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MAINSTREAMING OF BIODIVERSITY IN THE INFRASTRUCTURE SECTOR

Note by the Executive Secretary

I. BACKGROUND

1. At the thirteenth meeting of the Conference of the Parties to the Convention on Biological Diversity, a decision was adopted concerning the mainstreaming of biodiversity within and across economic sectors, and called for the mainstreaming of biodiversity in the sectors of energy and mining, infrastructure, manufacturing and processing, and health to be considered at its fourteenth meeting (decision XIII/3). Definitions of mainstreaming biodiversity vary, but essentially it is the process of making the consideration of biodiversity integral to decisions that have the potential to impact it.

2. The present document builds on documents produced for consideration by Parties at the twenty-first meeting of the Subsidiary Body on Scientific, Technical and Technological Advice.[1] It provides a brief overview of the infrastructure sector (the different major types of infrastructure, key actors, major trends, impacts and recent developments). This is followed by an exploration of key themes and potential approaches to mainstreaming biodiversity in the sector, including existing approaches and standards, good practice, and challenges. Opportunities and potential actions are then presented in the final section.

II. THE INFRASTRUCTURE SECTOR

A. Introduction

3. Infrastructure is fundamental to human societies. Built infrastructure is central to economic growth and facilitates every aspect of modern life. It includes the transport infrastructure that moves people and goods across the globe, telecommunications, energy infrastructure that delivers power to homes and business, urban infrastructure, and the dams, water and wastewater treatment plants and water pipelines that manage water supplies for domestic, industrial and agricultural use.

4. Infrastructure is required for almost every transaction, including the transport of raw materials for, and products from, the manufacturing and processing sector, agriculture, forestry, energy and mining. The construction of infrastructure and, in some cases, its operation and maintenance, relies on large quantities of materials (in particular construction minerals and timber) as well as water and energy. It is therefore

* CBD/SBI/2/1.

[1] Documents CBD/SBSTTA/21/INF/5 (Environmental assessment legislation - a global overview); CBD/SBSTTA/21/INF/9 (Energy and mining); CBD/SBSTTA/21/INF/11 (Infrastructure and biodiversity); CBD/SBSTTA/21/INF/12 (Manufacturing and processing); CBD/SBSTTA/21/INF/13 (Strategic Environmental Assessment and Environmental Assessment); CBD/SBSTTA/21/INF/14 (Cities and Infrastructure and Biodiversity Implications); CBD/SBSTTA/21/INF/15 (Options on how to make best use of existing programmes of work to further enhance the implementation of the Convention in the light of mainstreaming needs and the Strategic Plan for Biodiversity 2011-2020).

important to consider biodiversity and ecosystem services throughout the entire supply chain and life cycle of infrastructure projects.

5. Infrastructure is also an important component of the 2030 Agenda on Sustainable Development, included in Sustainable Development Goal 9. Infrastructure is also very relevant for a number of other Sustainable Development Goals, including Goal 11 on cities and human settlements.

B. Types of infrastructure

6. There are many different types of infrastructure: linear infrastructure (e.g. railways, roads and highways, pipelines, telecommunications cables and river and canal systems); energy infrastructure (e.g. energy distribution (also part of linear infrastructure), power plants, hydroelectric dams); urban/social infrastructure (residential buildings, non-residential buildings, such as hospitals and schools, footpaths and cycleways, car parks and leisure infrastructure); transport infrastructure (including linear infrastructure, such as roads and railways, airports and bus stops); water infrastructure (wastewater and water treatment plants and dams); and marine infrastructure (ports, sea defences, pipelines and platforms).

7. While most infrastructure relies heavily on engineered structures (referred to as "grey" infrastructure), approaches using nature-based infrastructure are increasingly being undertaken.[2] For example, "natural" infrastructure (such as mangroves and forests) has been used to provide infrastructure services, including water treatment or coastal protection. "Green" infrastructure[3] (whereby planted or other adapted systems are used to mimic natural processes) can be used for processes such as water purification or management. These approaches not only reduce the need for built (or "grey") infrastructure but can also provide additional ecosystem services.

C. Major trends

8. While estimates vary, the major trend in the infrastructure sector is likely to be one of growth (depending on the assumptions made for future projections and what types of infrastructure are included). For example, one projection indicates that 25 million kilometres of new paved roads and 335,000 kilometres of railroad track will be required by 2050.[4] Demand for both "conventional" and "smart"[5] power grids are also likely to increase.

9. With increasing urbanization (particularly in Asia, Latin America and Africa), and growth in infrastructure-dependent sectors (for example energy and mining), there will also be increased demand for, and construction of, associated infrastructure. This includes urban infrastructure,[6] pipelines, energy distribution infrastructure and access routes, including road and rail links.

10. This growth is particularly evident in developing countries. Noting that forward-looking estimates inevitably vary, one projection indicates that US$ 6.3 trillion of infrastructure investment would be needed each year between 2016 and 2030 to meet likely demand.[7] This is nearly double the estimated US$ 3.4 trillion annual global infrastructure investment currently.[8] However, supply is unlikely to be able

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[2] For examples see: https://www.equatorinitiative.org/knowledge-center/nature-based-solutions-database/

[3] "An interconnected network of natural areas and open spaces that conserves natural ecosystem values and functions, sustains clean air and water, and provides a wide array of benefits to people and wildlife" (Benedict, M. A. and McMahon, E. T. (2006). *Green Infrastructure: Linking Landscapes and Communities*. Island Press).

[4] Laurence et al (2014). A global strategy for road building. Nature 513, 229-232; Dulac, J. (2013) Global land transport infrastructure requirements: Estimating road and railway infrastructure, capacity and costs to 2050. Paris, France: Internal Energy Agency; Alamgir et al (2017) Economic, Socio-Political and Environmental Risks of Road Development in the Tropics. *Current Biology* 27 1130-1140.

[5] International Energy Agency (2011) *Technology Roadmap: Smart Grids*. Paris: Internal Energy Agency.

[6] Seto, K.C. (2012). Global forecasts of urban expansion to 2030 and direct impacts on biodiversity and carbon pools. *Proceedings of the National Academy of Sciences*. vol. 109, No. 40. http://www.pnas.org/content/109/40/16083.

