enhance food security and livelihoods. This transition recognizes the long-term dependency of marine food supplies and other benefits from the oceans on healthy ecosystems.

Rationale and benefits

Marine ecosystems are central to human well-being and the future of biodiversity. Marine fisheries provide food and livelihood security for many, and mariculture is rapidly expanding.[1] The ocean absorbs carbon dioxide and heat, thereby reducing climate change.[2] It is increasingly a source of material, energy and genetic resources, and a dump for unwanted waste[3] and excess nutrients. The ocean also supports global trade through shipping. Human activities impact marine biodiversity through overexploitation,[4] ocean acidification and sea temperature increase,[5] habitat change and degradation, pollution, noise and spread of invasive alien species. Such impacts threaten many species, damage habitats and the functioning of the Earth System, jeopardizing the continued provision of ecosystem services.

To protect biodiversity, and to support people's livelihoods and the emerging 'blue economy', there is a clear need to rebuild fisheries, improve the management of fishing fleets,[6] and to improve the management and planning of all marine activities in an integrated manner, applying the ecosystem approach.[7] Future scenarios show that, with policy reform, many marine fisheries stocks could be rebuilt over approximately one decade although some stocks would take longer to rebuild. Such measures would provide greater long-term catch with increased profits, but involve short-term catch reductions (Figure 22.4).[8] Rebuilding would benefit not only the species targeted, but also all levels of the food webs of which they are part. This includes, for example, marine mammals and other large ocean-going predators, seabirds and terrestrial or freshwater animals that depend on migrating fish.[9] Special attention will be needed to restore coral reefs and related ecosystems, as well as other vulnerable ecosystems.[10]

Key components of the transition[12]

PROMOTE MARINE SPATIAL PLANNING and integrated management of marine and coastal development and marine activities, in line with the ecosystem approach,[13] employing biodiversity-inclusive environmental assessment.[14]

SUSTAINABLY MANAGE AND REBUILD FISHERIES,[15] investing in robust stock assessments, fishery management plans with catch, gear and seasonal limits, as appropriate, and effective enforcement, redirecting subsidies away from capacity-enhancement,[16] addressing illegal, unreported and unregulated fishing,[17] improving the sustainability of distant water fleets, taking into account climate change,[18] and prioritizing the livelihood and nutritional needs of those most dependent on fisheries,[19] including gender considerations.

ENSURE THE SUSTAINABILITY OF MARICULTURE PRODUCTION, applying One Health and ecosystem approaches.[20]

PROTECT CRITICAL HABITATS such as key biodiversity areas, vulnerable marine areas and ecologically and biologically significant areas, taking into account the need to protect genetic resources,[21]

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and climate change.[22] Establish marine protected areas and enhance management effectiveness of existing as well as new marine protected areas, ensuring adequate human capacity and budget, and clear boundaries.[23] Area-based fishery management measures may complement marine protected areas. These may include no-take areas, prohibition of specific gears in certain areas, and, most commonly, regulation of fishing effort or catch by area. Such areas, which reduce negative impacts on biodiversity with only minimally-reduced profits, may arguably be considered as other effective area-based conservation measures (OECMs).[24]

REDUCE POLLUTION, addressing land and sea-based sources of excess nutrients and plastic waste.[25]

CONTROL INVASIVE SPECIES SPREAD via marine pathways, including through ballast water, hull fouling and use of species in aquaculture.

Progress towards the transition

There has been substantial expansion of marine protected areas during the last decade (see Aichi Biodiversity Target 11) and a number of countries, such as Canada, have designated other effective area-based conservation measures (OECMs) in the marine realm.[26] There has also been progress in the development of marine spatial planning. For example, the island of Barbuda, Belgium and the Seychelles have developed or are developing marine spatial plans for the entire areas under their jurisdiction.[27] Ecologically and biologically significant marine areas (EBSAs), described under the Convention, have been recognized through the national plans of Angola and Namibia.[28]

Despite the overall negative trends globally, there are signs of the rebuilding of previously-depleted stocks in marine fisheries that have improved fisheries management,[29] addressed illegal, unreported and unregulated fishing,[30] or introduced reforms of fisheries policy (see Aichi Biodiversity Target 6, especially Figure 6.3).[31] For example, in Indonesia, The Gambia and Liberia, bold action has been taken to crack down on illegal fishing by fleets from distant countries, resulting in a reduction of fishing pressure with benefits for local fishing livelihoods (Box 6.1).[32] More generally, most Exclusive Economic Zones (EEZs) appear to be respected, with unauthorized foreign fishing more than 80% lower in areas just inside EEZs compared to areas just outside them.[33] China has recently introduced measures to improve transparency, sustainability and compliance with international norms in the operation of its large distant-water fleet.[34] The development of vessel monitoring systems and lists of offending vessels has improved the tracking of fishing operations. A number of international agreements on fisheries and the ocean have recently come into force, including the Port State Measures Agreement to address illegal, unreported and unregulated fishing,[35] and the International Convention for the Control and Management of Ships' Ballast Water and Sediments, aimed at reducing the risk

from spread of invasive alien species through shipping.[36] Regulations on aquaculture and on deep sea mining are also under development.

Some linkages with other transitions

AGRICULTURE: *depends on* reduced pollution from agricultural run-off

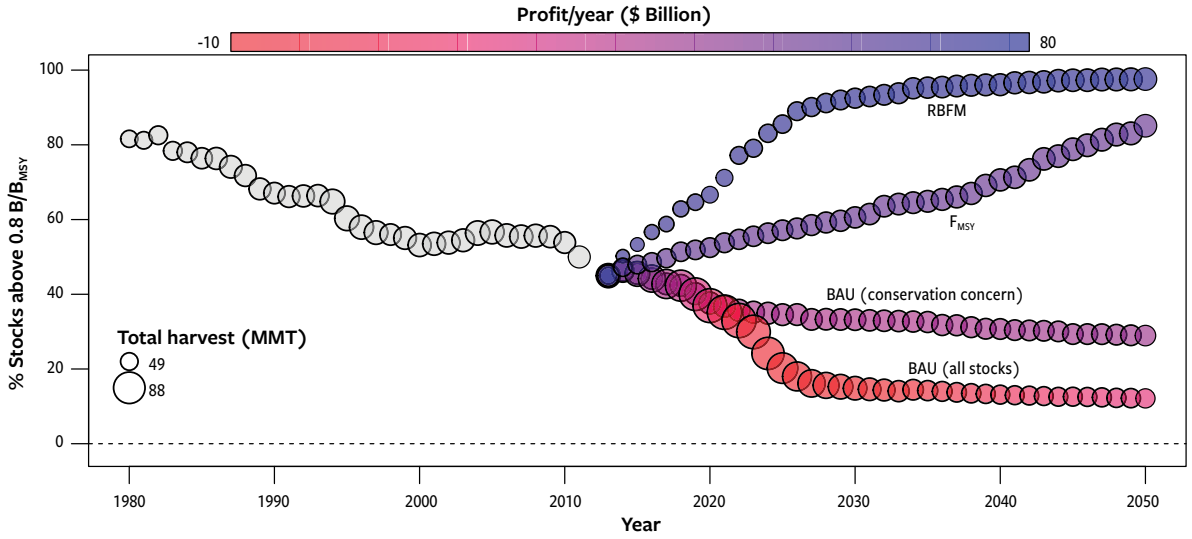
FOOD: *contributes to* nutrition for healthy and sustainable diets through ensuring long-term supplies of fish from well-functioning marine ecosystems

FRESHWATER: *depends on* transport of nutrients and sediments, reduced pollution from rivers and conservation of migratory fish in their freshwater life stages; *contributes to* conservation of fish that spawn in freshwater environments

CLIMATE ACTION: *depends on* sustainable climate change mitigation to reduce ocean acidification and impacts of warmer sea temperatures; *contributes to* climate change mitigation through sequestration of 'blue carbon', as well as resilience of both marine ecosystems and livelihoods to climate change impacts

ONE HEALTH: *contributes to* human health through sustaining fish-based protein and oils in diets, and to a One Health approach through sustainable mariculture production

Figure 22.4. Timing of projected recovery of marine fishery stocks under alternative scenarios.



The projections are shown for two scenarios for fisheries reforms (RBFM: full reform policy based on rights-based fishery measures aimed at achieving maximum economic yield, and FMSY: limited reform policy aimed at achieving maximum sustainable yield) compared to 'business as usual' (BAU) under two assumptions (BAU (all stocks: assuming that all stocks are subject to increased fishing pressure, and BAU(conservation concern: assuming that overexploited and fully exploited stocks are subject to increased fishing pressure.) The proportion of stocks above a threshold biomass level is indicated on the y axis. The size of the circles is proportional to the total harvest (Note the 'lean years' during the first years of the RBFM scenario). The profitability is shown in shades of colour from unprofitable (red) to profitable (blue). (Figure reproduced from Christopher Costello et al. (2016) PNAS 113, 5125-5129).[36]

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THE SUSTAINABLE AGRICULTURE TRANSITION

Summary of the transition

Redesigning agricultural systems through agroecological and other innovative approaches to enhance productivity while minimizing negative impacts on biodiversity. This transition recognizes the role of biodiversity, including pollinators, pest and disease control organisms, soil biodiversity and genetic diversity, as well as diversity in the landscape, for productive and resilient agriculture that makes efficient use of land, water and other resources.

Rationale and benefits

Currently, land-use change from the expansion of agriculture is the largest driver of biodiversity loss.[1] Many agricultural practices, such as tillage, fertilizer use and pesticide use as well as the overuse of antibiotics in livestock also tend to reduce biodiversity.[2]

On the other hand, enhanced biodiversity in agricultural ecosystems would contribute both to the sustainability and to productivity of agriculture.[3] For example, food production is stabilized by diversity among[4] and within[5] crops. The diversity and abundance of pollinators is associated with improved yields and nutritional quality of crops dependent on animal pollination.[6] Biodiversity among crops and livestock, as well as among arthropods and other species in agricultural ecosystems including soil biodiversity, reduces the incidence of pests and diseases.[7] Systems that integrate multiple crops, livestock, fish and trees on farms, can further promote productivity and sustainability through synergistic interactions.[8]

Increasing the productivity and sustainability of agriculture is an essential element of reducing and reversing biodiversity decline (see Pathways).[9] 'Sustainable intensification' comprises a range of methods to achieve these objectives,[10] by improving the efficiency of use of land and inputs of water, fertilizers and pesticides, including though genetic improvements to crops and livestock, substituting external inputs, and designing or redesigning systems based on agroecological principles.[11] A range of alternative terms are in use, and the latter approaches are sometimes termed ecological intensification or agroecology.[12] Besides technological improvements,[13] these approaches may also include changes in regulatory systems, incentives and markets, and in the roles and relationships of farmers, consumers, businesses, civil society and government.[14] To ensure that food systems are fully sustainable, these approaches need to be accompanied by changes in demand (see Food Systems transition).[15]

Increasing the productivity and sustainability of agriculture can reduce pressure on forests and other biodiverse ecosystems and, with the appropriate policy measures in place, allow space for increased conservation and restoration activities (see Land and Forests transition).[16] It can also improve the resilience of agricultural systems, locally and globally, and contribute to climate change mitigation and adaptation (see Climate Action transition).[17] More sustainable agriculture can also provide habitats for biodiversity,[18] improve connectivity to prevent isolation of species, and support the health and well-being of people through a cleaner, more diverse and resilient rural environment (see One Health transition).[19]

Key components of the transition[20]

PROMOTE INTEGRATED PEST AND DISEASE MANAGEMENT. This entails management of crop and integrated agroecosystems including, as appropriate, biological control agents (introduction

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of natural enemies, predators or parasites), replacement of pesticides with non-toxic alternatives, eliminating or reducing the use of pesticides and antibiotics.

