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KEY MESSAGES FROM THE WORKSHOP ON "BIODIVERSITY AND CLIMATE CHANGE: INTEGRATED SCIENCE FOR COHERENT POLICY"

Paris, 18 October 2018

Note by the Executive Secretary

1. In decision XIII/29, the Conference of the Parties to the Convention on Biological Diversity requested the Executive Secretary and invited the secretariats of the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services (IPBES) and the Intergovernmental Panel on Climate Change (IPCC) to foster further enhanced collaboration between the scientific communities related to the these bodies working on scenarios and models, as well as collaboration with communities working on biodiversity monitoring and data, and the policy community.

2. Further, in its recommendation XXI/1, the Subsidiary Body on Scientific, Technical and Technological Advice welcomed the ongoing work by the scientific and other relevant communities working on scenarios and related assessments, including the increased collaboration between the communities working on biodiversity and on climate change, and invited these communities to continue these efforts to promote coherence in scenarios and related assessments.

3. The Secretariat of the Convention on Biological Diversity organized a workshop on "Biodiversity and climate change: integrated science for coherent policy", in cooperation with IPBES and IPCC, as well as the United Nations Framework Convention on Climate Change (UNFCCC). The workshop, held at the headquarters of the United Nations Educational, Scientific and Cultural Organization (UNESCO) in Paris on 18 October 2018, was made possible thanks to the generous support of the Government of France.

4. The workshop was attended by experts in the fields of biodiversity and climate change science, mitigation and adaptation, mainly from the IPCC and IPBES communities. The workshop was co-chaired by Mr. Robert Watson, Chair of IPBES, and Mr. Youba Sokona, Vice-Chair of IPCC.

5. The workshop objective was to discuss recent assessments and policy-relevant science on climate change and biodiversity. By encouraging the continued communication and mutual understanding between the scientific communities involved in the work of IPCC and IPBES, the workshop aimed at ensuring that key issues are addressed in future work, including, as appropriate, assessments under both processes, and that implementation is strengthened and more coherent under the Convention on Biological Diversity and UNFCCC.

6. The workshop was opened with opening remarks by representatives of UNESCO, the Convention on Biological Diversity, UNFCCC and the Government of France, following by a welcoming address by the workshop co-chairs. The workshop featured presentations by experts from the IPCC and IPBES on the content of the most recent reports of the IPCC and IPBES processes and on key issues on the interface

* CBD/COP/14/1.

between biodiversity and climate change. These were followed by a group discussion on the major challenges for science, assessment and policy with regards to biodiversity and climate change. In the afternoon, two working groups worked in parallel to further examine and identify challenges, opportunities and unresolved issues, and to develop ideas for ongoing communication and collaboration between the two scientific communities on (a) impacts of climate change mitigation and adaptation measures on biodiversity and impacts of biodiversity conservation or restoration measures on climate change mitigation and adaptation: how to avoid or minimize negative and maximize positive impacts; and (b) nature-based solutions and "win-win" measures for achieving the co-benefits between addressing climate change and biodiversity, and the Sustainable Development Goals. More information is provided in the report of the workshop available in document CBD/CCB/WS/2018/2/3.

7. The Executive Secretary is circulating herewith, for the information of participants in the fourteenth meeting of the Conference of the Parties, the key messages from the above-mentioned workshop, presented in annex I below. In addition to the key messages from the workshop, the present document contains four annexes with related information. Annex II contains key findings from the IPCC Special Report on Global Warming of 1.5°C that most specifically relate to the climate-biodiversity interlinkages; annex III contains the key findings from the IPBES regional assessments and the thematic assessment on land degradation and restoration that most specifically relate to the climate-biodiversity interlinkages; annex IV contains a summary of major challenges for science, assessment and policy in addressing the interactions between climate change and biodiversity; and annex V contains the key messages from the workshop's two break-out group discussions.

