Biodiversity and Infrastructure: A better nexus?

Policy Paper on mainstreaming biodiversity conservation into the infrastructure sector – CBD SBSTTA 21

During the 13th Conference of Parties (COP) to the Convention on Biological Diversity (CBD) decided that the next COP would ultimately continue the *"Mainstreaming of biodiversity into the sectors of energy and mining, infrastructure, manufacturing and processing industry, and health"*. The 21st meeting of the Subsidiary Body on Scientific, Technical and Technological Advice (SBSTTA) will discuss initial draft propositions under Item 6 of the agenda.

In this brief, the World Wide Fund for Nature (WWF) and the International Institute for Sustainable Development (IISD) provide initial policy guidance for parties to consider prior to COP-14 in Egypt on how biodiversity mainstreaming can be reconciled with the infrastructure sector.

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Infrastructure development in Gabon

WWF

WWF is one of the world's largest and most experienced independent conservation organizations, with over 5 million supporters and a global network active in more than 100 countries. WWF's mission is to stop the degradation of the planet's natural environment and to build a future in which humans live in harmony with nature, by conserving the world's biological diversity, ensuring that the use of renewable natural resources is sustainable, and promoting the reduction of pollution and wasteful consumption.

IISD

The International Institute for Sustainable Development (IISD) is one of the world's leading centres of research and innovation. The Institute provides practical solutions to the growing challenges and opportunities of integrating environmental and social priorities with economic development. We report on international negotiations and share knowledge gained through collaborative projects, resulting in more rigorous research, stronger global networks, and better engagement among researchers, citizens, businesses and policy-makers.

IISD is registered as a charitable organization in Canada and has 501(c)(3) status in the United States. IISD receives core operating support from the Government of Canada, provided through the International Development Research Centre (IDRC) and from the Province of Manitoba. The Institute receives project funding from numerous governments inside and outside Canada, United Nations agencies, foundations, the private sector and individuals.

I. Introduction

The United Nations has stated that *"investments in infrastructure – transport, irrigation, energy and information and communication technology – are crucial to achieving sustainable development and empowering communities in many countries. It has long been recognized that growth in productivity and incomes, and improvements in health and education outcomes require investment in infrastructure."*[1]
Since the beginnings of civilization, developing infrastructure and conserving biodiversity have been at odds. Just as ancient civilizations expanded and fell, in part due to the imbalances they created in the natural habitats and ecosystems that fed and fuelled them, globalized societies today face the same challenges, but greatly exacerbated. Large infrastructure projects are destroying ecosystems from the Mekong to the Amazon.

At the same time, many governments consider infrastructure a key factor in their country's economic development, through the direct and indirect fiscal growth stimulus it can provide.[2] Infrastructure is also crucial for the attainment of the UN Sustainable Development Goals (SDGs) and is recognized as such in SDG 9: "*Industry, Innovation & Infrastructure; Build resilient infrastructure, promote inclusive and sustainable industrialization and foster innovation.*"[3] At the same time, the conservation of biodiversity underpins all the SDGs, and no long-term development can be envisaged unless the diversity of natural habitats and ecosystems is systematically included in the development, industrial and innovation policies.

Ecosystem-based approaches to climate change adaptation and mitigation, and disaster risk reduction have to be at the heart of the strategic planning across sectors.[4] But policies need to be more in sync with the market realities that are driving projects with detrimental environmental impacts.

This paper will discuss the catalytic opportunities for integrating biodiversity conservation into infrastructure development, particularly through the use of nature-based solutions and natural infrastructure. Undoubtedly, national biodiversity strategies and biodiversity action plans provide the first opportunities. The European Union Biodiversity Strategy, for example, makes provisions for baselines for valuing nature's benefits to society, the mainstreaming of biodiversity into key European Union funds and, most notably, the "links between Green Infrastructure implementation and no-net-loss policies which can include compensating and off-setting schemes."[5] Similarly, national green economy plans, national infrastructure plans and pipelines, national climate adaption and mitigation plans and broader rural development, agriculture and urban planning policies provide critical opportunities for integrating biodiversity goals with infrastructure development.

[1] *http://www.un.org/sustainabledevelopment/infrastructure-industrialization/*
[2] *http://www.ebrd.com/news/2015/infrastructure-spending-as-a-catalyst-of-growth-and-transition.html*
[3] *http://www.un.org/sustainabledevelopment/sustainable-development-goals/*
[4] *https://www.cbd.int/doc/decisions/cop-13/cop-13-dec-04-en.pdf*
[5] *http://ec.europa.eu/environment/nature/biodiversity/strategy/index_en.htm*

What is Sustainable Infrastructure?