ENHANCE MANAGEMENT OF LAND AND WATER by promoting soil biodiversity through minimal tillage, avoiding pesticides and excess fertilizers including through conservation agriculture or organic agriculture,[21] promoting efficient use of fertilizers,[22] and promoting efficient irrigation water management.

INTEGRATE SYSTEMS OF CROPS, LIVESTOCK, FISH AND/OR TREE PRODUCTION for productivity and ecological benefits, for example through mixed crop and forage systems, improved grazing management, and aquaculture integrated into farming systems; and ensuring animal health and welfare.

MAINTAIN BIODIVERSITY in agricultural ecosystems by promoting diversity within and among crop plants, livestock, fish and trees on farms[23] and through conservation and breeding programmes, protect pollinators[24] and natural enemies of pests, enhance soil biodiversity.

PROMOTE ON-FARM LEARNING AND RESEARCH, through farmer networks, farmer field schools, participatory plant breeding and research, supported by investment in research and extension services.

IMPROVE CONNECTIONS BETWEEN FARMERS AND CONSUMERS, through local markets, information and transparency of supply chains, including certification.

PROVIDE AN ENABLING ENVIRONMENT by taking into account the environmental, health and social externalities of agriculture and food systems (both positive and negative), promoting policies and redirect subsidies and incentives to support sustainable agricultural practices that enhance biodiversity.

Progress towards the transition

Globally, areas of cropland continue to grow, as do the use of pesticides and other agrochemicals; although the rate of use per area of these inputs has stabilized in most regions, rates remain high (see Aichi Target 8). Biodiversity in farmed landscapes continues to decline (see Aichi Biodiversity Target 7). A number of 'lock-ins' to industrialized agricultural models have been identified.[25]

Nevertheless, there are many initiatives, led by farmers, scientists, businesses, governments, intergovernmental organizations, and public interest groups, separately and in combination, seeking to achieve a sustainable interaction between agriculture and biodiversity.[26] These variously emphasize the role of technologies, management, enabling conditions, agency and equity.[27] For example, as noted in the summary of progress towards Aichi Biodiversity Target 7, a 2018 study estimated that 29 per cent of all farms worldwide, covering nine per cent of agricultural land in more than 100 countries, had substituted or redesigned some part of their agricultural production in ways that could be defined as sustainable intensification.[28] While still involving a minority of farm enterprises and a small portion of land under cultivation, this suggests a critical mass of global agriculture is already moving in a direction that can significantly improve outcomes for biodiversity, as well as supporting broader goals for sustainable development.

Some linkages with other transitions

FOOD SYSTEMS: *contributes to* more diverse and nutritious diets; *depends on* reduced production needs due to lower demand for meat and avoided waste

LAND AND FORESTS: *contributes to* reducing land pressure on ecosystems through avoiding expansion of cropland; *depends on* ecological processes essential for agriculture

FRESHWATER: *contributes to* reduced water abstraction and pollution

CLIMATE ACTION: *contributes to* reduced greenhouse gas emissions through reduced tillage, improved manure management and other measures

ONE HEALTH: *contributes to* reduced negative health impacts from pesticide pollution and overuse of antibiotics in livestock, among other unsustainable practices

Photo by Sunyu Kim on Unsplash

THE SUSTAINABLE FOOD SYSTEMS TRANSITION

Summary of the transition

Enabling sustainable and healthy diets with a greater emphasis on a diversity of foods, mostly plant-based, and more moderate consumption of meat and fish, as well as dramatic cuts in the waste involved in food supply and consumption. This transition recognizes the potential nutritional benefits from diverse foods and food systems, and the need to reduce demand-driven pressures globally while ensuring food security in all its dimensions.

Rationale and Benefits

The global food system is associated with many drivers of biodiversity loss, in particular through land-use change, the impacts of excess nutrients and the generation of greenhouse gases (see Climate Action transition).[1] At the same time, close to 750 million people – nearly one in ten people in the world – suffer severe levels of food insecurity and many more are malnourished. Levels of food insecurity and malnourishment, as well as obesity, are projected to continue to increase if current trends are maintained.[2] Shifting to diets that are healthier and more sustainable[3] could simultaneously help to improve human health, reducing diet-related premature mortality by over 90%, and reduce and help reverse the drivers of biodiversity loss (see Pathways).[4]

More specifically, a dietary pattern higher in plant-based foods (for example vegetables, fruits, legumes, seeds, nuts and whole grains) and lower in animal-based foods (especially red meat) is both healthier (see One Health transition) and gives rise to lower greenhouse gas emissions and land-use change compared to existing diets (see Climate Action and Land and Forests transitions).[5] It should be noted, however, that the shift would not apply equally in all regions, for example reductions in meat consumption in a number of countries in the Americas, and increases in some countries in Africa, may both help to improve health and nutrition.[6] Additionally, for each type of food there are large variations in the environmental impacts of production according to geography and production methods.[7] While limiting total meat production globally is necessary to reduce and reverse biodiversity loss, livestock production may be sustainable and appropriate in some ecosystems (see Agriculture transition).[8] Impacts on biodiversity are largely affected by the spatial distribution of production, and thus spatial planning and patterns of trade could help to optimize production to reduce negative impacts.[9] A final consideration is that not all healthy diets are sustainable, and not all diets designed for sustainability are always healthy.[10]

Healthy diets are underpinned by biodiversity: a diversity of species, varieties and breeds, as well as wild sources (fish, plants, bushmeat, insects and fungi) provide a range of nutrients.[11] For example, variety-specific differences within staple crops can often be the difference between nutrient adequacy and nutrient deficiency in populations and individuals.[12] Wildlife, from aquatic and terrestrial ecosystems, is a critical source of calories, protein and micronutrients such as iron and zinc for more than a billion people. Fish provides more than three billion people with important sources of protein, vitamins and minerals.[13] In addition, biodiversity is essential in food production systems.[14] Pollinator-dependent food products, encompassing many fruit, vegetable, seed, nut and oil crops, supply major proportions of micronutrients, vitamins and minerals, and are thus important contributors to healthy human diets and nutrition.[15]

A number of traditional diets can be important models of healthy and sustainable diets – for example the Mediterranean diet, the traditional

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Japanese diet, and the traditional diets of many indigenous peoples.[16] However, in general urbanization and globalization is driving trends towards unhealthy and unsustainable diets.[17]

Currently, some 30% of food produced is not consumed, either because it does not reach the markets and rots (the predominant cause of losses in developing countries), or because it is not eaten and is thrown away (the predominant cause of losses in developed countries).[18] Reducing food losses and waste would bring substantial benefits with few negative trade-offs.

Impacts of food systems are often experienced in countries far from where the food is consumed, due to the increased globalization of food supply chains.[19] Food supply chains also have significant impacts on biodiversity, ecosystem services and climate through sourcing, transport and processing.[20]

Healthy diets are unaffordable to many people, costing on average five times more than diets that meet only dietary energy needs.[21] At the same time, cheap food has many hidden costs for health, the environment and the economy, and current food systems show a number of 'lock-ins' or path dependency.[22]

Key components of the transition

Healthy and sustainable diets and reduced waste can be promoted through a number of measures, as summarized below.[23] These measures may be more effective in combination.[24] Given that social norms, especially within peer groups, are more important in changing behaviour than knowledge of health and environmental benefits, social movements are also important to effect change.[25]

REBALANCE AGRICULTURAL POLICIES AND INCENTIVES towards more nutrition-sensitive investment and policy actions all along the food supply chain, to reduce food losses and enhance efficiencies at all stages.

PROMOTE THE AVAILABILITY OF HEALTHY AND SUSTAINABLE DIETS. This entails realignment of producer subsidies and adjustment of agricultural policies towards production practices that are sustainable, more nutrition-sensitive and improve animal welfare (see Sustainable Agriculture Transition); promoting sustainable food supply chains to reduce food losses and enhance efficiencies at all stages; and adjusting trade policy to promote sustainability.

PROMOTE ACCESS TO HEALTHY AND SUSTAINABLE DIETS including through: realignment of consumer subsidies, and adjustments in pricing and tax policy; income support and social protection programmes to increase the purchasing power and affordability of healthy diets by the most vulnerable populations; improving food markets, particularly for fresh fruits and vegetables and especially in disadvantaged areas; public procurement and school meals programmes; and requirements to offer healthy and sustainable choices in food outlets.

PROMOTE THE CONSUMPTION OF HEALTHY AND SUSTAINABLE DIETS, including through official public information campaigns and social media, food standards, labelling requirements for health and environmental impacts, advertising guidelines or rules, product placing, public procurement, and updating and promotion of food-based dietary guidelines in line with the latest health advice while taking into account sustainability criteria.

PROMOTE MEASURES TO REDUCE FOOD WASTE, including through public information campaigns, changes in labelling of 'best before' dates, regulation or incentives for companies to report on food loss and waste. Improvements in technology and infrastructure, particularly in relation to the harvesting, storing and transportation of food would also help to reduce waste.

ENCOURAGE BUSINESSES TO PROMOTE SUSTAINABILITY THROUGH SUPPLY CHAINS AND TO REDESIGN PRODUCT PORTFOLIOS based on human and planetary health.

Progress towards the transition

Awareness of the negative impacts of unsustainable food demand is growing rapidly in many countries. Options for healthy food choices with reduced meat content, vegetarian or vegan ingredients have become much more mainstream and available to consumers in response to this awareness. The impact of food waste is also increasingly recognized, generating innovative solutions to prevent unnecessary purchase of food that will be discarded or allowed to spoil, and campaigns to prevent waste of food that remains unsold due to cosmetic imperfections. Some countries have adopted ambitious policies to cut food waste. In Norway, for example, five ministries and twelve food industry organizations signed a binding agreement to halve food

waste across the food value chain by 2030. Between 2010 and 2016, food waste in Norway was reduced by 14%.[26]

The dietary guidelines developed by many countries promote recommendations for healthy diets, many of which, if widely applied, would reduce environmental impacts.[27] For example, the official guidelines of Brazil, Sweden and Qatar recommend consumption of more fruits and vegetables and less meat, particularly red meat.[28] China's 2017 Guidelines strongly advise the selection of fish, poultry and eggs as a source of protein over red meats, emphasize seasonal vegetables and fruits, which are more likely to be grown locally, and discourage food waste as one of their core recommendations, noting that "frugality is a virtue in Chinese culture".[29]

Some linkages with other transitions

AGRICULTURE: *contributes to* reduced production needs through lower demand for meat and avoided waste, and thus indirectly to the Land and Forest, Climate Action and Freshwater transitions; *depends on* more diverse and nutritious diets from sustainable agriculture

CITIES AND INFRASTRUCTURE: *depends on* a new urbanization vision, including more sustainable supply chains and reduced food waste measures, and innovations such as urban gardens and city farms

FISHERIES AND OCEANS: *depends on* sustainable fishing and healthy marine ecosystems to provide the seafood content of healthy diets

FRESHWATER: *depends on* healthy freshwater ecosystems to provide nutrition derived from freshwater fish and other biodiversity in inland waters

ONE HEALTH: *contributes to* improved nutrition, thus reinforcing the connections between biodiversity and health

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THE SUSTAINABLE CITIES AND INFRASTRUCTURE TRANSITION

Summary of the Transition

Deploying 'green infrastructure' [1] and making space for nature within built landscapes to improve the health and quality of life for citizens and to reduce the environmental footprint of cities and infrastructure. This transition recognizes the dependency of urban communities on well-functioning ecosystems to sustain the human population, the majority of which is living in cities, the teleconnections between cities and nearby and distant ecosystems, and the importance of spatial planning to reduce the negative impacts on biodiversity of urban expansion, roads and other infrastructure.