Annex I

KEY MESSAGES FROM THE WORKSHOP ON "BIODIVERSITY AND CLIMATE CHANGE: INTEGRATED SCIENCE FOR COHERENT POLICY"

The following key messages were developed by the experts present at the workshop, and compiled by the co-chairs, with a view to bringing them to the attention of policymakers under both the Convention on Biological Diversity (CBD) and the United Nations Framework Convention on Climate Change (UNFCCC) at the fourteenth meeting of the Conference of the Parties to the CBD and the twenty-fourth session of the Conference of the Parties to the UNFCCC.

1. **Climate change and biodiversity loss are inseparable threats to humankind and must be addressed together.** Biodiversity and climate are interconnected in many ways. On the one hand, biodiversity is strongly affected by climate change, with negative consequences for human well-being and the long-term stability of critical ecosystems. On the other hand, the conservation of biodiversity, through the ecosystem services it supports, makes an indispensable contribution to addressing climate change. Better protection, management and restoration of natural and managed ecosystems can make significant contributions to the mitigation of human-induced climate change. Ecosystem-based approaches can also contribute significantly to climate change adaptation and disaster risk reduction thereby reducing the vulnerability of people, and the ecosystems upon which they depend, in the face of climate change. Finally, many direct (e.g. changes in land and sea use) and indirect drivers (e.g. consumption of food, materials and energy) of climate change and biodiversity loss are the same and thus there are important synergies in addressing these issues together.

2. **There are significantly greater risks to natural and human systems in a world warming to 2°C above pre-industrial temperatures compared to 1.5°C above pre-industrial temperatures.** Impacts are already apparent with current levels of global warming (about 1°C above pre-industrial levels) and these will increase with each temperature increment. Impacts on the distribution of species at 2°C warmer are expected to be at least twice as high as impacts at 1.5°C warmer. Impacts on coral reefs are expected to be an order of magnitude worse in a world that is 2°C warmer compared to 1.5°C warmer. Thus, limiting the global average temperature increase to 1.5°C above pre-industrial levels, as compared to a 2°C rise or higher, would reduce risks to biodiversity, ecosystems, food systems, water, and human livelihoods.

3. **In order to limit global warming to well below 2°C, and closer to 1.5°C above pre-industrial levels, strong actions are needed to reduce greenhouse gas emissions from fossil fuel use and cement production, as well as to protect and enhance carbon sinks on land and in the oceans through ecosystem-based approaches.** There is no one single action that can achieve the reduction in atmospheric greenhouse gas concentrations necessary to limit global warming to 1.5°C, and there is no conflict between decreasing our reliance on fossil fuels and on sustainably managing agriculture, forestry and other land-use. Land-use actions will not be sufficient on their own to reach the climate goal but they are essential components in our total effort.

4. **Protecting and conserving biodiversity and ecosystems is critical in order to maintain and increase the resilience and reduce the vulnerability of ecosystems and people in the face of the adverse effects of climate change, as well as to maintain their capacity to store carbon.** Diverse, well-functioning and resilient ecosystems are better able to provide society with ecosystem services and benefits that support climate change adaptation and disaster risk reduction, and to contribute to climate change mitigation. The loss of biodiversity and the degradation of ecosystems significantly reduces their resilience and undermines their capacity for carbon storage and sequestration, potentially leading to increases in emissions of greenhouse gases.

5. **Ecosystem-based approaches to climate change mitigation and adaptation, including biodiversity conservation, the reduction of ecosystem degradation, and restoration of ecosystems, provide significant contributions to stabilizing warming to below 2°C, and closer to 1.5°C above pre-industrial levels, while delivering multiple co-benefits for biodiversity and sustainable development.** In implementing ecosystem-based approaches, we must ensure that actions benefit

biodiversity, promote and enhance ecosystem services, and do not have negative impacts on food production. Afforestation of naturally unforested lands and the introduction of invasive species should be avoided. If appropriately designed and managed, ecosystem-based approaches can provide climate change mitigation and adaptation benefits while also delivering benefits to biodiversity and livelihoods.