The International Institute for Sustainable Development defines sustainable infrastructure assets that:

- Lower carbon and environmental footprints
- Provide for the stewardship of natural ecosystems in a manner that enhances the conservation of biodiversity
- Move beyond compliance on core labour standards and human rights
- Promote social cohesion
- Trigger green technological and industrial innovation across domestic and international value chains
- Spur investment in education, skills building and research and development
- Increase employment and the growth of green jobs
- Are financially viable
- Crowd-in domestic investors and businesses
- Increase opportunities for foreign direct investment and domestic value added
- Optimize value for money for taxpayers and investors across the asset life cycle

There is also a growing number of standards on sustainable infrastructure, including the Sustainable and Resilient Infrastructure (SuRe), Leadership in Energy and Environmental Design (LEED), BREEAM, the Environ Rating and many others. National governments are also fast developing national standards on sustainable infrastructure.

II. Mainstreaming biodiversity into infrastructure planning: the catalytic points

If infrastructure development is to make a real contribution to conserving biodiversity, conservation and infrastructure development plans have to intertwine throughout the infrastructure development cycle through:

- Assessment of infrastructure needs
- Integrated master planning at the appropriate scale
- Environmental and social safeguards
- Procuring and contracting
- Financing
- Construction
- Operation
- Decommissioning

The section below will examine the opportunities and challenges that arise at each of these stages.

Assessing infrastructure needs

Determining infrastructure needs—what public assets and services need to be made available, for whom and by when—is critical, for it questions the need to build assets in the first place. The pivotal question facing policy-makers is “What services do we need to provide for our citizens?” as opposed to ”What infrastructure do we need to finance and build?” For it indeed might be more astute to upgrade existing infrastructure or look at alternative methods of service delivery rather than build new assets from scratch.

Planning infrastructure is a long-term and expensive process. At the institutional level, it involves several ministries, planning commissions, city governments, the national treasury, banks and international donors. Biodiversity intersects with infrastructure needs assessments when the needs analysis is holistic and systemic. Reducing environ-

mental impacts in one area of development should not lead to an increase in environmental damage further downstream. And if industries and related roads, housing, water and energy services are being planned in one area, planners and policy would do well to take the opportunity to view the infrastructure needs of the wider region and plan for them in a systemic manner. This will reduce planning and deployment costs, making the systemic conservation of biodiversity much more feasible.

For example, if energy infrastructure and road infrastructure are being built around an extractive project or industrial development zone, can decentralized energy facilities be envisaged in situ as well as across the region? Likewise, can existing roads be upgraded instead of building new roads? Can water transport systems be considered instead of opening new areas for road construction? Taking the time to plan upfront might delay project deployment, but it can bring sizable cost savings and reduce environmental and biodiversity risks across the infrastructure project life cycle.

In determining infrastructure needs, policy-makers will be well served to consider if nature-based infrastructure can be regenerated and maintained in a productive state. For example, instead of building sea walls, can mangroves and lagoons be preserved in an active state to provide the same function- and, indeed, a host of other economic multipliers such as fisheries, tourism, increased real estate values, sustainable livelihoods, food security and nutrition, and many more?

To make such thinking and planning possible, policy-makers need to have information on the demographic, industrial, economic and urbanization trends that are likely to influence the demand for public assets and services. In envisioning these demands, policy-makers also need to plan how these assets and services might be financed. With the global infrastructure deficit estimated to be approximately USD 90 trillion,[6] it is well established that government budgets alone will not be able close this deficit, and private capital will need to be crowded in. In many countries where public assets and services are largely funded by governments, this presents additional challenges. Reliable forecasts of present and future users/beneficiaries, estimates of potential revenue streams (if any), the predicted capital and operations costs, where these assets will be sited, baseline engineering plans and a host of other intelligence need to come together in the form of infrastructure master plans and infrastructure project pipelines.

Given the time, trouble and expense it takes to develop these plans and pipelines, policy-makers are certainly well served in questioning if building assets are indeed the best way to service the infrastructure demands of taxpayers both today and in the future. The challenge is that infrastructure development is always linked with the building of new physical structures—railways, roads, waterways, runways, buildings, etc.—but does this always need to be the case?