Rationale and benefits

While the rate of population growth is slower than at any time since 1950, world population is expected to grow to around 8.5 billion by 2030 and 9.7 billion by 2050,[2] with the proportion residing in urban areas increasing from 55% in 2018 to 68% by 2050.[3] While almost half of the people living in urban environments live in towns or cities with fewer than 500,000 people, there are currently 33 cities with more than 10 million inhabitants (megacities). By 2030 the number of megacities is expected to reach 43, with most of these being in developing regions.[4] Growing urban populations and the associated need for infrastructure will place increasing demands on resources, and constitute an important driver of land-use change. The status of biodiversity, and the prospects for reaching the 2030 Agenda for Sustainable Development more generally, will depend in large part on how these demands are managed.[5] Moreover, the increasing trend towards urbanization risks separating people further from nature, with potential negative effects on human health and reduced understanding of biodiversity, the ecosystem services it provides and their importance.

Sustainable management of cities and urbanization can help to reduce the impacts of growing population on biodiversity, while also helping to contribute to other societal challenges including human health (see One Health transition). Green spaces in urban areas can help to improve mental health.[6] Access to green spaces also increases opportunities for physical activity which may reduce the risk of several noncommunicable diseases, as well as improved immune function.[7] The critical importance of urban nature in providing resilience in time of crisis has been demonstrated by the COVID-19 pandemic, during which access to green spaces has been an important factor in supporting health and well-being while people observe social distancing requirements.[8]

'Nature-based solutions' to climate change mitigation and adaptation are especially valuable in cities where they can address multiple urban challenges simultaneously, including flooding, heat stress, drought and pollution of air and water, as well as reconnecting people with nature (see Sustainable Climate Action transition).[9] Maintaining and encouraging food production within urban and peri-urban areas can both improve the resilience of urban populations, and benefit biodiversity by reducing the pressure for further conversion of distant ecosystems to cropland to feed growing urban populations (see Food and Land and Forests transitions).[10]

The rapid development of infrastructure beyond cities, especially roads, represents a substantial impediment to meeting goals for biodiversity in the coming decades. The number and extent of roads is forecast to expand dramatically with 25 million kilometres of new roads anticipated by

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2050, a 60% increase in the total length of roads since 2010. Around 90% of all road construction is expected to occur in developing countries, including in many of the last wilderness areas such as those in the Amazon, New Guinea, Siberia and the Congo Basin.[11] New roads create multiple threats in high biodiversity areas, including fragmentation of habitat, opportunity for land colonization, and the conditions for increased hunting and other forms of over-exploitation, as well as introduction of invasive alien species. Among many other impacts, the world's remaining populations of apes in equatorial Africa and Asia are especially vulnerable to the expansion in roads and other infrastructure including railways, hydroelectric dams, power lines, gas lines and mining.[12] A major global driver of infrastructure development across Asia, Europe and Africa, China's $6 trillion Belt and Road Initiative, presents many risks for biodiversity and new cooperative modes of governance will be needed to mitigate these. However, currently there are few safeguards for biodiversity in the lending requirements applied by the institutions providing finance for the initiative.[13] Widespread application of additional measures to minimize the impacts to biodiversity from infrastructure development will therefore be among the transitions required to achieve the 2050 Vision for Biodiversity.

Key components of the transition

PROMOTE LOCAL-LEVEL URBAN GOVERNANCE AND TRANSDISCIPLINARY PLANNING, accounting for biodiversity among other societal needs when decisions are made on urban development, preventing urban expansion from compromising ecosystems both within and outside cities on which people and biodiversity depend, including forests, watersheds and flood plains.

MAKE GREATER USE OF GREEN INFRASTRUCTURE, such as preservation and creation of green spaces and wetlands, to support multiple needs of urban populations as well as to promote urban biodiversity.

TAKE ACCOUNT OF THE FOOTPRINT OF CITIES ON ECOSYSTEMS IN DISTANT LOCATIONS through encouraging healthier diets, more sustainable use of materials in construction and minimizing energy use.

REFLECT BIODIVERSITY CONSIDERATIONS IN THE PLANNING AND DEVELOPMENT OF INFRASTRUCTURE INVESTMENTS, such as the design and management of transportation systems, and other linear infrastructure, through processes such as biodiversity-inclusive environmental assessments and large-scale zoning to avoid the most vulnerable areas for biodiversity, and application of measures to preserve ecological connectivity, for example through overpasses, underpasses and green infrastructure.

Progress towards the transition

Numerous networks and initiatives have emerged in recent years to promote a transition towards more sustainable models of urbanization. At a global level, the United Nations Conference on Housing and Sustainable Urban Development adopted the New Urban Agenda in 2016, subsequently endorsed by the UN General Assembly. The agenda envisions, among other things, cities and human settlements that 'protect, conserve, restore and promote their ecosystems, water, natural habitats and biodiversity, minimize their environmental impact and change to sustainable consumption and production patterns'.[14]While overall application of this agenda in urban planning has been limited, examples of initiatives supporting its principles include: a programme in Australia aiming to plant 20 million trees to establish green corridors and urban forests to re-establish native vegetation, provide native habitat for threatened species, sequester carbon and improve the liveability of cities and towns;[15] efforts in the Republic of Korea to build a green network through developing urban forests including 'meditation forests', school forests and tree-lined streets;[16] inclusion of urban biodiversity as a new thematic focus in the Philippines national biodiversity strategy, recognizing that 65% of the country's population is expected to live in cities by 2050;[17] and the designation of special green conservation areas under Japan's Urban Green Space Conservation Act, promoting the conservation, restoration, creation and management of green spaces.[18]

Some linkages with other transitions

LAND AND FORESTS: *depends on* services from protected or restored ecosystems, essential to urban populations; *contributes to* reducing land pressure on ecosystems through improved planning of urban expansion and infrastructure development

FOOD: *contributes to* more sustainable food supply chains and reduced food waste, through a new urbanization agenda that also includes innovations such as urban gardens and city farms

FRESHWATER: *depends on* sustainable management of freshwater ecosystems for urban water supply and quality; *contributes to* the conservation and restoration of freshwater ecosystems through reduced water consumption, controlled urban expansion and use of green infrastructure

CLIMATE ACTION: *contributes to* climate mitigation through use of green infrastructure, and to climate adaptation by increasing resilience among urban populations.

ONE HEALTH: *contributes to* mental and physical health through greater access to urban green spaces, and by reducing pollution

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THE SUSTAINABLE CLIMATE ACTION TRANSITION

Summary of the Transition

Employing nature-based solutions, alongside a rapid phase-out of fossil fuel use, to reduce the scale and impacts of climate change, while providing positive benefits for biodiversity and other sustainable development goals. This transition recognizes the role of biodiversity in sustaining the capacity of the biosphere to mitigate climate change through carbon storage and sequestration and in enabling adaptation through resilient ecosystems, as well as the need to promote renewable energy while avoiding negative impacts on biodiversity.

Rationale and benefits

Climate change and biodiversity loss are inseparable threats to humankind and must be addressed together.[1] Climate change is already impacting biodiversity and is projected to have progressively greater impacts,[2] with significantly greater risks to natural and human systems in a world warming to 2 degrees C above pre-industrial temperatures, compared to 1.5 degrees C above pre-industrial temperatures.[3] Climate change will likely become the largest driver of biodiversity loss in the second half of this century.[4] Thus, effective climate action is a prerequisite to slowing and reversing biodiversity loss.[5] Moreover, climate change impacts undermine ecosystem resilience and thus weaken the contribution of ecosystems to both mitigation and adaptation of climate change.[6] The large-scale use of certain forms of renewable energy, may, in some cases, further exacerbate these risks.[7] The aim of this transition is to move from this vicious cycle to a virtuous one whereby ecosystem-based approaches (or 'nature-based solutions'[8]), alongside strong action to reduce greenhouse gas emissions from fossil fuels, contribute to efforts to keep climate change close to 1.5 degrees C, thereby also ensuring the long term resilience and sustained contributions of ecosystems to both mitigation and adaptation to climate change.

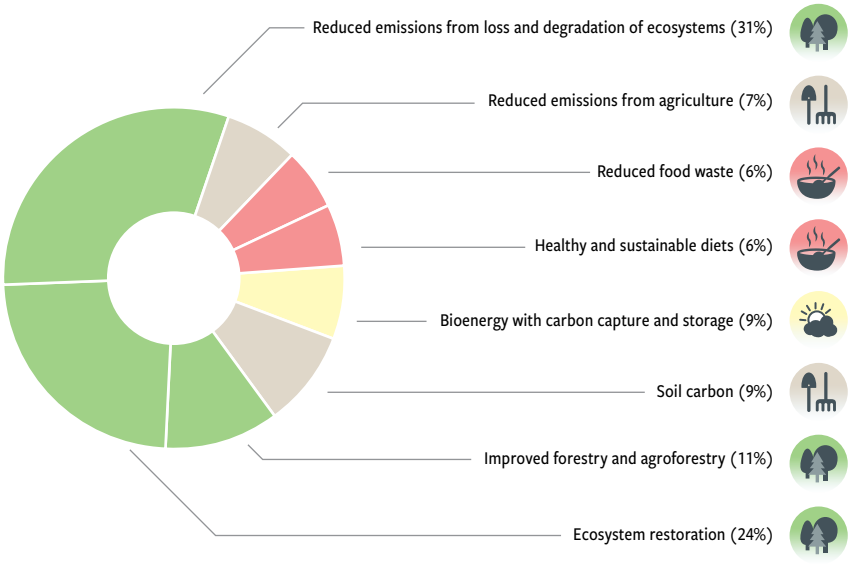
A number of studies indicate that such 'nature-based solutions' could provide about one third of the total net emission reduction effort required to keep climate change close to 1.5 degrees C (Figure 22.5). With appropriate safeguards,[9] they could also enhance a wide range of ecosystem services, including water filtration, flood and coastal protection and soil health, as well as contributing to the conservation and sustainable use of biodiversity.

However, there are four important caveats to the use of 'nature-based solutions'. Firstly, while they are an essential part of the solution, the climate problem cannot be solved without stringent reductions in the use of fossil fuels.[10] Secondly, the distributional impacts must be considered, and indigenous peoples and local communities must be fully involved in the development and implementation of land-based approaches.[11] Thirdly, while many ecosystem-based approaches have co-benefits for biodiversity, this is not always the case, and careful assessment of synergies and trade-offs is required.[12] In particular, tree planting is not always appropriate, especially non-native species in monoculture plantations.[13] Fourthly, it is important to conserve and restore the role of species and genetic diversity in addition to ecosystem extent (Box 22.5).

The phase-out of fossil fuels requires the development of alternative, renewable energy sources, as well as improved energy efficiency. Inevitably, renewable energy as well as some adaptation measures, have potential impacts on biodiversity.[14] Therefore, another essential part of the climate action transition is to manage this development to minimize any such negative impacts.

Photo by Annie Spratt on Unsplash

Figure 22.5. Priority measures to help to achieve the 1.5 degree C temperature goal of the Paris Agreement by transforming the land sector and deploying measures in food systems, agriculture, forestry, wetlands and bioenergy.