[7] Organization for Economic Cooperation and Development (2017). *Investing in Climate, Investing in Growth*, OECD Publishing, Paris [Online] Available from: http://www.oecd-ilibrary.org/economics/investing-in-climate-investing-in-growth_9789264273528-en [Accessed March 2018].

[8] The New Climate Economy (2016). *The Sustainable Infrastructure Imperative* [Online] Available from: http://newclimateeconomy.report/2016/ [Accessed March 2018].

to keep up, leading to infrastructure "gaps". With public finance for infrastructure declining, new sources of funding for infrastructure projects will be needed.

D. Biodiversity and ecosystem service impacts and dependencies

11. Infrastructure has both direct and indirect impacts on biodiversity and ecosystem services. The types, scale and duration of these impacts vary across infrastructure types and depend on the environment in which they occur, the biodiversity values and ecosystem service values present, the design and nature of the operation, and the impact mitigation measures adopted.

12. At a global level, infrastructure development is cited as one of the major drivers of biodiversity loss.[9] The fragmentation[10] effect of large linear infrastructure projects (such as roads), noise, water, soil and air pollution, water extraction and indirect or induced impacts[11] associated with opening up previously inaccessible areas to human activity (both legal and illegal, such as poaching) can result in loss of biodiversity and degradation of ecosystem services long after construction ends[12]. Less obvious, but potentially more damaging, indirect impacts can occur throughout the whole life cycle of an infrastructure project. In addition, the supply change impacts, such as those associated with the extraction and processing of raw materials for infrastructure construction (such as steel) should equally be considered.

13. The infrastructure sector is dependent on ecosystem services, including the provision of water for construction (e.g. water required for the preparation of mortar, cement or other materials), and protection from landslides or flooding. Another example is the networks of habitats that support functioning ecosystems and populations of species, such as wildlife corridors and flyways, that have been shown to be important to maintain certain infrastructure services.[13]

E. Key actors

14. A large number of actors are involved with and/or impacted by infrastructure projects, with each having potential contributions to mainstreaming biodiversity in the sector. These include national Governments, subnational governments, development banks and other financial institutions, indigenous peoples and local communities, non-governmental organizations, conservation groups, protected area and biodiversity resource managers, academia, research institutions and businesses involved with the planning, design, construction and operation of infrastructure (among other stakeholders).

III. THEMES AND APPROACHES FOR MAINSTREAMING BIODIVERSITY INTO THE INFRASTRUCTURE SECTOR

15. As almost all types of infrastructure are likely to increase over the coming years, there is a need to find ways of reducing demand for new infrastructure by making the most of existing infrastructure and increasing efficiencies as well as ensuring that any additional infrastructure considers biodiversity impacts and dependencies. There are a number of points of intervention for mainstreaming biodiversity within the infrastructure sector: (a) through demand and efficiencies; (b) strategic planning and impact assessment;

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[9] Organization for Economic Cooperation and Development Environmental (2012). *OECD Environmental Outlook to 2050: The Consequences of Inaction* [Online] Available from: http://www.oecd.org/env/indicators-modelling-outlooks/oecd-environmental-outlook-1999155x.htm [Accessed March 2018].

[10] "The disruption and spatial and functional break-up of extensive habitats into isolated and small patches, often by roads, housing developments, and other human activities" (Business and Biodiversity Offsets Programme (BBOP). 2012. Glossary. BBOP, Washington, D.C. 2nd updated edition [Online] Available from http://bbop.forest-trends.org/guidelines/Updated_Glossary [Accessed March 2018]).

[11] Impacts triggered in response to the presence of the project, rather than being directly caused by the project's own operations such as inward migration of people. An outcome directly attributable to a defined action or project activity, e.g. the impact a mine site has through its use of water, the land footprint that it occupies (Business and Biodiversity Offsets Programme (BBOP). 2012. Glossary. BBOP, Washington, D.C. 2nd updated edition [Online] Available from http://bbop.forest-trends.org/guidelines/Updated_Glossary [Accessed October 2017]).

[12] Alamgir, M., Campbell, M.J., Sloan, S., Goosem, M., Clements, G.R., Mahmoud, M.I., and Laurance, W.F. (2017) Economic, Socio-Political and Environmental Risks of Road Development in the Tropics. *Current Biology* 27(20):R1130-R1140. doi: 10.1016/j.cub.2017.08.067.

[13] Benedict, M. A. and McMahon, E. T. (2006). *Green Infrastructure: Linking Landscapes and Communities*. Island Press.

(c) contracting; (d) financing; (e) procurement; (f) construction; (g) operation; (h) decommissioning; and (i) project legacy. These are explored below.

A. National laws and policies: incentives and penalties

1. Introduction

16. Effective mainstreaming of biodiversity in specific sectors requires a strong and comprehensive legal framework that reflects international good practice and associated policy support. There is an array of legal and policy instruments available, including: constitutional provisions; planning laws; procurement laws; environmental laws and regulations; criminal law; human rights laws; regulation of infrastructure via permitting processes; regulations on liability for environmental damage; access to courts; and incentive based policy instruments.

2. Selected existing approaches, standards and good practice

17. National biodiversity strategies and action plans (NBSAPs) can provide frameworks for managing biodiversity opportunities and impacts of the infrastructure sector, as well as strategically planning the contribution of biodiversity and ecosystem services to the sector. By the end of 2017, 189 of 196 Parties (96 per cent) had developed national biodiversity strategies and action plans as part of their commitments under the Convention on Biological Diversity. Of these, 36 had strategies or actions that relate to environmental and social impact assessment or strategic environmental assessment. While few had strategies or actions specific to infrastructure, some examples exist: (a) the strategy of Namibia to enhance its protected area infrastructure for tourism and staff; (b) actions to review infrastructure needs in order to manage biodiversity sustainably; and (c) investment in infrastructure for biodiversity data storage and collection. Both Nepal and South Africa identified investment in "green" or "ecological" infrastructure to improve connectivity for wildlife, and Sri Lanka identified an action to research and monitor the impacts of infrastructure development on biodiversity.

18. National legislation that mandates the use of effective, rigorous and transparent environmental and social impact assessments and strategic environmental assessments is crucial for planning for and mitigating potential impacts of infrastructure development at a project and strategic level. Such legislation needs to be appropriate to national circumstances and applied at all levels of government where decisions on infrastructure are taken.