For example:

- Can decentralized energy and water systems be prioritized in rural and wilderness areas? This will reduce biodiversity impacts associated with transition and distribution infrastructure.
- Can future education needs to plan for a technology-savvy, knowledge-based economy be met through improvements in teacher training and curricular upgrades rather than building new facilities?
- Can traffic congestion be better managed by looking into the root causes of commuting and congestion rather than building news roads in greenfield areas?
- Could it be possible to stagger public sector service hours, introduce peak hour traffic restrictions, introduce congestion charges and increase public transport options, all of which might be cheaper and easier than planning new road development?
- Can new technologies, from mobile telephone applications to robotics and drones, be used to reduce the need to build infrastructure?

[6] *http://newclimateeconomy.report/2016/*

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Infrastructure building near Hong Hu, China

Integrated Master Planning at the Appropriate Scale

The business case and value proposition for not siting built infrastructure in areas of ecological value is well established. Yet infrastructure continues to be sited in pristine environments, for example the siting of the 2014 Sochi Winter Olympic Games in the UNESSCO World Heritage designated Sochi National Park, Western Caucasus, and the 11 MW Belo Monto hydroelectric dam on the Xingu River, near Altamira, Pará, Brazil.

Stakeholders now need to seek new ways to curb such developments. Market solutions such as offsets, debt-for-nature swaps and payment of ecosystems services, though mostly value added, only hold a part of the solution. Would the pricing of ecological stocks and flows and the pricing of environmental infrastructure services be valuable? Governments and investors often ask “What is the financial value of sustainable infrastructure?” and “How might sustainable infrastructure yield more attractive internal rates of return?” The solution is to demonstrate that the environmentally and socially sensitive siting of infrastructure is the first step in de-risking infrastructure projects across their life cycles. IISD has developed the Sustainable Asset Valuation (SAVi) tool to demonstrate this and make the wider investment case for sustainable infrastructure.

Sustainable Asset Valuation IISD (SAVI) Tool

Governments, cities and investors face numerous challenges when they plan or invest in infrastructure: conventional project finance valuation methodologies ignore a range of material risks, intangibles and externalities. Governments and cities desperately seek information on how to maximize economic and social returns of infrastructure projects.

IISD has developed the Sustainable Asset Valuation (SAVi) tool to address the challenges noted above by assessing environmental, social, economic and governance risks, co-benefits and avoided costs of infrastructure projects.

SAVi's engine is built using system dynamics modelling, complemented by project finance modeling, to demonstrate the financial impact of different risk scenarios.

Planners and policy-makers can also add special and additional provisions on infrastructure planning and building codes when building in rural and wilderness areas and, indeed, in the buffer zones of protected areas. For example, can they make decentralized energy and water infrastructure and onsite water recycling mandatory? Can water be delinked from sanitation by favouring composting toilets and similar technologies? Can there by strong provisions on vernacular architecture, passive solar, energy autonomy and less toxic building materials? Can there be strong provisions on wildlife corridors, wildlife crossings and other measures to avoid the fragmentation of habitats? Can provisions on consultations with local and Indigenous communities be strengthened—for this is indeed the social licence of infrastructure and development? Can higher taxes and stamp duties be levied on infrastructure in ecological sensitive areas?

Environmental and social safeguards

Safeguard policies are designed to identify and assess the potential severity of environmental and social impacts on infrastructure and design, and implement plans to both prevent and reduce negative impacts and enhance the positive ones. Safeguard policies also mandate consultation with stakeholders, which in itself presents important opportunities to reduce financial, construction and operating risks as the construction phase gets off the ground.

The most important safeguard policies relate to the scope, development and presentation of an environmental impact assessment (EIA) and its corresponding environmental management plan (EMP). In most countries, the bidding consortium awarded the contract is required to conduct this assessment. In the case of large projects such as hydroelectric dams, tunnels, motorways and railways, bidding consortiums can be required to conduct a preliminary EIA and include impact prevention and mitigation measures in their bids. There are also instances, such as in the construction of highways in India, when the National Highway Authorities conduct the EIA and make the ensuring EMP available to the winning bidder.

The objective of EIAs and EMPs is to ensure that the proposed infrastructure project will be compliant with national laws and regulations on acquiring land; maintaining clean water; avoiding pollution; degrading land; deforestation; conserving the diversity of genes, populations and species; handling hazardous materials; managing wastes; complying with labour rights; offering decent work; and resettling communities. It is also important to note that, in most jurisdictions, it is the responsibility of the public agency deploying the project to conduct a preliminary screening during the project preparation phase, alongside the technical (engineering and financing) feasibility analyses to determine the scope of the EIA that will need to be conducted.