A 'top-down' review of modelled pathways combined with 'bottom up' assessments of specific proposed mitigation measures suggests that a series of mitigation "wedges" could feasibly and sustainably contribute net reductions of about 15 billion tonnes of carbon dioxide equivalent (GtCO2e) per year, i.e. about 30% of the global mitigation needed by 2050 to deliver on the 1.5 degree C target.[15] The measures are related to interventions under other transitions featured in GBO-5, as indicated by the icons.

Key components of the transition

CONSERVE AND RESTORE ECOSYSTEMS. Contribute to climate change mitigation and adaptation through conservation and restoration of ecosystems, especially old-growth forests, peatlands, wetlands, seagrass and other high-carbon ecosystems, as well as ecosystems such as mangroves important for ecosystem-based adaptation and disaster risk reduction. This can be achieved through protected areas, other effective area-based conservation measures (OECMs), REDD+ programmes; and by promoting restoration including through natural regeneration, also addressing soil carbon (see Land and Forests transition).[16]

REDUCE EMISSIONS FROM AGRICULTURE AND FORESTRY: Reduce methane (CH_4) and nitrogen dioxide (N_2O) emissions from enteric fermentation, nutrient management, synthetic fertilizer production, water and residue management of rice fields, and manure management. Promote soil carbon sequestration through use of larger root plants, cover cropping, reduced tillage, avoiding over-use of chemical fertilizers and pesticides, erosion control and restoration of degraded soils, among other measures. Enhance forestry practices (rotation lengths, reduced-impact logging, fire management), agroforestry and silvi-pasture systems in agricultural and grazing lands (see Agriculture transition).

REDUCE EMISSIONS FROM FOOD CONSUMPTION. Reduce production of greenhouse gas-intensive foods through public health policies, consumer campaigns, and the development of new foods. Reduce food waste, through consumer campaigns, private sector policies, supply-chain transparency, improved food labelling, and recycling, for example through waste-to-biogas schemes. Reduce food loss, by improved handling and storage practices through training, investment and technology. Promote deforestation-free supply chains (see Food Systems transition).[17]

PROMOTE SUSTAINABLE RENEWABLE ENERGY. Deploy biomass crops only at appropriate scales and with appropriate zoning and safeguards to avoid or minimize negative effects on biodiversity and greenhouse gas emissions through direct and indirect land-use change.[18] Ensure that hydropower and wind power projects are sited, designed and managed to minimize ecological impacts and maximize benefits.[19] Promote recycling of materials to reduce the mined metals required for large-scale battery storage and energy transmission, and minimize the negative impacts of mining operations, including deep sea mining.[20]

MAKE USE OF 'GREEN INFRASTRUCTURE'. Promote 'green infrastructure' to support ecosystem-based adaptation and disaster risk reduction, including the use of vegetation in urban areas to reduce heat island effects and flood risks (see Cities and Infrastructure transition).[21]

Such approaches could be further integrated in countries' nationally-determined contributions (NDCs) under the UNFCCC Paris Agreement. For example, in half of tropical countries, cost-effective ecosystem-based approaches could mitigate over half of national emissions.[22] Noting the employment generation potential of such approaches, there is scope for such approaches to be supported through social assistance programmes,[23] as well as through international finance (see Aichi Biodiversity Target 20, Box 20.2).

Progress towards the Transition

Progress towards Aichi Biodiversity 15, as summarized in Part II, is relevant to this transition. As noted in that summary, many of the NDCs under the Paris Agreement also contribute to biodiversity

Box 22.5. Biodiversity and climate mitigation and adaptation

'Nature-based solutions' often focus on the extent of ecosystems and habitats, but the conservation of species and genetic diversity is important for mitigation and adaptation:

- Plant species diversity, including tree diversity in forests, enhances productivity and carbon storage by terrestrial ecosystems.[24]
- Animals also make substantial contributions to ecosystem carbon sequestration through seed dispersal and trophic interactions such as herbivory or predation in forests.[25]
- In the oceans, whales play an important role in supporting phytoplankton production through fertilization and in carbon sequestration.[26]
- Genetic diversity of both plant and animal species is also important for ecosystem dynamics.[27]
- The conservation and restoration of genetic and species diversity in crops, livestock and trees can make major contributions to climate adaptation strategies.[28]

objectives.[29] 75% percent of NDCs contain forest-related targets, including restoration activities. However, most commitments made under both Conventions have yet to be implemented.

In some countries, employment generation or social assistance programmes contribute to relevant activities. For example, in Ethiopia, the Productive Safety Nets Programme supports reforestation and land restoration.[30] In India, the Mahatma Gandhi National Rural Employment Guarantee Act enhances livelihood security in rural areas by creating employment and is one of the biggest social security schemes of the world. Most of the employment generation activities through the scheme relate to restoration, rehabilitation and conservation of natural resources.[31]

Some linkages with other transitions

LANDS AND FORESTS: *depends on* conservation and restoration of high-carbon ecosystems, to enhance carbon sequestration and increase resilience to climate change; *contributes to* reducing land-use change from some forms of land-based climate change mitigation

AGRICULTURE: *depends on* reduced greenhouse gas emissions through reduced tillage, improved manure management and other measures

FOOD: *depends on* shifts towards more diverse and healthy diets, and reduced food waste, through indirect benefits to climate change mitigation via sustainable agriculture and reduced land pressure on forests and other ecosystems.

CITIES AND INFRASTRUCTURE: *depends on* climate change mitigation provided by use of green infrastructure, and resilience to climate change provided by more sustainable urban environments

FRESHWATER: *depends on* climate change mitigation through carbon storage in wetlands, and on climate resilience provided by healthy freshwater ecosystems

THE BIODIVERSITY-INCLUSIVE ONE HEALTH TRANSITION

Summary of the transition

Managing ecosystems, including agricultural and urban ecosystems, as well as the use of wildlife, through an integrated approach, to promote healthy ecosystems and healthy people. This transition recognizes the full range of linkages between biodiversity and all aspects of human health, and addresses the common drivers of biodiversity loss, disease risk and ill-health.

Rationale and background

The links between biodiversity and human health are varied, and occur at various spatial and temporal scales. At a planetary scale, ecosystems and biodiversity play a critical role in determining the state of the Earth System, regulating its material and energy flows, and its responses to abrupt and gradual change.[1] Ecosystems, including food production systems, depend on a great diversity of organisms: primary producers, herbivores, carnivores, decomposers, pollinators, and pathogens. Services provided by ecosystems include food, clean air, and both the quantity and quality of fresh water, medicines, spiritual and cultural values, climate regulation, pest and disease regulation, and disaster risk reduction – each of which has a fundamental influence on human health, both mental and physical.[2] At a more intimate level, the human microbiota – the symbiotic microbial communities present in the gut, respiratory and urogenital tracts and on skin – contribute to nutrition, can help regulate the immune system and prevent infections.[3] Biodiversity is thus a key environmental determinant of human health, and the conservation and sustainable use of biodiversity can benefit human health by maintaining ecosystem services and options for the future.[4]

The COVID-19 pandemic has further highlighted the importance of the relationship between people and nature. While the relationship between biodiversity and infectious disease is complex (Box 22.6), it is clear that the loss and degradation of biodiversity undermines the web of life and increases the risk of disease spillover from wildlife to people. Responses to the current pandemic provide a unique opportunity for transformative change as a global community.[5]

Outbreaks of zoonotic diseases are increasing over time.[6] The risk of future pandemics could be reduced through a more integrated, cross-sectoral and inclusive One Health[7] approach that builds the health and resilience of people and the planet, both contributing to and benefitting from, the 2030 Agenda for Sustainable Development.

There are significant strategic opportunities to integrate the full range of biodiversity-health interlinkages[8] in the application of One Health approaches in a more systematic, comprehensive and coordinated manner. This would not only promote a sustainable, healthy and just recovery from the COVID-19 pandemic[9] but would also serve broader health objectives beyond the simple absence of diseases, entail a greater focus on prevention, and strengthen the resilience of social, ecological and economic systems. Such an approach would address the common drivers of biodiversity loss, climate change, ill-health and increased pandemic risk. Ultimately, these aims would need to be supported by fundamental shifts in political economy, accountability and governance.[10]

Essential principles of a biodiversity-inclusive approach to One Health[11] are that it should: consider all dimensions of health and human well-being; enhance resilience of socio-ecological systems to prioritize prevention; apply the ecosystem approach;[12] be participatory and inclusive; be cross-sectoral, multinational, and transdisciplinary; operate across spatial and temporal scales; and promote social justice and gender equality.

Photo by b-hide the scene on Shutterstock

Box 22.6. Biodiversity and emerging infectious diseases.[13]

Approximately two-thirds of known human infectious diseases are shared with animals, and the majority of recently-emerging diseases are associated with wildlife. Vector-borne diseases also account for a large share of endemic diseases. Higher biodiversity may be expected to increase the *hazard* of emerging infectious diseases, because host diversity (for example of wild mammals) is correlated with the diversity of pathogens (organisms that cause disease). However, this relationship is not necessarily predictive of disease *risk* since some event is needed to convert a hazard into a risk of pathogen emergence. Such *risk factors* include encroachment into natural habitats and contact with wildlife. Also, paradoxically, greater host diversity may actually decrease risk of zoonotic pathogen spillover by reducing the prevalence of pathogens among a diversity of host species (though this is not always the case). Thus, efforts to minimize biodiversity loss can also reduce disease risk, mostly by reducing contact between humans and wildlife and limiting introduction of exotic species, even if these efforts maintain areas of high disease hazard through the diversity of pathogens.

Encroachment of human activities into, and destruction of, ecosystems increase the risk of emergence and spread of zoonotic diseases.[14] In particular, deforestation, the degradation and fragmentation of habitats, and the unsustainable expansion of agriculture bring humans and livestock into closer contact with wildlife.[15] Wildlife persisting in human-modified landscapes are more likely to harbour disease.[16]

The health burden of infectious diseases is not limited to humans and domestic species: infectious diseases pose a threat to biodiversity conservation as well. Pathogen spillover can occur from one wild species to another, potentially causing an outbreak if the species or population is susceptible to the pathogen, especially when weakened by other human-induced pressures. For example, Ebola virus has also been recognized as causing severe declines in great ape populations, including the Critically Endangered western lowland gorilla.[17]

One infectious disease - chytrid fungal disease - has contributed to the decline of over 500 amphibian species (6.5% of all described amphibian species), 90 of which are presumed extinct, making *Batrachochytrium dendrobatidis*[18] the most destructive invasive species on record, spread mainly through trade in amphibians.[19] Other important wildlife pathogens are white-nose syndrome (*Pseudogymnoascus destructans*) in bats and West Nile virus (*Flavivirus sp.*) in birds.

Key components of the transition[20]

REDUCE DISEASE RISK BY CONSERVING AND RESTORING ECOSYSTEMS. Halt or reduce deforestation and degradation of terrestrial, freshwater, coastal and marine aquatic ecosystems; reduce overexploitation; halt or reduce encroachment into natural habitats; increase protection of areas of importance for biodiversity and ecosystem services, especially intact or near-intact areas and potential hotspots of disease emergence; subject major developments to integrated health and environmental impact assessments; plan urbanization and linear infrastructure to avoid impacting these areas and to reduce fragmentation (see Land and Forests and Cities and Infrastructure transitions).