6. **Investing simultaneously in ecosystem restoration, the rehabilitation of degraded agricultural and pasture lands, and ways to sustainably enhance agricultural productivity can contribute to combating climate change and biodiversity loss and enhance food security at the same time.** Some mitigation measures such as afforestation and bioenergy use could have significant adverse impacts on agricultural and food systems, biodiversity and ecosystem services.

7. **When considering bioenergy and biomass-based measures, attention should be given to the direct and indirect effects of related land-use changes, including net greenhouse gas emissions, water and nutrient constraints and changes in albedo.** This will be necessary to ensure that these measures contribute to climate change mitigation without unduly compromising biodiversity, food security, ecosystem resilience and adaptation to climate change. The deployment of bioenergy, including bioenergy with carbon capture and storage (BECCS), on a very large scale as envisaged in some mitigation scenarios, could have significant negative impacts on biodiversity and food security through land-use change.

8. **Many of the direct and most of the indirect drivers of biodiversity loss and climate change are common to both these challenges.** Land-use change may result in increased greenhouse gas emissions, reductions in sequestration potential, biodiversity loss and a loss in the resiliency of ecosystems, compromising their adaptation capacities. Addressing behavioural change and consumption patterns, such as excessive consumption of meat, would reduce pressures on both biodiversity and climate change.

9. **The integration between climate and biodiversity requires an integrated approach at the local/national level in order to be able to address the systemic interactions and identify the synergies that could be strengthened by adequate policy packages.** The structuring of a body of literature that would consider such an approach defines an important horizon for the research community.

10. **There are opportunities for further work to integrate science on the links between climate change and biodiversity in policy.** Potential opportunities already exist within the framework of the sixth Assessment Report cycle of the Intergovernmental Panel on Climate Change (IPCC) to integrate biodiversity considerations more thoroughly (e.g. regarding feedbacks on the climate system created by changes in biodiversity, under Working Group I, and on addressing common drivers of change, under Working Group III). In addition, many proposals have been put forward to the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services (IPBES) for its future work programme to address the nexus between climate change and food systems. Integration of climate change and biodiversity science could be promoted further through an expert meeting. In addition, the IPCC and IPBES could explore the possibility of developing a joint technical report, building on existing assessments under both processes.

Annex II

KEY FINDINGS FROM THE IPCC SPECIAL REPORT ON GLOBAL WARMING OF 1.5°C

Summary:

- Climate change is already affecting people, ecosystems and livelihoods all around the world.
- Limiting warming to 1.5°C is not impossible but would require unprecedented transitions in all aspects of society.
- There are clear benefits to keeping warming to 1.5°C compared to 2°C, or higher. Every bit of warming matters.
- Limiting warming to 1.5°C can go hand in hand with achieving other global policy goals.

Key finding 1: Climate change is already affecting people, ecosystems and livelihoods all around the world.

- The world is already experiencing the impacts of rapid and unequivocal human-induced global warming (coral reef decline, sea level rise, Arctic sea ice loss, biodiversity loss, declining crop yields, more frequent heatwaves and heavy rainfall).
- The world has warmed by 1°C and the science is clear that it is caused by humans. Activities such as burning fossil fuels and cutting down forests increase the concentrations of gases in the atmosphere that cause it to warm.
- Hotspots: some places are warming faster than the global average, e.g., land areas warm more than oceans, and high latitudes warm more than the tropics.
- By the decade 2006-2015, 20-40% of the global population had already experienced warming of 1.5°C in at least one season.
- All countries are affected by global warming, but the impacts tend to fall disproportionately on the poor and vulnerable, as well as those least responsible for the problem.
- These impacts were predicted by IPCC decades ago.
- We can minimize these impacts by keeping the warming as low as possible.

Key finding 2: There are clear benefits to keeping warming to 1.5°C compared to 2°C. Every bit of warming matters.