19. Land use planning policies are of critical importance given the potential impacts on biodiversity that can result from the location of infrastructure development and associated activities. National development plans and policies can promote or require land use planning that integrates biodiversity and ecosystem services considerations. These planning processes also need to consider the migration of people as a result of large projects that can lead to a suite of associated development and induced impacts.

20. No-net-loss or net-gain policies, based on the concept of the mitigation hierarchy[14] are increasingly relevant for the infrastructure sector. Over 100 countries currently have, are developing, or are starting to discuss national Government policies to require, encourage, guide or enable the use of offsets.[15] Australia, for example, has policies at both the national and subnational levels, including guidance and calculator tools. Other countries have legislation or policy in place that helps to facilitate voluntary offsetting. The European Union's biodiversity strategy includes provisions for promoting links between green infrastructure implementation and no-net-loss policies, which can include compensating and off-setting schemes. International standards, such as the International Finance Corporation's Performance Standard 6,

[14] An impact mitigation process that prioritises strategies to avoid impacts, followed by those that minimize, restore and finally offset or compensate for impacts and deliver gains. Strategies to avoid or minimize impacts should be prioritized over remediation through restoration and offsetting where there is greater uncertainly and time lags associated with biodiversity outcomes (Cambridge Conservation Initiative (2015). Strengthening implementation of the mitigation hierarchy: managing biodiversity risk for conservation gains. A Cambridge Conservation Initiative – Collaborative Fund Project Report compiled by: BirdLife International, UNEP-WCMC, RSPB, FFI and the University of Cambridge).

[15] The Biodiversity Consultancy (2016) Government policies on Biodiversity Offsets [Online] Available from: http://www.thebiodiversityconsultancy.com/wp-content/uploads/2013/07/Government-policy-2.pdf [Accessed March 2018].

require the consideration of many such concepts for lending, and have been helpful in mainstreaming biodiversity considerations into the projects they fund.

21. Procurement policies and laws enable biodiversity to be integrated into the procurement process. Many countries have been modernizing their public procurement laws, integrating sustainability into the decision-making process.

22. Local content policies are also a consideration due to the expectations of income generation around large infrastructure policies. If not met, this can lead to environmental degradation associated with alternative revenue streams in an area.

23. Steps towards national integration of natural capital accounting have been taken through numerous efforts, including in the Gaborone Declaration for Sustainability in Africa, which calls on governments and other stakeholders to integrate "the value of natural capital into national accounting and corporate planning and reporting processes, policies and programmes".[16]

3. Challenges

24. A key challenge is linking national biodiversity strategies and action plans to development and sectoral plans, such as national development plans. National development plans often lack approaches to balance infrastructure development with the provision of biodiversity and ecosystem services. However, there are examples of where National Development Plans explicitly recognise the value of biodiversity.

25. Even where specific examples of good practice exist, a challenge can be to ensure policy coherence across the range of sectoral laws and policies as well as between the mandates of national and subnational governments. While some national biodiversity strategies and action plans mention infrastructure (and, to a lesser extent, some national development plans and sectoral strategies mention biodiversity and ecosystem services), inconsistency and a lack of clarity in the intent and language of policy instruments may lead to contradicting policy advice, and this is a significant barrier to implementation and uptake.

26. Implementation of policies and legislation requires cooperation and coordination across sectors, as well as institutional capacity to monitor and enforce compliance, which are often lacking. There are also challenges around setting and enforcing appropriate financial and other penalties for non-compliance that reflect the extent of impact on biodiversity. These challenges can be particularly acute for polices that require detailed accounting of biodiversity impacts, such as those related to no-net-loss or net-gain policies.

B. Good planning: spatial planning and strategic environmental assessment

1. Introduction

27. Spatial planning and strategic environmental assessments are key tools used to mainstream biodiversity at the policy, plan or programme level.

2. Selected existing approaches, standards and good practice

28. A fundamental part of successful biodiversity mainstreaming is effective planning, which allows alternatives to mitigate the impact from the very beginning and avoid unintended or cumulative effects of infrastructure development. Spatial planning at the landscape/seascape level works across sectors, to integrate biodiversity and ecosystem services values and link into national and subnational planning mechanisms and policies. This scale of planning is particularly important in the infrastructure sector, where single or multiple forms of developments will often traverse or bisect large areas over long periods of time, and can stimulate growth in a range of other sectors in certain locations. It can also be relevant to achieving multiple, intertwined priorities, such as the Sustainable Development Goals, and to facilitating the consideration of alternatives to traditional infrastructure projects, including "natural" and "green" infrastructure.

[16] The Gaborone Declaration for Sustainability in Africa (no date) About the GDSA [Online] Available from: http://www.gaboronedeclaration.com/about-the-gdsa-1/ [Accessed March 2018].

29. Strategic level spatial planning can help identify and address cumulative and induced impacts of multiple types of infrastructure at the landscape or seascape scale, helping avoid conflicts between infrastructure development and conservation and social considerations. It can also help identify areas that are off limits to certain types of infrastructure developments. An example of this would be identifying utility corridor routes that have the least impact on biodiversity and ecosystem services, when a combination of transmission grids, roads or rail lines are planned in one area. Marine spatial planning is growing in significance.[17]

30. There are a growing number of tools available to support spatial planning (e.g. the Integrated Biodiversity Assessment Tool,[18] and MapX[19]).

31. Central to effective planning are strategic environmental assessments that target strategic-level decision-making with regard to government policies, plans or programmes, allowing "upstream" consideration of biodiversity early on in government planning. These can be national, regional, transnational or sector-specific and may be conducted either to fulfil a requirement in the law, as a result of financing requirements, or on a voluntary basis.[20] Biodiversity needs to be considered along with a range of environmental, social and economic factors (including cumulative impacts), and, therefore, cross-sectoral participation across government ministries, as well as consultation with other stakeholders including local communities is important. These assessments need to be conducted in a scientifically rigorous, coherent and consistent manner. They should also be updated as needed to ensure that they remain relevant and applicable as sectors and other factors change over time.

3. Challenges

32. The use of strategic-level spatial planning and strategic environmental assessments is growing, with promising initial outcomes, but they are not yet embedded in the legal framework of all countries. With many still in the early phases of development, adopting consistent and effective approaches to carrying out strategic environmental assessments will be key to their success.