PROMOTE SUSTAINABLE, LEGAL AND SAFE USE OF WILDLIFE. Reduce overall harvest, trade and use of wildlife while protecting customary sustainable use by indigenous peoples and local communities;[21] combat illegal wildlife trade and restrict trade in endangered species; phase out or ban the trade of high risk species (for example primates, bats, mustelids); regulate wildlife farms, limiting wild-caught animals, avoiding high-risk species and improving animal welfare and veterinary care; improve markets, improving hygiene including for slaughter, avoiding mixing species (also with livestock); improve biosecurity of wildlife trade and control of all potential pathways for invasive alien species; improve routine disease surveillance.

PROMOTE SUSTAINABLE AND SAFE AGRICULTURE, INCLUDING CROP AND LIVESTOCK PRODUCTION AND AQUACULTURE. Reform livestock production, decreasing hyper-intensive lots and improving their biosecurity, integrating livestock and crop production; promote silvo-pastoral, agroecological and other innovative approaches to sustainability; manage aquaculture sustainably;[22] maintain and use genetic diversity; reduce overall extent of pasturelands, while protecting rights of pastoralists including nomadic groups; improve animal welfare, and reduce and regulate live animal trade; end non-essential use of antibiotics as well as pesticides, fertilizers and other nutrient inputs; enhance the microbiomes of soils, plants and animals (see Agriculture transition).

CREATE HEALTHY CITIES AND LANDSCAPES. Promote integrated land use planning to meet multiple needs for biodiversity conservation and the provision of ecosystem services to support human well-being, including the provision of clean water and nutritious food, and disaster risk reduction; provide equitable access to quality green and blue spaces to improve physical, physiological and mental health; use strategic integrated health and environment assessments to maximize benefits and minimize risks of interaction with nature; identify hotspots of high risk of disease emergence; monitor wildlife for high-risk pathogens, especially where there is a large diversity of viral strains in wildlife with significant potential for spillover to people, and monitor people who have contact with wildlife to identify early spillover events (See Land and Forests, Cities and Infrastructure transitions).[23]

PROMOTE HEALTHY DIETS AS A COMPONENT OF SUSTAINABLE CONSUMPTION.[24] Promote safe and nutritious foods from diverse crops, livestock and wild sources; lower overall meat consumption, particularly red meat consumption among high meat consumption societies, reducing overconsumption, reducing waste, and reducing luxury consumption of exotic wild species; reduce overall overconsumption and waste of natural resources, raising awareness and promoting behaviour change to support a transition toward healthy and sustainable diets and food safety measures (See Food Systems transition).

These actions are mutually supportive, and also support the 2030 Agenda for Sustainable

Development, including the goals relating to health, equity, and ensuring gender equality. They are underpinned by respect for human rights, including the rights of indigenous peoples, local communities and small farmers;[25] and supported by protecting and reforming, as appropriate, tenure of land and resources, equitable access to resources by poor and marginalized communities, and universal health care.

To be effective, these actions need to be implemented by countries individually and collectively. Cross-sectoral coordination and alignment will be key to success, by exploring synergies, tradeoffs and feedbacks across the full range of issues (beyond a focus on animal and human health alone). Investment is needed to enable proactive assessment, monitoring and surveillance and early warning systems that enable health systems to anticipate, prepare for and respond to public health threats resulting from ecosystem change and to reduce and address risks of disease emergence.

While substantial funding will be needed for effective implementation of a biodiversity-inclusive One Health transition, it would be a small fraction of the costs of the COVID-19 pandemic alone.[26] There is a major opportunity to integrate funding for the One Health transition within COVID-19 stimulus and recovery programmes.

Progress towards the transition

To date, the One Health approach has been applied mainly to address issues of food safety, the control of zoonoses, and combatting antibiotic resistance, all of which remain important issues. This includes, for example, formalized collaboration between the WHO, OIE and FAO, as well as the World Bank, and a number of countries are applying a One Health approach to these issues. China has taken action to address risks from wildlife consumption for food and related trade.[27] The PREDICT project is one effort to identify where future zoonotic outbreaks could occur by examining samples from a large variety of vertebrate animals that could serve as reservoirs of human infectious with the goal of identifying where future zoonotic outbreaks could occur.[28]

There is also growing awareness and actions to address threats to human health and to biodiversity in integrated ways.[29] This includes issues related to water quality, waste management, pollution, and climate change. Further, the relationship between human physical and mental health and access to nature and green spaces is increasingly recognized and considered in issues related to urban planning and design (see Cities and Infrastructure transition). However, overall considerably less attention has been paid through One Health approaches to broader aspects of human health beyond control of disease.[30]

Some linkages with other transitions

LAND AND FORESTS: *depends on* maintaining healthy ecosystems to reduce disease risk

AGRICULTURE: *depends on* reduced health impacts from pesticide pollution and overuse of antibiotics in livestock, among other unsustainable practices

FOOD SYSTEMS: *depends on* the adoption of more nutritious, sustainable diets to improve health

FRESHWATER: *depends on* healthy and biodiverse freshwater ecosystems to maintain physical and mental health through provision of clean water as well as environments important for leisure, cultural and spiritual activities

CITIES AND INFRASTRUCTURE: *depends on* greater access to urban green spaces to improve mental and physical health, and on improved planning to avoid increased disease risk from infrastructure development in high-biodiversity areas

ACHIEVING TRANSFORMATIVE CHANGE

The analysis of steps required to achieve transitions in individual areas of activity, described in the previous sections, reveals two approaches that meet multiple objectives in the overall effort to bring about transformative change. They include making use of biodiversity in 'nature-based solutions' or through 'green infrastructure' in urban, agricultural and natural landscapes and seascapes to help provide the transitions needed to reduce climate change, improve health and food security, restore biodiversity itself and achieve sustainable development. This approach also supports the second approach: reducing the drivers of biodiversity loss through reduced total consumption and more efficient use of resources, thereby helping to create the conditions that allow biodiversity to continue to provide benefits for people and the planet. This reinforces the argument made in Section I of this Outlook that, rather than being an obstacle that needs to be balanced with the needs of socio-economic development, biodiversity is foundational to sustainable development.

An effective approach to sustainability involves better understanding the common factors that can influence fundamental changes in institutions, governance, values and behaviour, essential to bringing about the transitions described in this Outlook. The IPBES Global Assessment has identified eight priority points for intervention, or leverage points, with five associated 'levers' that may be applied by leaders in government, business, civil society and academia to spark transformative changes towards a more just and sustainable world.[1] The transitions in the individual areas of activity highlighted in this Outlook illustrate the relevance of these leverage points (Table 22.1)and the application of the levers (Table 22.2). It may be noted that most of these levers are reflected among the principles and guidance of the Ecosystem Approach under the Convention.[2]

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Table 22.1. Leverage points for transformative change, and their relation to the transitions.

LEVERAGE POINTS	RELATIONSHIP TO TRANSITIONS
Visions of a good quality of life	Visions of a good quality of life are central to the whole effort of achieving transformative change. Visions that give importance to relational notions of a good quality of life, including of humans with nature, may, in part, reflect the 2050 Vision of 'living in harmony with nature' and contribute to a decoupling of excess consumption and wellbeing.
Total consumption and waste	Lowering total consumption and waste is essential to the overall approach of 'bending the curve' of biodiversity loss as elucidated by the pathways described earlier in this Outlook. This leverage point is also directly addressed through the Food Systems Transition which entails, among other things, in reducing overconsumption generally, and of meat in particular, and of food waste.
Values and social norms	Unleashing of values is employed in the Food Systems transition, for example, by building social peer-pressure to promote healthy and sustainable diets, and in the Fisheries and Oceans transitions by mobilizing public concern about the impact of plastic pollution on marine ecosystems
Inequality	Addressing inequality is employed in the Food Systems transition, for example, by improving the affordability of healthy and sustainable diets and access to them.
Justice and inclusion	Ensuring justice, respect for human rights and inclusion of indigenous peoples and local communities in decision making is vital to all the transitions, particularly those taking place in landscapes and seascapes (Land and Forests; Freshwater; Fisheries and Ocean) where competing, and sometimes contested, demands on territories and resources for conservation, restoration, production and development are inevitable.
Externalities and tele-coupling	Exposing and internalizing hidden externalities and understanding tele-coupling between places and actors that are separated in space is necessary to achieve sustainability in all areas of transition, notably for Cities and Infrastructure in relation to Food Systems and Sustainable Agriculture, where consumption by urban populations is often inevitably separated from sites of production, and the associated generation of waste.
Technology, innovation and investment	Technology, innovation and investment are key for many transitions, notably Sustainable Agriculture, where support for innovation by farmers, for example, is key to all dimensions of sustainability.
Education and access to, generation and sharing of knowledge	Education and access to, generation and sharing of knowledge including formal science and indigenous peoples and traditional knowledge Needs to be strengthened to advance transitions in many of the areas, including Sustainable Agriculture, Climate Action, Freshwater and biodiversity-inclusive One Health.

Table 22.2. Levers for transformative change, and their relation to the transitions. The five levers of transformational change are applicable to each of the eight leverage points identified in Table 22.1, and all are relevant to most, if not all, of the transition areas.

LEVERS	RELATIONSHIP TO TRANSITIONS
Developing incentives and widespread capacity for environmental responsibility and eliminating perverse incentives	Necessary element of efforts to reform fisheries, agriculture and water management and to ensure that resources are in place to achieve restoration and support nature-based solutions for sustainable climate action.
Reforming sectoral and segmented decision-making to promote integration across sectors and jurisdictions	Defining feature of the biodiversity inclusive One Health Transition, and also essential to enable integrated planning and management of cities, infrastructure, landscapes, seascapes and water resources.
Taking pre-emptive and precautionary actions in regulatory and management institutions and businesses to avoid, mitigate and remedy the deterioration of nature, and monitoring their outcomes	Central to the purpose of the One Health Transition, but are also relevant to all of the other transition areas, as part of the rationale for conservation action, especially taking account of the risk of approaching thresholds or tipping points which precipitate rapid loss of biodiversity and ecosystem services.
Managing for resilient social and ecological systems in the face of uncertainty and complexity to deliver decisions that are robust in a wide range of scenarios	Especially relevant to the investment in 'green infrastructure' and 'nature-based solutions', as a strategy for maintaining multiple ecosystem services and building resilience into ecosystems and societies.
Strengthening environmental laws and policies and their implementation, and the rule of law more generally	Important in the context of efforts to combat illegal, unreported and unregulated fishing and the illegal wildlife trade, and also to ensure that infrastructure development complies with environmental assessments and their findings.

Another key element in the development of pathways for living in harmony with nature will be the evolution of global financial and economic systems towards a globally sustainable economy, steering away from the current limited paradigm of economic growth.[3]

Finding solutions that address all the varying values we attach to nature is challenging, but the potential rewards are great. As nations evaluate options on how to recover from the COVID-19 pandemic, there is a unique opportunity to initiate the transformative changes needed to achieve the 2050 Vision of living in harmony with nature. Such actions would put biodiversity on a path to recovery, reduce the risk of future pandemics, and produce multiple additional benefits for people.