- Every extra bit of warming will worsen impacts (e.g. more severe heatwaves in cities, crop losses).
- Most countries are already vulnerable to climate change and are not well adapted for the impacts we are already seeing.
- There are clear benefits for human health from limiting warming to 1.5°C, e.g. related to heat stress, food, air quality, vector-borne diseases.
- Some of the most affected areas are small islands, megacities, coastal regions and high mountain ranges.
- Some places are experiencing multiple impacts at the same time, and they are often the least able to cope.
- Hotspots: Particularly high risk for the Mediterranean area, sub-Saharan Africa, and small island States.
- Limiting warming to 1.5°C rather than 2°C could result in 420 million fewer people being exposed to severe heatwaves.

- There is a chance of some tropical coral reefs surviving with 1.5°C of warming, but coral reefs virtually disappear with 2°C warming.
- Arctic sea ice-free in summer once per decade with 2°C. With 1.5°C, perhaps once per century.
- 1.5°C will mean losing fewer plant and animal species and will help protect forests/wetland habitats.
- Oceans are getting more acidic, affecting sea life, and could take centuries to recover.
- Exceeding 1.5°C risks irreversible impacts and triggering instabilities in polar ice sheets.
- Losing these ecosystems matters for people and livelihoods that depend on them.

Key finding 3: Limiting warming to 1.5°C is not impossible but would require unprecedented transitions in all aspects of society: the next 10 years are critical.

- We would need to strongly reduce CO_2 emissions, reaching near zero by around 2050.
- Deep changes would be required in all aspects of society (e.g. energy, land, buildings, transport, food and diets, cities).
- New technologies, cleaner energy sources, less deforestation, managing land better, sustainable agriculture would be needed.
- By 2050, renewables need to supply half to two thirds (49-67%) of primary energy, while coal would drop to 1-7%.
- Even then, we would need to remove CO_2 from the air to offset remaining emissions (i.e., from transport). We would also need to reduce how much energy is consumed globally and use it more efficiently.
- We are not on track. We are currently heading for much more than 3-4°C warming by 2100.
- The good news is there is movement in the right direction in lots of these areas but would need to do more, faster.
- This would require greater collective ambition.
- We need to make these transitions responsibly and sustainably, and limit unintended consequences (trade-offs).
- The sooner emissions fall the more options we keep on the table.
- Doing more now reduces reliance on unproven and risky techniques to remove CO_2 from the air.
- A particular challenge is coastal areas - sea level rise will continue, even if warming stops today. We still need to adapt, even if we limit warming to 1.5°C. Transformational, not just ad hoc. Doing less now would shift the burden of responsibility to later generations.

Key finding 4: Limiting warming to 1.5°C can go hand in hand with achieving other world goals.

- Tackling climate change can be consistent with ensuring people around the world are healthy, prosperous, and have food, clean air and water. Everything is connected.
- In the same way that the world was very different 50 years ago, it will also be very different 50 years from now. The decisions we make now will define our future and those of future generations.
- But there is no single recipe for success. What’s right somewhere won’t necessarily be right everywhere.
- Responding to climate change while reducing poverty and enhancing sustainable development would require a collective global effort.

- Poorly designed policies could have unexpected or adverse consequences, known as trade-offs. We need joined thinking on policies that reduce the scale of the problem by cutting emissions and those that build resilience against climate change and help adapt to the impacts.
- We already have good examples from around the world but this report shows very clearly that the world would need to collectively ramp up ambition if we want to limit warming to 1.5°C.

Annex III

KEY FINDINGS FROM THE IPBES REGIONAL ASSESSMENTS AND THE THEMATIC ASSESSMENT ON LAND DEGRADATION AND RESTORATION

Summary:

- The loss of biodiversity is already impacting climate and affecting people and livelihoods all around the world.
- Limiting the loss of biodiversity and the degradation of ecosystems can be facilitated through transformative changes including the use of participatory governance systems and multisectoral planning.
- There are clear benefits to limiting the loss of biodiversity and degradation of ecosystems.
- Limiting the loss of biodiversity and degradation of ecosystems can contribute to mitigating and adapting to climate change and is essential to the achievement of many of the United Nations Sustainable Development Goals.

Key finding 1: The loss of biodiversity is already impacting climate, and affecting people and livelihoods all around the world.