33. Lack of effective stakeholder engagement, good data and tools, the support of government, sufficient financial resources and a good legal framework (specifically a competent authority charged with, responsible for, and capable of executing such assessments), among other factors, are identified as key challenges to the production and implementation of spatial plans and strategic environmental assessments in both terrestrial and marine environments.[21]

34. Particular challenges can arise when the hierarchy of authority and specific roles within relevant institutions (that are both creating and subject to strategic environmental assessments) are unclear.

C. Impact assessment and mitigation: environmental and social impact assessment

1. Introduction

35. Environmental and social impact assessments (and associated environmental management plans, biodiversity action plans and species action plans), coupled with robust avoidance and mitigation measures, are crucial for avoiding or addressing the impacts of infrastructure development.

2. Selected existing approaches, standards and good practice

36. The use of environmental and social impact assessments for evaluating the potential impacts of projects is widespread. Approaches to environmental and social impact assessments vary, but, generally,

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[17] Jay, S., Ellis, G. and Kidd, S. (2012) Marine Spatial Planning: A New Frontier?, *Journal of Environmental Policy & Planning*, 14:1, 1-5, DOI: 10.1080/1523908X.2012.664327

[18] IBAT Alliance (no date) IBAT Alliance [Online] Available from: https://www.ibat-alliance.org/ [Accessed March 2018].

[19] MapX (no date) MapX [Online] Available from: https://www.mapx.org/ [Accessed March 2018].

[20] Saxena, A., Rajvanshi, A., and Mathur, V. B. (2016), Progressive Trends in the Uptake of SEA in South Asia, *Journal of Environmental Assessment Policy and Management* (JEAPM), 18, (02), 1-22.

[21] Picone, F., Buonocore, E., D'Agostaro, R., Donati, S., Chemello, R., and Franzese, P.P. (2017). Integrating natural capital assessment and marine spatial planning: A case study in the Mediterranean sea. *Ecological Modelling*, Volume 361, pp. 1-13.

they identify and analyse the broad range of environmental and social impacts that could arise from the project and identify actions to mitigate them that are then outlined within an environmental management plan. After a project is approved, such actions (and their associated timelines) can be associated with the conditions of the licence. The environmental management plan can be used to guide the project after the approval stage. Contained within the environmental management plan would be the project's biodiversity action plan and, as necessary, associated species action plans. Biodiversity action plans should seek to support and implement national biodiversity strategies and action plans.

37. Good practice guidance for environmental and social impact assessment and mitigation often includes adherence to the mitigation hierarchy, and working towards targets such as no-net-loss or net-gain of biodiversity.[22] Biodiversity offsets are gaining popularity where residual impacts remain, but this is not a universally accepted approach, and there is significant debate about the applicability, appropriateness and effectiveness of biodiversity offsetting under certain conditions. The World Bank is involved in a number of activities related to biodiversity offsetting, including developing a toolkit and sourcebook, supporting projects that include offsets that lead to the establishment or strengthening of important protected areas These approaches are looking to develop national aggregated offset systems and therefore differ from project-specific offsets.

38. While impact mitigation is an iterative process throughout the project life cycle, opportunities for impact avoidance are far greater at the planning phase of development, where it can influence siting and design. This approach necessitates quantification of losses and gains to biodiversity and extends to indirect and induced impacts where these can be reliably predicted to occur. A number of tools can be used to help quantify these losses and gains, such as natural capital accounting or biodiversity offsetting.

39. Assessment of cumulative impacts should be undertaken as part of environmental and social impact assessments in order to address impacts derived from the successive, incremental, and/or combined effects of an action, project or activity when added to other existing, planned, and/or reasonably anticipated future ones. This process should be clearly linked to strategic environmental assessments where they are carried out.

40. The outcome of environmental and social impact assessments should be integrated into the procurement process in such a way as to ensure that calls for tender and subsequent contracts contain references to any safeguard measures that are identified.

41. Effective environmental and social impact assessment requires: (a) developing comprehensive and implementable environmental management plans (with associated biodiversity action plans and species action plans as necessary); (b) a legal process in place to ensure that sufficient information is available to all relevant stakeholders at regular intervals throughout the life cycle of the project; (c) adequate capacity for monitoring and enforcement; and (d) availability of good data on biodiversity and ecosystem services, particularly for new sector activities or locations, such as marine infrastructure.

42. Investment institutions (e.g. the International Finance Corporation, World Bank and European Investment Bank) as well as private sector banks (e.g. the Equator Principles Banks) require stringent environmental impact assessment procedures to be applied to any infrastructure projects they agree to support as part of their Environmental and Social Performance Standards requirements. Both the World Bank and IFC recently adopted updated environmental and social safeguards, which are likely to set the new global best practice standards. Good practice around accurately assessing and valuing nature is being developed. Engaging with research bodies to develop indicators and understand biodiversity impacts, emerging technologies and approaches (e.g. the effectiveness of habitat restoration) will help increase the evidence base and fill data gaps.

[22] The goal that the biodiversity (and ecosystem services) impacts of a project are balanced so that no net loss occurs or there is an overall net gain for biodiversity (and ecosystem services) as a result of the project. This is done through the mitigation hierarchy. (BBOP (2012) Glossary. BBOP, Washington, D.C., 2nd updated edition [Online] Available from http://bbop.forest-trends.org/guidelines/Updated_Glossary [Accessed November 2017]).

3. Challenges

43. Ensuring that the mitigation or other actions identified in environmental and social impact assessments and associated environmental management plans are carried out is a key challenge to mainstreaming biodiversity in the infrastructure sector. There are a number of entry points for strengthening the implementation of follow-up measures, including expanding the powers (and clarifying the chain of action) of the competent enforcement agencies, creating regional monitoring networks and requiring a financial surety or bond for the implementation of follow-up measures prior to project approval. Making environmental and social impact assessment decisions or recommendations and permitting conditions/implementation guidelines available to the public and relevant agencies helps to support follow-up measures (including enforcement in case of non-compliance) and adaptive management.[23]

44. International and regional finance institutions play a large role in driving uptake of good practice (e.g. adherence to the mitigation hierarchy). However, when these standards are not aligned with national environmental and social impact assessment requirements (and institutions), challenges can arise. It is therefore important that government agencies be aware of and understand these standards and provide an enabling policy environment for their implementation. It is equally important that robust standards be mainstreamed across finance institutions.