ENDNOTES

Part I. Introduction

1. These also include the Agreement on Port State Measures to Prevent, Deter and Eliminate Illegal, Unreported and Unregulated Fishing (see Part II, Aichi Target 8), the Minamata Convention on Mercury (see Part II, Aichi Target 8), and the International Convention for the Control and Management of Ships' Ballast Water and Sediments (see Part II, Aichi Target 9).
2. Secretariat of the Convention on Biological Diversity (2010) Global Biodiversity Outlook 3. Montréal, 94 pages; available at https://www.cbd.int/gbo3/
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6. Convention on Biological Diversity. (2015). CBD/SBSTTA/19/INF/9. Links between the Aichi Biodiversity Targets and the 2030 Agenda for Sustainable Development. https://www.cbd.int/doc/meetings/sbstta/sbstta-19/information/sbstta-19-inf-09-en.pdf provides an analysis of the links between the Aichi Biodiversity Targets and the relevant targets from the 2030 Agenda for Sustainable Development. Comments are provided describing the relation and noting overlaps, gaps and differences in scope where relevant. Convention on Biological Diversity (2017) CBD/SBSTTA/21/2/Add.1. Biodiversity and the 2030 Agenda for Sustainable Development. https://www.cbd.int/doc/meetings/sbstta/sbstta-21/official/sbstta-21-02-add1-en.pdf, in table 1, lists some gaps and inconsistencies between some elements of the targets under the SDGs and the corresponding Aichi Biodiversity Targets. For example, there is no specific reference to the role of traditional knowledge in the 2030 Agenda. This document also lists the SDG targets derived from the Aichi Biodiversity Targets that have a target date of 2020.
7. For ease of readability the phrasing in this figure has been shortened. The complete text of the Strategic Plan for Biodiversity 2011-2020 is available in decision X/2. https://www.cbd.int/decision/cop/?id=12268
8. IPBES (2019): Summary for policymakers of the global assessment report on biodiversity and ecosystem services of the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services. S. Díaz, J. Settele, E. S. Brondízio E.S., H. T. Ngo, M. Guèze, J. Agard, A. Arneth, P. Balvanera, K. A. Brauman, S. H. M. Butchart, K. M. A. Chan, L. A. Garibaldi, K. Ichii, J. Liu, S. M. Subramanian, G. F. Midgley, P. Miloslavich, Z. Molnár, D. Obura, A. Pfaff, S. Polasky, A. Purvis, J. Razzaque, B. Reyers, R. Roy Chowdhury, Y. J. Shin, I. J. Visseren-Hamakers, K. J. Willis, and C. N. Zayas (eds.). IPBES secretariat, Bonn, Germany. 56 pages. https://doi.org/10.5281/zenodo.3553579. The IPBES Global Assessment in its Chapter 3 provides a detailed assessment of how trends in nature and its contributions to people affect the ability to achieve particular SDGs.
9. IPBES (2016). The assessment report of the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services on pollinators, pollination and food production. S.G. Potts, V. L. Imperatriz-Fonseca, and H. T. Ngo (eds). Secretariat of the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services, Bonn, Germany. 552 pages. https://ipbes.net/assessment-reports/pollinators
10. IPBES (2019): Summary for policymakers of the global assessment report on biodiversity and ecosystem services of the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services. S. Díaz, J. Settele, E. S. Brondízio E.S., et al (eds.). IPBES secretariat, Bonn, Germany. 56 pages. https://doi.org/10.5281/zenodo.3553579. The IPBES Global Assessment in its Chapter 3 provides a detailed assessment of how trends in nature and its contributions to people affect the ability to achieve particular SDGs.
11. KC, S. and Lutz, W. (2017). The human core of the shared socioeconomic pathways: Population scenarios by age, sex and level of education for all countries to 2100. Global Environmental Change 42, 181–192. https://doi.org/10.1016/j.gloenvcha.2014.06.004; Vollset et al (2020) Fertility, mortality, migration, and population scenarios for 195 countries and territories from 2017 to 2100: a forecasting analysis for the Global Burden of Disease Study, Lancet Published Online, July 14, 2020. https://doi.org/10.1016/S0140-6736(20)30677-2.
12. Based on Convention on Biological Diversity. (2015). CBD/SBSTTA/19/INF/9. Links between the Aichi Biodiversity Targets and the 2030 Agenda for Sustainable Development. https://www.cbd.int/doc/meetings/sbstta/sbstta-19/information/sbstta-19-inf-09-en.pdf.
13. Based on the assessment in Chapter 3 of IPBES (2019): Summary for policymakers of the global assessment report on biodiversity and ecosystem services of The Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services. S. Díaz, J. Settele, E. S. Brondízio E.S., H. T. Ngo, M. Guèze, J. Agard, A. Arneth, P. Balvanera, K. A. Brauman, S. H. M. Butchart, K. M. A. Chan, L. A. Garibaldi, K. Ichii, J. Liu, S. M. Subramanian, G. F. Midgley, P. Miloslavich, Z. Molnár, D. Obura, A. Pfaff, S. Polasky, A. Purvis, J. Razzaque, B. Reyers, R. Roy Chowdhury, Y. J. Shin, I. J. Visseren-Hamakers, K. J. Willis, and C. N. Zayas (eds.). IPBES secretariat, Bonn, Germany. 56 pages. https://doi.org/10.5281/zenodo.3553579. as well as Convention on Biological Diversity (2016). CBD/COP/13/10/Add.1, Biodiversity and Sustainable Development: Technical note. https://www.cbd.int/doc/meetings/cop/cop-13/official/cop-13-10-add1-en.pdf; Shultz et al (2017). "The 2030 Agenda and Ecosystems – a discussion paper on the links between the Aichi Biodiversity Targets and the Sustainable Development Goals". SwedBio at Stockholm Resilience Centre. http://tentera.org/wp/wp-content/uploads/2017/03/The-2030-Agenda-and-Ecosystems_web.pdf and Blicharska, Malgorzata & Smithers, Richard & Mikusiński, Grzegorz & Rönnbäck, Patrik & Harrison, Paula & Nilsson, Måns & Sutherland, William. (2019). Biodiversity's contributions to sustainable development (Nature Sustainability). 1-11. https://doi.org/10.1038/s41893-019-0417-9
14. Based on Convention on Biological Diversity (2017). CBD/SBSTTA/21/2/Add.1. Biodiversity and the 2030 Agenda for Sustainable Development. https://www.cbd.int/doc/meetings/sbstta/sbstta-21/official/sbstta-21-02-add1-en.pdf and Convention on Biological Diversity (2019). CBD/SBSTTA/23/2/Add.2. Informing the Scientific and Technical Evidence Base for the Post-2020 Global Biodiversity Framework. https://www.cbd.int/doc/c/a4f8/c003/69b60e0a66feb68824cb0485/sbstta-23-02-add2-en.pdf building upon the analysis in ICSU, 2017. A Guide to SDG Interactions: from Science to Implementation [D.J. Griggs, M. Nilsson, A. Stevance, D. McCollum (eds)]. International Council for Science, Paris. https://council.science/wp-content/uploads/2017/05/SDGs-Guide-to-Interactions.pdf. See also Griggs et al (2016) Policy: Map the interactions between Sustainable Development Goals. Nature. 534, 320-321. https://doi.org/10.1038/534320a.
15. UNFCCC (2015). Paris Agreement. https://unfccc.int/files/essential_background/convention/application/pdf/english_paris_agreement.pdf
16. IPCC, 2018: Summary for Policymakers. In: Global Warming of 1.5°C. An IPCC Special Report on the impacts of global warming of 1.5°C above pre-industrial levels and related global greenhouse gas emission pathways, in the context of strengthening the global response to the threat of climate change, sustainable development, and efforts to eradicate poverty [Masson-Delmotte, V., P. Zhai, H.-O. Pörtner, D. Roberts, J. Skea, P.R. Shukla, A. Pirani, W. Moufouma-Okia, C. Péan, R. Pidcock, S. Connors, J.B.R. Matthews, Y. Chen, X. Zhou, M.I. Gomis, E. Lonnoy, Maycock, M. Tignor, and T. Waterfield (eds.)]. World Meteorological Organization, Geneva, Switzerland, 32 pp. https://www.ipcc.ch/sr15/chapter/spm/b/spm2/
17. Key messages under each of these four headings, together with background information, is provided in the summary for policymakers of the assessment and in the Executive Summaries of each of the Chapters of the Assessment. These are available from https://www.ipbes.net/global-assessment-report-biodiversity-ecosystem-services.

Part II. Biodiversity in 2020

1. Aichi Biodiversity Target 16 and 17 had deadlines of 2015.
2. All of the national biodiversity strategies and action plans are accessible from https://www.cbd.int/nbsap/
3. All of the sixth national reports are accessible from https://www.cbd.int/reports/. The introduction of an online reporting tool enables interactive exploration of the reports submitted in this way, including an overview of progress towards national targets aligning with the global targets, through the Clearing House Mechanism of the CBD.
4. Convention on Biological Diversity (1992). Convention on Biological Diversity. https://www.cbd.int/doc/legal/cbd-en.pdf
5. Bhatt, R., Gill, M. J., Hamilton, H., Han, X., Linden, H. M., & Young, B. E. (2020). Uneven use of biodiversity indicators in 5th National Reports to the Convention on Biological Diversity. Environmental Conservation, 47(1), 15–21. https://doi.org/10.1017/S0376892919000365; Han, X., Gill, M. J., Hamilton, H., Vergara, S. G., & Young, B. E. (2020). Progress on national biodiversity indicator reporting and prospects for filling indicator gaps in Southeast Asia. Environmental and Sustainability Indicators, 5, 100017. https://doi.org/10.1016/j.indic.2019.100017; and Convention on Biological Diversity (2020). CBD/SBI/3/INF/2 - Analysis of the Use of Indicators in the 6th National Reports for the Secretariat of the Convention on Biological Diversity: Technical Report.
6. Except for minor changes in the phrasing of some target elements to improve readability and the use of sub-targets for Target 20.
7. The more specific national examples and case studies are occasionally supplemented by other literature where it is available. This is noted in the references.
8. Due to limited space not all relevant SDG targets are listed. Further the wording of some of the SDG targets has been shortened. Additional and a more detailed assessment of the links between the Aichi Biodiversity Targets and the 2030 Agenda for Sustainable Development and its associated targets is contained in documents Convention on Biological Diversity. (2015). CBD/SBSTTA/19/INF/9. Links between the Aichi Biodiversity Targets and the 2030 Agenda for Sustainable Development. https://www.cbd.int/doc/meetings/sbstta/sbstta-19/information/sbstta-19-inf-09-en.pdf, Convention on Biological Diversity (2017) CBD/SBSTTA/21/2/Add.1. Biodiversity and the 2030 Agenda for Sustainable Development. https://www.cbd.int/doc/meetings/sbstta/sbstta-21/official/sbstta-21-02-add1-en.pdf, Convention on Biological Diversity (2016). CBD/COP/13/10/Add.1, Biodiversity and Sustainable Development: Technical note. https://www.cbd.int/doc/meetings/cop/cop-13/official/cop-13-10-add1-en.pdf; Based on Convention on Biological Diversity (2017). CBD/SBSTTA/21/2/Add.1. Biodiversity and the 2030 Agenda for Sustainable Development. https://www.cbd.int/doc/meetings/sbstta/sbstta-21/official/sbstta-21-02-add1-en.pdf and Convention on Biological Diversity (2019). CBD/SBSTTA/23/2/Add.2. Informing the Scientific and Technical Evidence Base for the Post-2020 Global Biodiversity Framework. https://www.cbd.int/doc/c/a4f8/c003/69b60e0a66feb68824cb0485/sbstta-23-02-add2-en.pdf
9. Forest Peoples Programme, Secretariat of the Convention on Biological Diversity, International Indigenous Forum on Biodiversity, Indigenous Women's Biodiversity Network and Centres of Distinction on Indigenous and Local Knowledge (2020) Local Biodiversity Outlooks 2: The contributions of indigenous peoples and local communities to the implementation of the Strategic Plan for Biodiversity 2011–2020 and to renewing nature and cultures. A complement to the fifth edition of Global Biodiversity Outlook. Moreton-in-Marsh, England. https://localbiodiversityoutlooks.net/
10. See COP 10 Decision X/2. Strategic Plan for Biodiversity 2011-2020. https://www.cbd.int/decision/cop/?id=12268
11. Meetings since 2010 of the Conference of the Parties, and of the Subsidiary Body for Implementation and its precursor the Working Group on Review of Implementation of the Convention. Further information on the methodology used is contained in document Convention on Biological Diversity (2020). CBD/SBI/3/2/Add.2. Analysis of the contribution of targets established by parties and progress towards the Aichi Biodiversity Targets. https://www.cbd.int/doc/c/f1e4/ab2c/ff85fe53e210872a0ceffd26/sbi-03-02-add2-en.pdf. This analysis builds on earlier analyses contained in Convention on Biological Diversity (2016). UNEP/CBD/COP/13/8/Add.2/Rev.1. Updated analysis of the contribution of targets established by Parties and progress towards the Aichi Biodiversity Targets. https://www.cbd.int/doc/meetings/cop/cop-13/official/cop-13-08-add2-rev1-en.pdf; Convention on Biological Diversity (2018). CBD/SBI/2/2/Add.2. Analysis of the contribution of targets established by Parties and progress towards the Aichi Biodiversity Targets. https://www.cbd.int/doc/c/e24a/347c/a8b84521f326b90a198b1601/sbi-02-02-add2-en.pdf; and Convention on Biological Diversity (2018) CBD/COP/14/5/Add.2. Analysis of the contribution of targets established by Parties and progress towards the Aichi Biodiversity Targets. https://www.cbd.int/doc/c/7c28/274f/338c8e84ad6f03bf9636dcbf/cop-14-05-add2-en.pdf, which were prepared on the basis of information provided through the fifth national reports.