- Biodiversity (genes, species and ecosystems) continues to degrade in all parts of the world, with a corresponding loss of nature's contributions to people, hence undermining people's quality of life.
- Literally all terrestrial, freshwater and marine ecosystems exhibit some level of degradation, with wetlands, forests and coral reefs being particularly transformed in most regions.
- The emphasis on increasing the production of material contributions to people, e.g., food, fibre and energy to meet the needs of an ever-increasing population and a wealthier population has resulted in a decrease in most regulating contributions, e.g., pollination, climate, air quality, freshwater quantity and quality, and non-material contributions. For example, food production has increased in most parts of the world through the conversion of natural habitats, i.e., extensification, and unsustainable intensification. This has caused a loss of biodiversity, which, in turn, can threaten food production.
- The risk to populations or species (mammals, birds, amphibians, reptiles, fish and plants) threatened with loss or extinction is increasing in terrestrial, coastal, marine and freshwater habitats in all regions of the world, caused directly or indirectly by anthropogenic drivers (land conversion, overexploitation, climate change, pollution, and invasive alien species). The situation has become markedly worse in all regions during the last 20 years; about 20% of all species assessed by the IUCN are listed in the Red List as either extinct, extinct in the wild, critically endangered, endangered or vulnerable, with endemic species even more threatened.
- Two important indirect drivers, which are increasing in most parts of the world, are growth in population and economic wealth. This growth has increased the demand for goods and services and the globalization of trade, which has led to a decoupling of where resources are produced and consumed. Unfortunately, the benefits of this growth are not distributed equitably among or within countries.
- These indirect drivers are leading to an increased demand for natural resources, which in turn result in the fragmentation, conversion and overexploitation of ecosystems, accompanied by pollution, invasive alien species and climate change, which in tum increase with economic growth and trade.
- To date, land use change/conversion has been the most dominant direct driver of biodiversity loss in most terrestrial ecosystems, while overexploitation, i.e., overfishing, has been the most dominant direct driver in marine ecosystems.
- The combination of land degradation and climate change is projected to reduce global crop yields by 10% (up to 50% in some regions) by 2050, forcing up to 700 million people to migrate.

- There are synergistic and compounding effects among the drivers; e.g., climate change, which is projected to increase significantly in the coming decades (the world is projected to warm on average, relative to today, by 1-3°C between now and the end of the century, with land areas warming more than the oceans), interacts with, and amplifies, all other direct drivers.
- The individual and combined effect of all the direct drivers will have chronic, prolonged and delayed consequences for biodiversity due to the inertia and considerable time lags in the response of ecological systems.

Key finding 2: Limiting the loss of biodiversity and the degradation of ecosystems can be facilitated through transformative changes, including the use of participatory governance systems and multisectoral planning.

- According to the assessed knowledge, biodiversity could be conserved and sustainably used with more integrated multisectoral policies, institutional arrangements, adequate financing, use of appropriate technologies and behaviour changes leading to sustainable production and consumption.
- It is important to recognize that there is a great diversity of policy instruments across the regions.
- Choice of low resource intensive diets (the composition of which may vary geographically), coupled with a reduction in food and water waste, would relieve pressures on biodiversity.
- Ecosystem-based approaches such as ecosystem-based adaptation, nature-based solutions, disaster risk reduction and sustainable forest, agriculture, fisheries and wildlife management, would provide multiple benefits and could foster synergies between biodiversity and climate change and sustainable development agendas.
- While future trade-offs between certain of nature's contributions to people are inevitable, the severity of the trade-offs may be mitigated by timely, progressive and proactive policy interventions and environmental safeguards based on the most up-to-date evidence, and by mainstreaming/integrating environmental issues (e.g., biodiversity, climate change and land degradation) into all socio-economic sectors, such as agriculture, water, energy, health, transportation, infrastructure, and cities. This will be crucial as most biodiversity is, and will always remain, outside of protected areas. Analysis of different scenarios can help policymakers make better decisions on the most plausible futures for biodiversity and nature's contributions to people.
- More collaborative, inclusive, participatory and decentralized governance systems, at national, regional and global scales, involving governments, private sector, civil society, and indigenous peoples and local communities, are likely to result in the development and ownership of more sustainable practices that would facilitate the sustainable use of biodiversity. These governance systems will vary depending on the socio-economic-political environment in which they operate.
- Regional and transboundary collaboration is considered vital and has shown positive results in almost all regions. Partnerships with the private sector, individuals and non-governmental organizations could assist countries in meeting the growing shortfalls in funding conservation efforts.