D. Effective institutions: enforcement, transparency, coordination and consultation

1. Introduction

45. Effective institutions for infrastructure development are of paramount importance in creating sector-wide change through the development and implementation of policies, laws and regulations, establishing mechanisms for public participation and enhancing the availability of environmental data and information.[24]

2. Selected existing approaches, standards and good practice

46. Effective institutions encompass a range of inter and intra ministerial structures, process and committees that are important for management and implementation. They rely on a number of factors including transparency, accountability, coordination, stakeholder engagement, capacity, independent funding, clarity of mandate and information.

47. The Construction Sector Transparency Initiative (CoST) "works with governments, industry and local communities around the world to get better value from public infrastructure investment by increasing transparency and accountability".[25] By providing a platform for Governments to disclose information on public infrastructure investment in the 15 participating countries, it helps to inform stakeholders and hold decision makers to account. Such transparency and accountability can help "reduce mismanagement, inefficiency, corruption and the risks posed to the public from poor infrastructure".

48. In 2017, the Organization for Economic Cooperation and Development released "*Getting Infrastructure Right: A Framework for Better Governance*".[26] Apart from recognizing the challenges associated with effective institutions for the infrastructure sector, it provides a framework for the governance of infrastructure. As many countries face rapid growth in infrastructure, there is a considerable opportunity for countries with an established infrastructure sector to share their experiences. This could be particularly useful for sharing information and experience among countries within the same region and contexts.

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[23] United Nations Environment Programme (2018). *Assessing Environmental Impacts - A Global Review of Legislation*, Nairobi, Kenya.

[24] Heathcote, C. (2018). A critical piece of the infrastructure puzzle: good governance [Online] Available from: http://blogs.worldbank.org/ppps/critical-piece-infrastructure-puzzle-good-governance [Accessed March 2018].

[25] Construction Sector Transparency Initiative (CoST). [Online] Available from: http://www.constructiontransparency.org/the-initiative?forumboardid=1&forumtopicid=1.

[26] Available from: http://www.oecd-ilibrary.org/governance/getting-infrastructure-right_9789264272453-en.

3. Challenges

49. Infrastructure projects are often the largest-scale investment within a country and therefore involve multiple ministries, including environment, planning, development and finance. This can lead to an unclear mandate to act. Responsibility for impacts and coordination across ministries does not always take place.

50. Technical capacity and resources can also be a real constraint to understanding and managing large infrastructure projects that traverse regional and sometime national boundaries.

51. In addition, open and transparent dialogue and consultation with key stakeholder groups (including indigenous peoples and local communities, and industry) is crucial for developing the institutional capacity to manage infrastructure developments.

E. Funding and environmental and social safeguards: innovative solutions to finance and investment

1. Introduction

52. The development of sustainable infrastructure will require significant additional funding and capacity-building to address the "infrastructure gap" (as described in section C).

2. Selected existing approaches, standards and good practice

53. While there are well established mechanisms for funding projects that consider biodiversity and ecosystem services, there are fewer options for funding planning and impact assessments at the policy, plan or programme level. Engaging with the finance sector at this level could provide financial support and capacity-building for strategic environmental assessment and developing effective, transparent, accountable and inclusive institutions.

54. In recognition of the significant "infrastructure gap", the Global Investment Fund was formed. Comprising private sector investors as well as multilateral development banks and donor countries, the Global Investment Fund provides financial support for governments to deliver well-structured and designed/planned infrastructure projects. However, it is likely that public-private sector partnerships and greater private financing of infrastructure projects will be required.

55. Multilateral development banks and international finance institutions provide vital project level financial support, some of which require biodiversity and ecosystem services to be considered as a condition of funding being granted. For example, under the International Finance Corporation's Performance Standard 6, lending for any project within an area defined as a critical habitat would only be considered if it can be demonstrated that there will be a net positive gain as a result. Appropriate use of the mitigation hierarchy is also supported through such standards.

56. Creating strong links between national legislation and policies and international standards may be a powerful tool for mainstreaming biodiversity in the infrastructure sector. Public finance for infrastructure could play a similar role through the adoption of the biodiversity standards of international finance institutions. The Equator Principles provide a risk management framework, adopted by financial institutions, for determining, assessing and managing environmental and social risk in projects. Members are required to apply the performance standards of the International Finance Corporation. There are currently 92 Equator Principles financial institutions in 37 countries, covering the majority of international project finance debt within developed and emerging markets.

57. One source of potential finance for biodiversity conservation is compensation related to the impacts of infrastructure (e.g. biodiversity offsets) or payment for ecosystem services. Given the uncertainty of outcomes for biodiversity, offsets and compensation should be seen as a last resort when avoidance, minimization and restoration options are exhausted. Offsets as a resource mobilization strategy should be treated with caution.

58. With a significant funding gap likely to develop, a number of innovative financing instruments have been suggested.[31] These include viability gap funds, which support sustainable and/or innovative projects that would otherwise not be financially viable, and instruments such as environmental fiscal reform (EFR) or ecological fiscal transfers.

59. Natural capital assessments and tools such as the sustainable asset valuation tool (SAVi) may help make the "business case" for biodiversity-inclusive, sustainable infrastructure projects. Schemes such as the United Nations Principles for Responsible Investment help investors consider such factors as the environment in their decision-making.

3. Challenges

60. Perhaps the main challenge to mainstreaming biodiversity is the huge demand, urgency and lack of funds for infrastructure, which can make the consideration of alternatives and costly mitigation unpalatable. There is a need to ensure that lenders for infrastructure development apply stringent environmental and social standards that consider biodiversity and ecosystem services at every stage. Equally, while there is increasing acceptance of market-based systems to internalize environmental costs, biodiversity accountancy is still in its infancy, and there remains a high degree of uncertainty associated with such activities as restoration and biodiversity offsetting.

F. Good data and information

1. Introduction

61. Inherent in all good decision-making is the need for good data and information. Many of the overarching data and information needs are common across sectors. However, as infrastructure projects are often large in scale (e.g. transboundary pipelines), the geographical data requirements can be greater than single point developments. Data requirements can also be more complex, particularly if infrastructure is closely associated with natural ecosystems (e.g. water catchment management).