The scope of EIA policies	
When are EIAs mandatory	Identify projects considered to have significant effects on the environment and therefore requiring a mandatory EIA. These projects include long-distance railway lines, motorways, airports, hazardous waste treatment plants, wastewater treatment plants and waste treatment plants.
When screening is mandatory to determine the scope of the EIA	Identify projects that require mandatory screening to determine their environmental effects on the basis of thresholds or other criteria or that require case-by-case examination. Based on this screening, the public agency deploying the project can determine the scope of the EIA that will be required. Examples of these projects include railways, roads, waste disposal installations, urban development projects, irrigation infrastructure and flood protection infrastructure.
What are the due processes for conducting the EIA	The processes through which an EIA should be conducted and how its effects should be measured and recorded.
What should the EIA cover?	The content of an EIA report typically includes: a description of the location and physical environment of the project; a forecast and assessment of the likely environmental and social impacts; a description of environmental protection and social cohesion measures that need to be incorporated into the project, including a corresponding technical and economic feasibility analyses; and recommendations for implementing environmental monitoring.

What should the EMP cover?	The contents of an EMP and how its effects and mitigation measures need to be recorded.
Public consultation	Modalities for public review and stakeholder consultation.
Public sector review	How the EIA and EMP will be reviewed by the public sector—the procuring and contracting entities and other public sector agencies; time frames within which the approvals and refusals need to be conveyed.
	Level of transparency and public disclosure during the development of the EIA.
	Legal liability and sanctions for non-compliance with the EMP during construction.

Multilateral development banks (MDBs) and development finance institutions also require the implementation of safeguards for financing for infrastructure projects that are approved. The merits and drawbacks of the revised World Bank Environmental and Social Framework (2016), the revised International Finance Corporation (IFC) Performance Standards on Environmental and Social Sustainability (2012) and indeed the other MDB safeguard frameworks have been widely debated.

Further uncertainties arise on the use of "country and corporate systems" in place of the MDB frameworks. MDBs are certainly mandated to strengthen country systems and capacities on the management of environmental and social risks. And before stating that the country systems are equivalent to those of the MDBs, they are required to conduct rigorous assessments of domestic legal frameworks pertaining to environmental and social risk mitigation and public and private sector capacities in their implementation and monitoring. Of particular note is that the responsibility of compliance with the MDB safeguard framework is passed on to borrowers—MDB staff are mandated to "assist the borrower" in containing risk during the project.

Another space to watch is the growing trend towards streamlining EIA processes. As stated by the European Union in announcing the revised EIA Directive (2014/52/EU), the objective is to: "Simplify the rules for assessing the potential effects of projects on the environment. It is in line with the drive for smarter regulation, so it reduces the administrative burden. It also improves the level of environmental protection, with a view to making business decisions on public and private investments more sound, more predictable and sustainable in the longer term. The new approach pays greater attention to threats and challenges that have emerged since the original rules came into force some 25 years ago. This means more attention to areas like resource efficiency, climate change and disaster prevention, which are now better reflected in the assessment process".[7]

European Union Member States now have the mandate to simplify the EIA procedures and adhere to timeframes: screening decisions are to be taken within 90 days, public consultations should be open for a minimum of 30 days and final decisions are taken within a "reasonable period of time." In the same vein, the Directive requires that:

- EIA reports are made "more" understandable to the public, especially those parts that describe the prevailing state of the environment and alternatives to the proposed project.
- Development consent decisions (on granting of permission for infrastructure developments) are made more clear and transparent.
- Additional monitoring is conducted on projects that adversely affect the environment, and winning bidders are required to use additional measures to reduce and mitigate effects.

Given the vast scope and the complexity of the EIA and EMP processes, the extent to which these policies contribute to real biodiversity conservation is an important question. In most countries, the quality, integrity and scientific rigour of EIA processes and ensuing management plans are themselves an issue. Lower income countries lack the scientific and ecological expertise to conduct thorough analyses, and public agencies and regulators are too poorly skilled and inadequately equipped to monitor and enforce regulations. Conflicts of interest also arise, as the consulting companies conducting the EIAs are rarely able to provide an objective assessment. They are often under pressure from either the commissioning politicians and public agencies, who are in a hurry to get the project going, or the companies that co-own or are constructing the asset, who too are eager to get the project started and reduce

[7] *http://ec.europa.eu/environment/eia/review.htm*

seemingly unimportant due diligence that increase costs and hold up expensive capital and labour. The authors have observed in many cases and countries that EIAs are conducted by subsidiaries of construction firms, which itself provides a compelling case for the EIA to be fashioned in a manner that downplays the negative impacts.