Key finding 3: There are clear benefits to limiting the loss of biodiversity and degradation of ecosystems.

- Biodiversity and nature's contributions to people are essential for a good quality of life. They play a critical role in providing food, clean water, energy, medicines and secure livelihoods, and in regulating climate, air quality, freshwater quantity and quality, and pollination services; and they are fundamental to social cohesion, spiritual fulfilment, preservation of cultural heritage, mental and physical well-being, and identity and sense of place.
- Biodiversity has significant market and non-market economic value and non-economic (social/cultural) value. People value nature for its important contributions to their cultural, spiritual,

psychological, physical and economic well-being, and their interactions with nature are shaped by people's diverse values and value systems.

- The true value of biodiversity and nature's contributions to human well-being tend to be underappreciated and underused in decision-making processes, in particular for non-material and regulating contributions to well-being. Full valuation of biodiversity and nature's contributions to people is a tool that can be used in decision-making and communicating their importance, thus realistically accounting for their value and assisting in promoting their conservation and sustainable use and the equitable sharing of benefits.
- Valuation has to avoid the commodification of those contributions of nature to people related to culture and identity, respecting the diverse holders of cultural values that do not see their cultures as appropriate for commerce and value-based trade-off analyses.

Key finding 4: Limiting the loss of biodiversity and degradation of ecosystems can contribute to mitigating and adapting to climate change and is essential to the achievement of many of the United Nations Sustainable Development Goals.

- Land degradation is a major contributor to climate change, and climate change can exacerbate the effects of land degradation.
- Few of the Aichi Biodiversity Targets are likely to be met anywhere in the world. The evidence suggests that some progress towards many of the Aichi targets is being made in most regions of the world, but this progress appears often to be at an insufficient rate, and for a number of targets there appears to be either no significant change or worse, there is movement away from the target.
- Continued loss of biodiversity, especially when coupled with projected changes in climate, is likely to undermine achievement of many of the Sustainable Development Goals and many of the climate-related goals.
- Future impacts on biodiversity and nature's contributions to people are typically underestimated, since most scenarios consider only a few direct drivers, notably climate change. Such scenarios fail to capture interactions among drivers, as well as compounding factors.
- Between now and 2050, business-as-usual scenarios in all regions are projected to result in a continued loss of biodiversity, with climate change becoming a dominant driver for most ecosystems.
- Scenarios optimized for economic growth or regional competition tend to result in significant loss of biodiversity and nature's contributions to people, whereas sustainability scenarios, which are characterized by environmental concern (including environmentally motivated changes in consumption patterns), social equity and human welfare and a balanced supply of nature's contributions to people (a balance between material, regulating and non-material contributions), have much more positive outcomes and at least slow down the rate of loss of biodiversity and nature's contributions to people.
- Land management can play an important role in mitigating climate change. Between 2000 and 2009, land degradation was responsible for annual global emissions of up to 4.4 billion tonnes of CO_2. Deforestation alone caused 10% of all human-induced greenhouse gas emissions.
- Halting and reversing land degradation can provide more than 113 of the most cost-effective greenhouse gas mitigation activities to keep global warming under 2°C.