Target 1

1. The low confidence level attributed to assessment of the achievement of this target is due to lack of alignment of available metrics to the components of the target; spatial gaps in available survey-based data; and the limitations of using internet-based metrics to measure public awareness and/or interest.
2. Brazil, China, Colombia, Ecuador, France, Germany, India, Japan, Mexico, Netherlands, Peru South Korea, Switzerland, United Kingdom of Great Britain and Northern Ireland, United States of America, and Vietnam
3. Union for Ethical BioTrade (2018). UEBT Biodiversity Barometer 2018 - https://static1.squarespace.com/static/577e0feae4fcb502316dc547/t/5b51dbaaaa4a99f62d26454d/1532091316690/UEBT+-+Baro+2018+Web.pdf and Union for Ethical BioTrade (2019). UEBT Biodiversity Barometer 2019, Specifical Edition – Asia - https://static1.squarespace.com/static/577e0feae4fcb502316dc547/t/5d0b61d53df5950001ac0059/1561027031587/UEBT+Biodiversity+Barometer+2019+.pdf
4. Federal Ministry for the Environment, Nature Conservation and Nuclear Safety (BMU) and Federal Agency for Nature Conservation (BfN) (2019), Nature Awareness Study - https://www.bfn.de/en/activities/social-affairs/nature-awareness.html
5. Cooper, M. W., Di Minin, E., Hausmann, A., Qin, S., Schwartz, A. J., & Correia, R. A. (2019). Developing a global indicator for Aichi Target 1 by merging online data sources to measure biodiversity awareness and engagement. *Biological Conservation, 230*, 29–36. https://doi.org/10.1016/J.BIOCON.2018.12.004 ; https://www.bipindicators.net/indicators/global-biodiversity-engagement-indicator
6. SINUS Institute (2019): Societal biodiversity awareness in Brazil, China, Colombia, India, Indonesia, Kenya, Mexico, Peru, South Africa, and Vietnam. Indicator calculation and socio-demographic characteristics. Report for WWF Germany. Heidelberg/Germany. https://resources.connect2earth.org/. The survey was carried out under a project funded by the International Climate Initiative (IKI), using methodology developed by the Germany's Federal Agency for Nature Conservation (BfN) for the Nature Awareness Survey conducted every two years since 2009. (https://www.bfn.de/en/activities/social-affairs/nature-awareness.html) The methodology has been evaluated by the German Science Council in 2015 (https://www.wissenschaftsrat.de/download/archiv/4905-15.pdf) and is reviewed in Trautwein, S., Lindenmeier, J., Schleer, C., Mues, A. W. (2019). Sozial erwünschte Antworten bei Befragungen von Anspruchsgruppen durch öffentliche Organisationen: Eine Analyse der Effekte der öffentlichen Studienträgerschaft, des Befragungsmodus und der sozialen Erwünschtheitswahrnehmung. ZögU, 42 (1-2), 100-12; Hoppe, A., Chokrai, P. and Fritsche, F. (2019): Eine Reanalyse der Naturbewusstseinsstudien 2009 bis 2015 mit Fokus auf dem Gesellschaftsindikator biologische Vielfalt und den Leititems zum Naturbewusstsein. BfN Skripten 510. Bonn. https://www.bfn.de/fileadmin/BfN/service/ Dokumente/skripten/Skript510.pdf. DOI: https://doi.org/10.5771/0344-9777-2019-1-2-100; and Kleinhückelkotten, S., Neitzke, H.-P. (2011). Naturbewusstsein in Deutschland und Konsequenzen für die Naturschutzkommunikation. Natur und Landschaft, 86 (05). DOI: https://doi.org/10.17433/5.2011.50153096.189-195

7. Belize's Sixth National Report - https://chm.cbd.int/database/record/7E3D234F-E8AD-520C-C92B-490CE2806718
8. Ecuador's Sixth National Report - https://chm.cbd.int/database/record/6120BF7A-BD24-5225-9DEF-4D4BE3AD3799
9. Forest Peoples Programme, Secretariat of the Convention on Biological Diversity, International Indigenous Forum on Biodiversity, Indigenous Women's Biodiversity Network and Centres of Distinction on Indigenous and Local Knowledge (2020) Local Biodiversity Outlooks 2: The contributions of indigenous peoples and local communities to the implementation of the Strategic Plan for Biodiversity 2011–2020 and to renewing nature and cultures. A complement to the fifth edition of Global Biodiversity Outlook. Moreton-in-Marsh, England. https://localbiodiversityoutlooks.net/

Target 2

1. Despite the lack of global indicators for this target, information from the UN Statistics Division on increased national uptake of the System of Environmental-Economic Accounting (SEEA), together with information from the Sixth National Reports to the CBD, provide a medium level of confidence that Target 2 has been partially achieved.
2. United Nations Committee of Experts on Environmental-Economic Accounting (2018). Global Assessment of Environmental-Economic Accounting and Supporting Statistics 2017. https://unstats.un.org/unsd/statcom/49th-session/documents/BG-Item3h-2017-Global-Assessment-of-Environmental-Economic-Accounting-E.pdf
3. System Of Environmental Economic Accounting https://seea.un.org/content/global-assessment-environmental-economic-accounting
4. Hein, L., Bagstad, K. J., Obst, C., Edens, B., Schenau, S., Castillo, G., … Caparrós, A. (2020). Progress in natural capital accounting for ecosystems. *Science, 367*(6477), 514 LP – 515. https://doi.org/10.1126/science.aaz8901
5. Vardon, M., Burnett, P., & Dovers, S. (2016, April 1). The accounting push and the policy pull: Balancing environment and economic decisions. *Ecological Economics*. Elsevier B.V. https://doi.org/10.1016/j.ecolecon.2016.01.021
6. Wealth Accounting and the Valuation of Ecosystem Services -https://www.wavespartnership.org/en/partners
7. Colombia's Sixth National Report - https://www.cbd.int/doc/nr/nr-06/co-nr-06-es.pdf
8. Liberia's Sixth National Report - https://www.cbd.int/doc/nr/nr-06/lr-nr-06-en.pdf; and Liberia - Mainstreaming the Value of Ecosystems and Biodiversity into coastal and Marine Management Policies - http://www.teebweb.org/areas-of-work/teeb-country-studies/liberia
9. Guinea's Sixth National Report - https://www.cbd.int/doc/nr/nr-06/gn-nr-06-fr.pdf
10. Namibia's Sixth National Report - https://www.cbd.int/doc/nr/nr-06/na-nr-06-en.pdf
11. Pesce et al. 2020. Integrating biodiversity into the Sustainable Development Agenda: An analysis of Voluntary National Reviews. UNEP-WCMC, Cambridge, UK.
12. European Union's Sixth National Report, - https://chm.cbd.int/database/record/1B95A397-C57E-CEFA-0847-142E52783E69; European Commision, Natural Capital Accounting- http://ec.europa.eu/environment/nature/capital_accounting/index_en.htm;System of Environmental Economic Accounting-Natural Capital Accounting and Valuation of Ecosystem Services Project - https://seea.un.org/home/Natural-Capital-Accounting-Project
13. Guatemala's Sixth National Report - https://chm.cbd.int/database/record/7023F81E-EFBD-F578-8B84-4E4045E2E8A3
14. Uganda's Sixth National Report - https://www.cbd.int/doc/nr/nr-06/ug-nr-06-en.pdf
15. United Kingdom of Great Britain and Northern Ireland's Sixth National Report, https://www.cbd.int/doc/nr/nr-06/gb-nr-06-p1-en.pdf and UK natural capital accounts: 2019 Estimates of the financial and societal value of natural resources to people in the UK. https://www.ons.gov.uk/economy/environmentalaccounts/bulletins/uknaturalcapitalaccounts/2019
16. Secretariat of the Convention on Biological Diversity (2020). CBD/SBI/3/2/Add.1 - Update on progress in revising/updating and implementing national biodiversity strategies and action plans, including national targets - https://www.cbd.int/doc/c/d2b9/ebf9/5e0c96b85bc233a413a433bd/sbi-03-02-add1-en.pdf
17. Whitehorn, P. R., Navarro, L. M., Schröter, M., Fernandez, M., Rotllan-Puig, X., & Marques, A. (2019). Mainstreaming biodiversity: A review of national strategies. *Biological Conservation*, 235, 157–163. https://doi.org/10.1016/j.biocon.2019.04.016