62. Consultation is essential to reach the wealth of relevant information held by international organizations, national and subnational governments, national and local conservation groups, non-governmental organizations, companies, academics, indigenous peoples and local communities and other stakeholder groups. Such consultations can also highlight important social and cultural values associated with biodiversity and ecosystem services that may not be obvious from data alone.

2. Selected existing approaches, standards and good practice

63. Collation of and access to biodiversity and ecosystem service data is not consistent. Examples of tools that provide access to relevant biodiversity-relevant data for decision makers are the Global Biodiversity Information Facility (GBIF), the Integrated Biodiversity Assessment Tool (IBAT), MapX and the Local Ecological Footprint Tool (LEFT).

64. A number of countries are advancing their national data platforms to make national-level data available across institutions for decision-making. As Internet access improves with investment in telecommunications infrastructure, this is set to improve further. Examples include the MAGIC website and the National Biodiversity Network for the United Kingdom of Great Britain and Northern Ireland,[27] [28] that relates to their obligations under The Infrastructure for Spatial Information in Europe (INSPIRE) Directive) – a platform for a huge range of biodiversity records. Systematic collation and publication of biodiversity-relevant data via online databases is likely to be helpful to governments, companies and other stakeholders, including communities and advocacy bodies. Sharing experiences of methods, standards and data infrastructures (along with funding models to maintain them) could also help create consistent systems that are interoperable across national borders and feed into global tools, such as the Global Biodiversity Information Facility.

65. Data collected through strategic environmental assessments and environmental and social impact assessments (including monitoring data and assessments undertaken in the marine realm) could provide valuable information on biodiversity and ecosystem services at scales relevant to infrastructure planning and projects. While these assessments and their underlying data are seldom public, they provide an

[27] MAGIC (no date) MAGIC: Interactive Mapping at your Fingertips [Online] Available from: http://www.magic.gov.uk/home.htm [Accessed March 2018].

[28] NBN (2018) Where we are [Online] Available from: https://nbn.org.uk/about-us/where-we-are/ [Accessed March 2018].

opportunity to greatly increase the availability of biodiversity data, as well as transparency around decision-making and development.

3. Challenges

66. An enormous amount of biodiversity and ecosystem service data exists, but data availability and accessibility remains a challenge for governments and businesses alike when making decisions that can have biodiversity impacts. There are several barriers to effective data management and sharing, including technology for sharing and using data, capacity to understand and use data, and a willingness to share data for social and political reasons.

67. One of the key data challenges facing decision makers is lack of data for certain habitats or locations. With the growth of marine infrastructure and associated activities, data gaps in the marine realm are particularly problematic. As many infrastructure projects cross subnational (and sometimes international) borders, variation in data availability and policy along the length of a project can lead to uncertainty when making decisions about biodiversity and ecosystem services.

68. Monitoring data (usually collected during construction, operation and post decommissioning) is vital to assess the effectiveness of mitigation measures. A lack of these data can prevent adaptive management of projects and obstruct the comprehensive assessment of the effectiveness of policies, such as no net loss.

69. While many countries have policies requiring data collected by the private sector to be made public, data may not always be published in an accessible and interoperable format, preventing use by other stakeholders.

70. Many countries also lack the telecommunications and informatics infrastructure to host comprehensive biodiversity and ecosystem services platforms and ensure access to decision makers and stakeholders. Licensing of maps and other data (many are not available for commercial use, for example) can also prove challenging to providing open access.

G. Innovation: reducing demand, increasing efficiency and considering alternatives

1. Introduction

71. An overall reduction in demand for new infrastructure by increasing the efficiency of existing and new infrastructure will be a key strategy for reducing the impact of this sector on biodiversity. If existing infrastructure can be upgraded or developed for multiple purposes, the biodiversity and ecosystem service impacts may be avoided or reduced compared to the development of new infrastructure. Similarly, improving the performance of new infrastructure may reduce future demand for both additional infrastructure and for materials for maintenance and operation. “Natural” or “green” infrastructure alternatives are increasingly being found to traditional engineered solutions and, in addition to reducing the need for grey infrastructure, can offer a number of benefits associated with biodiversity, health and wellbeing and climate change or adaptation. Enabling policies will be required to scale innovative solutions.

2. Selected existing approaches, standards and good practice

72. A number of countries have reviewed their infrastructure requirements and are actively seeking ways to make infrastructure more efficient.

73. Avoiding impacts should be the first step where possible, such as considering decentralizing power generation to reduce the need for powerlines and their associated impacts on flying species (e.g. collisions or electrocution). Exploring options for multipurpose infrastructure can help reduce demand, such as a dam that generates hydroelectric power, manages drinking water supply, provides irrigation for agriculture, assists with flood control, supplies industrial needs and/or provides amenity value, rather than having separate infrastructure for each application.

74. There is also potential to consider “natural” infrastructure solutions instead of engineered ones. One potential example of this might be creating oyster reefs to protect a pipeline instead of installing engineered rock barriers, which has been piloted through collaboration between a company and a

conservation organization. As well as creating new habitat and eliminating the impacts that would be associated with rock barriers, this hybrid approach is likely to adapt more readily to changes in sea level and was found to be economically effective.[29] The restoration of mangrove forests to protect coastlines as an alternative to sea walls is also being explored in various locations. Apart from being generally cheaper than hard-engineered solutions, well established mangroves can provide habitat for wildlife and fisheries-based livelihoods for local communities and act as carbon sinks. Many countries recognize the importance of natural infrastructure for the delivery of vital services, such as water management.

75. Assessing methodologies for the whole lifecycle of projects, not just the construction or implementation of infrastructure projects, can help reduce biodiversity and ecosystem service impacts. For example, a natural capital assessment of traditional open construction methods to lay a hypothetical pipeline compared to trenchless technology indicated that the latter method had considerably lower natural capital costs.[30] Life cycle costing and analysis can also help inform a wide range of project-related decisions at all stages.

76. Innovation to reduce demand and increase efficiency can also come through repurposing existing infrastructure after it has been decommissioned, such as creating public walkways along old transport infrastructure routes.