Annex IV

MAJOR CHALLENGES FOR SCIENCE, ASSESSMENT AND POLICY IN ADDRESSING THE INTERACTIONS BETWEEN CLIMATE CHANGE AND BIODIVERSITY

Key message 1: Impacts of climate change on biodiversity and ecosystem services. There is a need for concerted efforts to evaluate:

- Feedback between biodiversity and climate. For example, the effects of deforestation and reforestation on regional climate can be large but are not well understood.
- Uncertainty related to climate change and its impacts on biodiversity and ecosystem services. This needs to be accompanied by greater efforts to communicate uncertainty and provide decision makers with tools to manage uncertainty.
- Interactions between climate change and other drivers. We currently have limited understanding of the interactions of climate change with other key drivers such as land-use change, fishing pressure and pollution.
- Links between biodiversity, ecosystem function, ecosystem services and human well-being. Climate change impacts on each of these components of socio-ecological systems, which have been well studied individually, but the interactions and feedbacks between these are poorly understood.

Key message 2: Impacts of climate change adaptation and mitigation on biodiversity and ecosystem services. While some climate mitigation impacts on biodiversity are beginning to receive greater attention, such as bioenergy production, there is a need for much more comprehensive understanding and assessment of the impacts of climate change mitigation and adaptation actions on biodiversity. This includes:

- Evaluating a broad panel of mitigation and adaptation actions. This includes mitigation based on increased deployment of renewables (e.g., bioenergy, wind, solar, hydroelectric) and adaptation measures (e.g., sea walls to protect from sea level rise; flood control measures; green infrastructure for cities).
- Comparing benefits of reducing climate change impacts vs. potential negative effects of mitigation actions (e.g., large-scale bioenergy with carbon capture and storage) on biodiversity. Many studies exist, but synthesis and improved communication with decision makers and the general public are critical.
- Identifying win-win actions and means of implementing them.
- Identifying trade-offs and means of avoiding or minimizing trade-offs in implementation of climate mitigation and adaptation plans.

Key message 3: Nature-based solutions to climate change adaptation and mitigation. A wide range of nature-based solutions to climate change adaptation and mitigation have been identified, but knowledge of these solutions needs to be much better communicated to decision makers and the general public. Priorities include:

- Clear presentation of the suite of potential nature-based solutions. Some examples are well known, e.g., reforestation or reducing deforestation, but others, such as increasing blue carbon (i.e., carbon sequestration in marine systems) or increasing soil carbon sequestration are less well known.
- Agreement on and dissemination of best practices. For example, reforestation can have strong adverse effects on biodiversity if done without taking biodiversity into consideration.
- Identification of key social, technical and political barriers to implementation. This needs to be accompanied with efforts to better understand how these barriers can be overcome.

- Potential speed and costs of implementation. The speed with which mitigation measures can be implemented is not well studied, but speed is critical because limiting climate change to 1.5 or 2.0°C will require rapid and widespread deployment.
- Sustainability of ecosystem carbon sequestration. For example, future global change, including climate change and land-use change, could imperil ecosystem carbon stocks.
- Relative contributions of nature-based solutions to portfolios of mitigation measures. How do nature-based solutions compare with and complement other mitigation and adaptation measures?

Annex V

KEY MESSAGES FROM THE BREAK-OUT GROUP DISCUSSIONS

Group 1, on the "Impacts of climate change mitigation and adaptation measures on biodiversity and impacts of biodiversity conservation or restoration measures on climate change mitigation and adaptation: how to avoid or minimize negative and maximize positive impacts"