Most countries are also in the processes of fast tracking and streamlining EIA processes. This can bring opportunities, but also fresh challenges for biodiversity conservation. On one hand, rigorous analysis takes time, and biodiversity conservation cannot be planned for in the absence of rigours and relevant inventories, assessments, maps and action plans. On the other hand, EIAs need also to liaise with many public agencies at different levels of government and, indeed, many stakeholders with diverse views and opinions. A lot of energy can be spent on administrative red tape rather than the rigorous assessment of potential environmental impacts and what solutions could be employed to mitigate them. This is especially true for greenfield projects that involve protected areas, the acquisition of land and the resettlement of local communities.

While is it certainly true that EIA processes are administratively cumbersome and expensive, it is too early to comment on whether the ongoing reforms will improve the administrative efficiency and prompt the delivery of more scientifically relevant and integral assessments. There is always the risk that, in the haste to increase efficiency, science and relevance are compromised, and bidders, financiers and taxpayers stand to lose, as infrastructure development will destroy habitats and not deliver value for money across the asset life cycle.

The questions also begs: who uses the outputs of the EIA and the EMP? In theory, they are designed to influence the final decisions on where assets should be sited and how they should be designed. But in the real world, this rarely happens. The authors have examined many EIAs and EMPs containing thousands of pages and several annexes, which have very little relevance to the project under analysis. In fact, we can safely state that the lower the in-country capacities on both environmental assessments and safeguard regulators, the more long winded and irrelevant EIA and EMPs are likely to be. In fact, EIAs and associated permits have become an administrative endeavour—a few more expensive boxes to tick in the process of getting the construction permit to move on.

In light of the above, it is not surprising that most financing institutions have little confidence that the EAI and the EMP can be of value in making investment decisions. The authors have observed that, in most development banks, the teams working on the safeguards do not always liaise with those making investment decisions. Most financing institutions point out that they consider projects for investment after the safeguard framework has been applied. But this rarely implies that the project design has been altered to prevent impacts, and the costs and risks associated with unmitigated impacts are identified and priced. Development banks tend to set aside a contingency to plan for risks related to environmental and social issues and *force majeure*. A better strategy would be to price these risks, but there is no strategy at this point to connect the dots between safeguards, risk and investment decisions. No financier will disagree that lowering environmental and social impacts will make the asset more financially attractive. Indeed many private financiers will walk away from a project that has high impacts on biodiversity.

Another very real challenge in the implementation of EIAs and EMPs, especially in middle- and lower- income economies, is that the public sector does not have the necessary expertise and technologies to monitor compliance. Environment ministries and their agencies are often poorly funded and lack the scientific knowledge and the necessary tools and technologies to conduct scientifically valid testing and monitoring. As a result, they can find it difficult to command due respect from developers and gain access to the necessary records to complete rigorous site inspection due diligence. Unless the public sector is able to monitor compliance and have robust evidence of non-compliance, holding developers responsible for environmental and social performance is exceedingly difficult.

Procurement and contracting

The procurement phase is critical to the deployment of sustainable infrastructure, as it encompasses the point at which governments publicly announce that they intend to deploy the design and construction of assets and funding and financing arrangements are in place, and that formal tenders will be launched to identify and contract the bidder that offers optimum value for money (VfM).

The opportunity to address biodiversity in this process begins with the principle of VfM. When seeking to deploy sustainable infrastructure, VfM takes on a whole new meaning. Together with transparency, competition and fairness, VfM makes up one of the four major principles governing public procurement. As public procurers are custodians and bursars of public funds, they are bound to ensure that public spending is carefully targeted at options that optimize VfM for citizens and taxpayers. The issue with the traditional approach towards VfM is that it is often

interpreted as the cheapest bid. The downside of selecting the lowest priced bid is that it often compromises on quality, durability and sustainability, and results in assets that ultimately can be more expensive to finance and cost more to build, manage, maintain and dispose of. Selecting the cheapest bid is also likely to cause significant environmental damage and losses to biodiversity, as the developer would be seeking to minimize costs and cut corners wherever possible—it is perceived to be much cheaper to plan and build in a manner that destroys biodiversity than the reverse. Preventing biodiversity loss through design for the environment approaches, material and resource efficiency, durability, circular economy, the integration of greener technologies and responsible construction practices can all make assets more expensive to plan and build, and therefore the cheapest solution at the time of purchase is never the best option.