77. Despite the pressures, infrastructure demand also presents opportunities to reduce impacts. These include prioritising decentralized energy and water systems in rural areas to reduce impacts associated with energy transition and distribution, and staggering working hours to reduce traffic on roads rather than building new ones.[31] Such strengthened social structure innovation resulting from changes in behaviour could also play a role in reducing demand. The private sector is already exploring options for "natural" or "green" infrastructure, as well as innovative solutions for traditional infrastructure. In terms of experience, knowledge and funding, public-private infrastructure partnerships are an opportunity to build capacity and develop innovative solutions. Innovative approaches taken by indigenous peoples and local communities also provide opportunity for learning.[32]

78. The scientific community is supporting such approaches as natural capital assessments (that can help understand the full economic and environmental costs of infrastructure and consider alternatives[33]), and initiatives such as the Global Road Map (a large-scale template for proactively zoning and prioritizing roads[34]).

79. National policy plays a key role in incentivizing research, innovation and development of more efficient use of resources and alternative sources that perform better regarding biodiversity.

3. Challenges

80. Demand for infrastructure is at a critical point for many countries, making the time and money needed to develop "new" infrastructure approaches more difficult to find. Some (though not all) innovative approaches may also be more expensive in the initial stages (which can obscure the long-term advantages of new and innovative infrastructure for decision makers working over shorter timeframes), with others

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[29] Dow, Swiss Reinsurance Company, Shell Global, Unilever, and The Nature Conservancy (2013) Green Infrastructure Case Studies [Online] Available from: http://www.nature.org/about-us/working-with-companies/case-studies-for-green-infrastructure.pdf[[Accessed January 2018].

[30] Global Nature Fund (2017) Natural Capital Assessment for Trenchless Pipe Laying [Online] Available from: http://naturalcapitalcoalition.org/wp-content/uploads/2017/10/GNF-Pilot_Natural-Capital-Valuation-Construction-1.pdf [Accessed March 2018].

[31] WWF and IISD (2017) Biodiversity and Infrastructure: A better nexus? [Online] Available from: https://www.wwf.ch/sites/default/files/doc-2017-11/Final%20WWF%20IISD%20Study-mainstreaming%20biodiversity%20into%20infrastructure%20sector.pdf [Accessed March 2018].

[32] Equator Initiative (2017) Utooni Development Organisation [Online] Available from: https://www.equatorinitiative.org/2017/05/30/utooni-development-organization/ [Accessed May 2018].

[33] The stock of renewable and non-renewable resources (e.g. plants, animals, air, water, soils, minerals) that combine to yield a flow of benefits to people.

[34] Global Road Map (2018). Global Road Map [Online] Available from: www.global-roadmap.org [Accessed May 2018].

still at the pilot stage. However, not taking the time to consider innovative approaches and alternatives may be costly in the long run, economically, socially and environmentally.

81. Supply chains for many infrastructure projects are very complicated, leading to challenges around sustainable souring of materials and other supply chain considerations – particularly for new or untested approaches. Therefore, many innovative schemes may only be appropriate in certain circumstances.

82. There are sometimes barriers to efficient, multipurpose use of infrastructure. For example, challenges associated with opening up infrastructure associated with particular projects (such as railway lines) to uses beyond their original purpose. This could be, in part, a consequence of not considering multi-stakeholder use of infrastructure at the planning stage or what, if any, adaptations may be required to facilitate this.

83. Furthermore, such approaches as combined energy and transport infrastructure (solar roads, for example) may not be appropriate in all locations. Energy generation in a location that is far from the main energy demand sources could increase the overall demand for transmission infrastructure. Careful assessments must be done to reduce the risk of such unintended consequences on biodiversity and ecosystem services. Efforts to minimize disruption to urban areas, for example, can lead to infrastructure being located in natural areas, with the associated impacts for biodiversity. This links firmly to good strategic planning and impact assessment.

84. It should be noted that different countries may have differing levels of capacity for innovation, highlighting the challenge of sharing information, tools and technologies around good practices, capacity-building and funding for the implementation of innovative approaches.

IV. OPPORTUNITIES FOR CONSIDERATION BY THE SUBSIDIARY BODY ON IMPLEMENTATION

A. Parties

85. The Subsidiary Body may wish to consider recommending that Parties take the following actions:

(a) Take action to support the successful implementation of national biodiversity action plans and strategies, such as:

(i) Alignment and coordination with other national strategies and action plans;

(ii) Consideration of sector-specific infrastructure targets and actions during subsequent review processes;

(iii) Exploring with the private sector the options for a national biodiversity strategy and action plan for business;

(b) Review national legislation and policy of relevance to the infrastructure sector (all aspects, including environmental, social, sectoral, monitoring and planning) to identify where there are biodiversity-related gaps or a lack of coherence, and feeding this back into institutional arrangements. This could include actions, such as those listed below:

(i) Consider (where relevant) integrating international best practice concepts into national law. These include robust impact assessments that include cumulative and indirect impacts, adherence to the mitigation hierarchy, no net loss/net gain impact, natural capital assessments and accounting, and the use of biodiversity indicators and baselines;

(ii) Establish in law which geographic areas may be off limits to large infrastructure projects on the basis of a strategic policy planning process. For example, the national position on infrastructure activities within protected areas, including indigenous and community conserved areas, as well as the conditions of licence if granted (e.g. there must be a demonstrated net gain for biodiversity as a result of the development);

(iii) Develop or strengthen legislation for strategic environmental assessment (including infrastructure-specific content in sectoral laws), that includes cross-sectoral collaboration and allows for the consideration of alternatives;

(iv) Consider biodiversity and references to environmental and social impact assessments within national procurement laws as part of value for money assessments for the procurement of infrastructure projects;

(v) Develop national policy which incentivizes research, innovation and development of more sustainable infrastructure that performs better regarding biodiversity impacts;

(vi) Promote national policies for sharing data and information, including supporting, encouraging or requiring businesses to make biodiversity data collected as part of environmental and social impact assessments public in a format which is readily accessible;

(vii) Enshrine the role of the State as the steward of biodiversity in law, leading to liability in the case of its failure to uphold this duty. This could be a constitutional, broad responsibility, later elaborated on either by the legislature or the judiciary;

(viii) Ensure policy coherence between environmental and industry laws and policies. This could include, for example, direct references to biodiversity-related laws and policies within infrastructure plans, or at an absolute minimum statement that biodiversity and ecosystem services must be considered in all sectoral laws;

(c) Address the challenge of the implementation gap (or deficit) where legislative requirements exist but are not (fully) elaborated on or complied with and build institutional capacity for mainstreaming biodiversity into the infrastructure sector. This could include the following actions:

(i) Clarify ministerial mandates and dispute settlement procedures;

(ii) Ensure sufficient capacity for compliance monitoring of environmental licences and management plans;

(iii) Develop training or capacity-building programmes and integrate learning related to biodiversity, ecosystem services and innovation into the curricula of a range of educational institutions;

(iv) Strengthen guidance for environmental and social impact assessments that refer to the mitigation hierarchy and consideration of alternatives;

(v) Collaborate with other governments to identify opportunities for information exchange, capacity-building and funding opportunities;

(vi) Developing institutional capacity on the relationship between infrastructure, biodiversity and ecosystem services. This could include public-private partnerships with businesses from the infrastructure sector to build capacity. It should also include building capacity to implement sustainable procurement;

(vii) Discuss with potential donors the options for supporting capacity-building for governments to mainstream biodiversity into infrastructure development;

(viii) Encourage cross-government or interministerial policy approaches, dialogue and clear chains of responsibility that build understanding of the value of nature and the potential impacts and opportunities associated with infrastructure;

(d) Facilitate spatial planning at the landscape/seascape level that works across sectors, integrates biodiversity values and links into national and subnational planning mechanisms and policies through the consistent use of strategic environmental assessments;

(e) Consider the promotion of voluntary strategic environmental assessments until relevant legislation can be enacted;

(f) Ensure public participation (including stakeholders identified through links with ecosystem services) at an early stage of the strategic environmental assessment and throughout the entire process. This would include public involvement in determining whether a project should go ahead, and agreement on community development activities (such as environmental programmes and investment) arising from the project as well as post-closure;

(g) Create a direct link between the outcome of strategic environmental assessments and the procurement process for infrastructure projects (i.e. the inclusion of sustainability safeguards and criteria within the process of calling for, assessing and awarding contracts);

(h) Consider linking elements of stakeholder analysis (such as livelihood assessments) to ecosystem valuations and support comprehensive and responsive stakeholder consultation processes, including with indigenous peoples and local communities, to help provide fair assessments of the impacts on livelihoods of infrastructure projects;

(i) Explore public-private partnerships in order to develop innovative and green solutions to infrastructure demand, including innovative social and labour practices aimed at reducing demand and options for multipurpose infrastructure to reduce impacts on biodiversity and ecosystem services;

(j) Consider incorporating elements of good international practice (such as consideration of the mitigation hierarchy and assessment of cumulative and induced impacts) into public finance requirements for infrastructure;

(k) Work with finance and sector ministries to explore the creation of funds that could be used to support the mainstreaming of biodiversity in infrastructure;

(l) Develop a clear mechanism for ensuring transparency and access to information, as well as responsiveness to input provided. This could include the actions listed below:

(i) Adopt tools such as natural capital assessments, life cycle analysis tools and the sustainable asset valuation tool (SAVi) to assess options for sustainable development;

(ii) Support the development of national platforms and/or networks for increasing access to such information (recognizing that, in a range of countries, all this is already in place). This should include information from within a country's exclusive economic zone;

(iii) Link national biodiversity platforms (where present) to the obligations for reporting/data collection under other agreements in order to achieve synergies and cost savings.

B. The Executive Secretary

86. The Subsidiary Body may wish to consider recommending that the Executive Secretary take the following actions:

(a) Support coordination between Parties and international organizations (such as the United Nations Environment Programme, the United Nations Development Programme and the United Nations Human Rights Council) in order to avoid duplication and identify synergies relating to the implementation of multilateral environmental agreements at the national level;

(b) Support Parties in adopting clear and concise language within coherent environmental and industry policies, particularly when translating international commitments into national frameworks;

(c) Review existing guidance material related to strategic environmental assessments and environmental and social impact assessments with Parties, experts and other relevant stakeholders. Consider developing and issuing updated guidance, if required, that includes advice on consideration of ecosystem services;

(d) Engage with the business and financial sectors to promote strategic environmental assessments as an important tool for sustainable business and to gain their support for governments through this process;

(e) Provide a platform for the sharing of information and experiences on mainstreaming biodiversity into the infrastructure sector;

(f) Develop a long-term strategic theme of innovation for infrastructure and biodiversity under the Convention on Biological Diversity. Consider the following actions:

(i) Engaging with business and academia on innovation for sustainable infrastructure;

(ii) Engaging with the finance sector to develop innovative funding arrangements for mainstreaming biodiversity into the infrastructure sector;

(iii) Facilitating peer-to-peer learning for Parties on mechanisms to fund and encourage biodiversity-inclusive innovation at the national and regional levels. This could include facilitation of technology transfers, where appropriate;

(g) Learn from the way other issues have been mainstreamed, such as the way the United Nations has led on human rights and engaging with business leaders (e.g. the United Nations Guiding Principles on Business and Human Rights);

(h) Consider mechanisms for facilitating transnational cooperation on infrastructure projects;

(i) Increase access to data and tools for mainstreaming biodiversity into the infrastructure sector, by the following actions:

(i) Promoting and facilitating the work of organizations already active in the area;

(ii) Facilitating peer-to-peer learning for Parties on mechanisms for funding and creating effective national biodiversity and ecosystem service data and information;

(iii) Creating and maintaining a comprehensive central database of available sources of data and information to support stakeholders in learning from the experiences of others and developing appropriate, data-led approaches to mainstreaming biodiversity into the infrastructure sector.

C. Private sector

87. The Subsidiary Body may wish to consider recommending that private sector entities take the following actions:

(a) Engage in national business and biodiversity initiatives under the Global Partnership for Business and Biodiversity to share knowledge and experience of innovation in infrastructure, and encourage knowledge transfer and capacity development;

(b) Invest in research and development for innovative infrastructure types that reduce demand and increase efficiency;

(c) Ensure that projects are aligned with and supportive of strategic-level planning efforts and that they support the development of strategic environmental assessments;

(d) Ensure compliance with national legislation and international best practice where this provides greater biodiversity safeguards;

(e) Adopt transparent reporting as part of corporate disclosure, to include actions on biodiversity;

(f) Explore options for financing sustainable infrastructure projects, including developing the business case;

(g) Develop mechanisms to share biodiversity and ecosystem services data collected through environmental and social impact assessments and monitoring with governments and other stakeholders.

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