Target 3

1. The assessment of this target is rated as medium confidence due to the lack of detailed analysis by countries about the impacts on biodiversity of existing subsidies and incentives. Nevertheless, available evidence strongly suggests that harmful subsidies still greatly outweigh positive incentives, with no counter-indications suggesting that any component of the target has been met.
2. OECD (2020) A Comprehensive Overview of Global Biodiversity Finance. https://www.oecd.org/environment/resources/biodiversity/report-a-comprehensive-overview-of-global-biodiversity-finance.pdfand Dempsey, J., Martin, T. G., & Sumaila, U. R. (2020). Subsidizing extinction? *Conservation Letters, 13*(1). https://doi.org/10.1111/conl.12705
3. OECD (2020) A Comprehensive Overview of Global Biodiversity Finance. https://www.oecd.org/environment/resources/biodiversity/report-a-comprehensive-overview-of-global-biodiversity-finance.pdf
4. McFarland, W., Whitley, S., & Kissinger, K. (2015). Subsidies to key commodities driving deforestation (Working paper for the Overseas Development Institute). https://www.odi.org/publications/9286-subsidies-key-commodities-driving-forest-loss
5. OECD (2019), "Producer and Consumer Support Estimates", OECD Agriculture statistics (database), http://dx.doi.org/10.1787/agr-pcse-data-en ; https://www.bipindicators.net/indicators/trends-in-potentially-environmentally-harmful-elements-of-government-support-to-agriculture-producer-support-estimate
6. Sumaila, U. R., Ebrahim, N., Schuhbauer, A., Skerritt, D., Li, Y., Kim, H. S., Mallory, T. G., Lam, V. W. L., & Pauly, D. (2019). Updated estimates and analysis of global fisheries subsidies. *Marine Policy, 109*, 103695. https://doi.org/10.1016/j.marpol.2019.103695
7. World Bank. 2017. *The Sunken Billions Revisited: Progress and Challenges in Global Marine Fisheries*. Washington, DC: World Bank. Environment and Sustainable Development series. doi:10.1596/978-1-4648-0919-4.
8. This figure encompasses price-gap support for lower consumer energy prices as well as direct budgetary transfers and tax expenditures that provide benefit or preference for fossil-fuel production or consumption; OECD (2020), "OECD Inventory of Fossil-fuel support measures (database)", http://www.oecd.org/fossil-fuels/data/
9. Guerriero, C., Haines, A. & Pagano, M. (2020). Health and sustainability in post-pandemic economic policies. Nat Sustain. https://doi.org/10.1038/s41893-020-0563-0; Hepburn, C. O'Callaghan, B., Stern, N., Stiglitz, Dimitri Zenghelis, J. Will COVID-19 fiscal recovery packages accelerate or retard progress on climate change?, *Oxford Review of Economic Policy*, , graa015, https://doi.org/10.1093/oxrep/graa015; Kuzemko, C. etal (2020). Covid-19 and the politics of sustainable energy transitions, Energy Research & Social Science, 68,101685, https://doi.org/10.1016/j.erss.2020.101685.
10. Coady et al (2019) "Global Fossil Fuel Subsidies Remain Large: An Update Based on Country-Level Estimates" IMF Working Paper 19/89. International Monetary Fund. https://www.imf.org/en/Publications/WP/Issues/2019/05/02/Global-Fossil-Fuel-Subsidies-Remain-Large-An-Update-Based-onCountry-Level-Estimates-46509
11. Support to agricultural producers considered potentially most environmentally harmful consists of market price support; payments based on commodity output, without imposing environmental constraints on farming practices; and payments based on variable input use, without imposing environmental constraints on farming practices. Support considered potentially least harmful (or beneficial) consists of payments based on area/animal numbers/receipts/income with environmental constraints, payments based on input use with environmental constraints, and payments based on non-commodity criteria. "Other" refers to the remaining support that does not fit in either of these categories (i.e. miscellaneous). For explanation of the

methodology, see Chapter 4 of the OECD (2013), Policy Instruments to Support Green Growth in Agriculture, OECD Green Growth Studies, OECD Publishing. http://dx.doi.org/10.1787/9789264203525-en. OECD Secretariat calculations based on OECD (2019[32]) "Producer and Consumer Support Estimates", OECD Agriculture statistics (database), http://dx.doi.org/10.1787/agr-pcse-data-en.

12. Italy's Sixth National Report,, https://chm.cbd.int/database/record/2044473C-CFF3-E26D-50A0-4555278A9AAB and http://www.minambiente.it/sites/default/files/archivio/allegati/sviluppo_sostenibile/catalogo_sussidi_ambientali.pdf
13. OECD (2020) *Tracking Economic Instruments and Finance for Biodiversity - 2020*, available at https://www.oecd.org/environment/resources/tracking-economic-instruments-and-finance-for-biodiversity-2020.pdf
14. Denmark's Sixth National Report, - https://www.cbd.int/doc/nr/nr-06/dk-nr-06-p1-en.pdf
15. Guatemala's Sixth National Report, - https://chm.cbd.int/database/record/7023F81E-EFBD-F578-8B84-4E4045E2E8A3

Target 4

1. The confidence level for this assessment is high due to a substantial number of primary indicators (12) and no contrary evidence to suggest that the target may have been met.
2. Global Footprint Network (2020). Calculating Earth Overshoot Day 2020: Estimates Point to August 22nd. - https://www.overshootday.org/content/uploads/2020/06/Earth-Overshoot-Day-2020-Calculation-Research-Report.pdf. Results from 1961 to 2016 are calculated on the basis of actual data. For year period 2017-2020, footprint and biocapacity results are estimated on the basis of various actual and/or proxy data. http://data.footprintnetwork.org/#/ ; https://www.bipindicators.net/indicators/ecological-footprint
3. Another measure of the impact of human activities on the biological resources of the planet is the proportion of all potential plant growth that is diverted towards uses by people – known as human appropriation of net primary production (HANPP). This takes into account both the impact of land conversion on the total biomass generated through photosynthesis, and the proportion of the remaining vegetation harvested by people. This index has doubled in the past century to reach approximately 25% of all potential vegetation – the increase has been significantly slower than both population increase and economic growth, suggesting that we are using land and plant resources more efficiently. However, future levels of our appropriation of the foundation of all food chains will depend on many factors including human population and the use of biofuels. IPBES Global Assessment 3.2.1; https://www.bipindicators.net/indicators/human-appropriation-of-net-primary-production-hanpp; Krausmann, Fridolin et al. 2013. "Global Human Appropriation of Net Primary Production Doubled in the 20th Century." *Proceedings of the National Academy of Sciences* 110(25): 10324 LP – 10329. http://www.pnas.org/content/110/25/10324.abstract; Haberl, Helmut, Karl-Heinz Erb, and Fridolin Krausmann. 2014. "Human Appropriation of Net Primary Production: Patterns, Trends, and Planetary Boundaries." *Annual Review of Environment and Resources* 39(1): 363–91. https://doi.org/10.1146/annurev-environ-121912-094620.
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Target 5

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Target 6

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Target 7

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Target 8

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Target 9

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Target 10

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13. Sully, S., Burkepile, D.E., Donovan, M.K. *et al.* A global analysis of coral bleaching over the past two decades. *Nat Commun* 10, 1264 (2019). https://doi.org/10.1038/s41467-019-09238-2

Target 11

1. The large number of global indicators available for Target 11 enable a high level of confidence in the assessment of target achievement. There is ample data to show that the area-based components of the target will be achieved by 2020, but also that the remaining components have not made sufficient progress to enable the target as a whole to be achieved.
2. UNEP-WCMC, IUCN and NGS (2019). Protected Planet Live Report 2019. UNEP-WCMC, IUCN and NGS: Cambridge UK; Gland, Switzerland; and Washington, D.C., USA. - https://livereport.protectedplanet.net/
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Target 12

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Target 15

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Target 16

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2. 57 Parties and 7 non-Parties have published ABS measures on the ABS Clearing-House.
3. 64 Parties and 5 non-Parties have published competent national authorities on the ABS Clearing-House.
4. 29 Parties and the 3 non-Parties have published their checkpoints on the ABS Clearing-House.
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14. Ethiopia's Interim National Report on the Implementation of the Nagoya Protocol https://absch.cbd.int/pdf/documents/absNationalReport/ABSCH-NR-ET-238743/1
15. Finland's Interim National Reports on the Implementation of the Nagoya Protocol- https://absch.cbd.int/pdf/documents/absNationalReport/ABSCH-NR-FI-238837/4
16. Madagascar's Interim National Report on the Implementation of the Nagoya Protocol https://absch.cbd.int/pdf/documents/absNationalReport/ABSCH-NR-MG-238714/1
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Target 17

1. The assessment of partial achievement is based on the fact that while the great majority of Parties have submitted up to date NBSAPs, submission is not universal, and implementation is variable. Evidence for both of these conclusions is very strong, and confidence in the assessment is therefore high.
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6. Secretariat of the Convention on Biological Diversity (2020). CBD/SBI/3/2/Add.1 - Update on progress in revising/updating and implementing national biodiversity strategies and action plans, including national targets. https://www.cbd.int/doc/c/d2b9/ebf9/5e0c96b85bc233a413a433bd/sbi-03-02-add1-en.pdf
7. Secretariat of the Convention on Biological Diversity (2020). CBD/SBI/3/2/Add.1 - Update on progress in revising/updating and implementing national biodiversity strategies and action plans, including national targets https://www.cbd.int/doc/c/d2b9/ebf9/5e0c96b85bc233a413a433bd/sbi-03-02-add1-en.pdf and Secretariat of the Convention on Biological Diversity (2020). CBD/SBI/3/2/Add.2 - Analysis of the contribution of targets established by Parties and progress towards the Aichi Biodiversity Targets - https://www.cbd.int/doc/c/f1e4/ab2c/ff85fe53e210872a0ceffd26/sbi-03-02-add2-en.pdf
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Target 18

1. The low confidence level given to the assessment of this target is due to the lack of any global indicators covering the time period of the Strategic Plan.
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3. Secretariat of the Convention on Biological Diversity (2020). CBD/SBI/3/2/Add.1 - Update on progress in revising/updating and implementing national biodiversity strategies and action plans, including national targets. https://www.cbd.int/doc/c/d2b9/ebf9/5e0c96b85bc233a413a433bd/sbi-03-02-add1-en.pdf
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13. These were adopted in decisions XIII/18- and 14/12 respectively. A full list of such tools is available at https://www.cbd.int/tk/

Target 19

1. The lack of well-aligned global indicators covering all aspects of this target, along with the non-quantitative formulation of the target itself, makes it challenging to assess target achievement with confidence. However, substantial progress in the generation of and access to biodiversity data, information and knowledge suggests that Target 19 has been at least partially achieved.
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Target 20

1. On adoption, it was noted that "This target will be subject to changes contingent to resources needs assessments to be developed and reported by Parties." Subsequently, specific targets were developed through CBD decisions XI/4- and XII/3, summarized as follows: (a) to double international financial flows to developing countries by 2015 and to at least maintain this level until 2020, using average 2006-2010 flows as a baseline; (b) at least 75% of Parties to include biodiversity in national priorities or development plans; (c) at least 75% of Parties to report on domestic spending, needs, gaps, priorities by 2015; (d) at least 75% of Parties to prepare national finance plans and 30% to assess and/or evaluate the multiple values of biodiversity by 2015; and (e) domestic financial resources mobilized to reduce resource gaps by 2020. Refer to decision XII/3 for the full text.
2. The assessment of partial achievement is based on that fact that official development assistance doubled from a 2006-2010 baseline by 2015, thus meeting one component of the associated targets. For sub-targets (b) to (d), while there is evidence of progress, the number of countries reporting is clearly below 75%. For sub-target (e) while there is incomplete information, it is clear that domestic resources have increased in some countries and decreased in others. Information is limited on additional components such as and private sector investment.
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6. One list of SMART criteria is specific, measurable, achievable, results-based and time-bound (for example, in the conclusion of the first meeting of Working Group on the Post-2020 Global Biodiversity Framework (see CBD/WG2020/01/05)). The list of SMART criteria used in Green, E. J., Buchanan, G. M., Butchart, S. H., Chandler, G. M., Burgess, N. D., Hill, S. L. and Gregory, R. D. (2019), Relating characteristics of global biodiversity targets to reported progress. Conservation Biology https://doi.org/10.1111/cobi.13322 is "specific, measurable, ambitious, realistic and time-bound". In yet

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18. Mean species abundance (MSA) is the mean abundance of original species relative to their abundance in undisturbed ecosystems. An area with an MSA of 100% means a biodiversity that is similar to the natural situation. An MSA of 0% means a completely destructed ecosystem, with no original species remaining.Geometric Mean Abundance is the ratio between total population size of a species at a given point in time compared to its population size at a reference time.
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The sustainable Climate Action transition

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