- Land use must be a part of the mitigation and adaptation solution.
- Many land managers are not prepared for engagement in climate mitigation and adaptation, and there is a lack of awareness and capacity that varies between and within regions and countries.
- The land contribution to mitigation requires continuous attention; actions to enhance sequestration involve multiple synergies and may trigger unintended consequences such as for biodiversity and ecosystem services.
- Land-based mitigation requires specialized approaches and needs an integrated approach, and must address all forcing factors, not only CO_2 sequestration (e.g. albedo change, unintended consequences for biodiversity).
- Land-based actions often have multiple objectives and can occur in multifunctional landscapes, with complex synergies and unintended consequences; there may be multiple pathways to achieve similar outcomes with no necessary best pathway. The needs of people are critical in developing these pathways, and this is especially important due to direct links between land-based action and sustainable development pathways. There is a need to take an integrated view of adaptation-mitigation linkages.
- "Phantom trade-offs" can occur where afforestation can degrade existing below ground carbon storage and reduce biodiversity (Sitka spruce example in Wales), more than nullifying the sequestration benefits.
- Multiple opportunities for food production and consumption efficiencies exist and need to be assessed in appropriately nuanced ways, relevant for local and regional contexts.
- Overall, these options and trade-offs need to be better communicated for both managers and policymakers, preferably in the form of "policy packages", i.e., combinations of policies that maximize synergies and minimize adverse trade-offs.
- Downscaling of responses in terms of potential unintended and adverse consequences will be important – including large-scale renewable energy roll-outs and upgrades as envisaged by the IPCC 1.5^{o}C report.
- Synergies between nature-based solutions and adaptation to extreme events is a powerful entry point for initial implementation.
- There is a need to entrain market forces to scale up societal transformation and behavioural change.
- There is a significant knowledge gap regarding biodiversity multifunctionality, and about the relationship with sustainable land use.
- The role of conservation in preserving the sink function of low management systems is crucial, especially tropical forests and high-latitude peat systems – can we get a better idea of the conservation-mitigation linkage?
- Where are the assessment gaps vs. research gaps in all of this? Some of these topics simply have not been well assessed yet, so they appear as research gaps when in fact they may not be. For example:

  - Are quantities of rare earth metals sufficient to support renewable energy technologies at the scale required to transition to a low-carbon economy?
  - Models of biodiversity change do not address impacts on sustainability; this is a major gap.
- Where have land-based mitigation and adaptation policies been effective and why?
- Better support is needed for government stocktaking to support action on biodiversity.
- We have an organizational issue: IPCC, UNFCCC, CBD and IPBES do not have a full mandate to synergize on issues where this is vital and of mutual benefit to each.
  - Policy effectiveness evaluation can be a hot button issue – one way to defuse this tension is to address it via case studies.
  - The IPBES programme over the next decade is considering the nexus between a number of Sustainable Development Goals and biodiversity issues.
  - The IPCC is tied into its own cycle - how do we find a way to develop some integration between IPCC and IPBES?

Group 2, on "Nature-based solutions and "win-win" measures for achieving the co-benefits between climate change and biodiversity, and the Sustainable Development Goals"

- There are many synergies, and some trade-offs, between climate policy consistent with the Paris Agreement and protecting biodiversity as outlined in the recent IPCC Special Report on 1.5^{o}C. Coherent policies across different policy areas at the national scale can benefit from the options that provide synergy. However, such coherent policies are still often lacking.
- Achieving the Sustainable Development Goals depends on ensuring a healthy climate as well as conserving and sustainably using biodiversity.
- There are many examples of policy options that lead to synergies:
  - Conservation of natural areas and avoiding deforestation;
  - Nature-based adaptation (e.g. mangroves instead of sea walls);
  - Other examples can be found in the 1.5^{o}C report or for instance in the recent ocean-based solutions paper.
- In general, support for options is higher if they achieve synergies.
- Feasibility considerations should take account of technical, economic and socio-political considerations.
- Sustainable Development Goal 12 (Achieving sustainable production and consumption patterns) is of key importance for both climate and biodiversity policy. It also recognizes that solutions are often outside the realm of narrow climate/biodiversity policies (e.g. urban planning, mobility, etc.).
- Climate change and biodiversity policies should be harmonized to realize synergies and avoid unintended adverse consequences.
- Two of the most vital strategies for achieving the co-benefits between climate change, biodiversity and the Sustainable Development Goals are through ecosystem restoration and avoiding deforestation.
- It is important to explore how IPCC and IPBES could find new ways to work together and improve the synergy between their assessments in order to increase the relevance and quality of the assessments and reduce the workload on the communities. This could for instance include joint expert meetings, cross-sectoral papers, technical papers, and in the longer future maybe joint special reports.

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