The better approach is therefore to base public procurement decisions on the total cost of ownership (TCO): options that optimize VfM, not simply at the time of purchase but across the asset life cycle. TCO refers to practices that take into account all the direct and indirect costs associated with the purchase of an asset over its life cycle. It therefore enables procurers and investors to determine the total cost of the asset—including costs of financing, planning, designing, constructing, operating, maintaining, managing and, if relevant, decommissioning.

Let us take the example of a LEED-rated building or a road rated under the Greenroads Rating System. While these assets may require more capital to plan, design and build, they can be cheaper and easier to operate and maintain. Better design features may also make these assets more agreeable and safer to use, resulting in productivity gains during its use. Indeed, the increase in capital costs during the planning, design and construction phases may well be offset by savings in operating expenditure and productivity gains when the asset is in operation. Procurement decisions based on TCO can hence yield better VfM than decisions based on the cheapest purchasing price.

This rationale lies at the core of sustainable public procurement—procurement that is based on the environmental and social performance of assets and how much they cost to plan, design, build, manage and maintain as opposed to how much they cost to purchase alone.

Defining sustainable public procurement

Sustainable public procurement is about laws, policies and practices to integrate economic, social and environmental risks into public procurement processes and decisions. It is about achieving "value for money" across the asset life cycle (Perera, 2014).

http://www.iisd.org/sites/default/files/publications/implementing_spp_south_africa.pdf

Financing

Infrastructure projects require a large amount of capital to cover their capital expenditures (capex) and operating expenditures (opex). These investment needs are often beyond public budgets (especially in developing countries), so governments need to rely on other sources of financing. MDBs play an important role in realizing these projects both in terms of financing and providing technical assistance during project preparation. Private investors only commit capital to bankable projects with stable revenue streams, sufficient mitigation of key project risks (e.g., through credit enhancement) and other financial incentives such as bundling the project with other lucrative business opportunities (e.g. access to the natural resources of the host country at a preferential rate).

Sustainability and responsible investment are increasingly integrated in the investment process of MDBs. Especially in the case of developing countries, MDBs have important leverage when it comes to how the local project is planned and designed. Mainstreaming biodiversity conservation in the project cycle should be a requirement for projects to have access to their capital and to receive any form of assistance. MDBs have a wide range of financial instruments at their disposal beyond loans (e.g., partial credit guarantees, political risk guarantees, liquidity facilities, currency risk management), which could be made available and/or priced differently depending on the environmental footprint of the project. MDBs lacking a stringent environmental assessment methodology should adopt other existing frameworks. Some of the more notable environmental standards are the IFC Performance Standards (which have become a benchmark in the industry) covering "Biodiversity Conservation and Sustainable Management of Living Natural Resources," among other areas. Also, the World Bank Group's Environmental, Health, and Safety Guidelines, which provide examples of international good practices, are a widely used resource in the industry.

Private investors also have an inherent responsibility to ensure that the projects they finance have a low environmental footprint, especially in the case of biodiversity conservation. The Equator Principles is an important benchmark when it comes to the assessment and mitigation of environmental and social impacts in project finance. This risk management framework was adopted by 91 financial institutions, covering 70 per cent of project finance debt in emerging markets.[8] The principals acknowledge the importance of the protection and conservation of biodiversity and require signatories not to provide financing to projects that do not comply. Some financial service providers, such as Citigroup, have developed more stringent lending guidelines in relation to forest resources and biodiversity.[9]

While this may not be specifically spelled out in the mandate of private businesses, the mitigation of environmental externalities can have a material impact on their revenue streams and the long-term financial viability of their investments. Preserving biodiversity and critical habitats of endangered species may play an essential role in securing the supply chains of international businesses. If these correlations are less evident, the role of international organizations and non-governmental organizations should be to provide the necessary tools and methodologies to demonstrate these linkages.

Construction

Construction is a critical phase in the infrastructure project cycle. The large amount of investment required, lack of revenue streams and a range of construction-related risks explain why many institutional investors are only willing to commit capital in the operating phase. For biodiversity conservation, the construction phase is also critical, potentially having a wide range of negative impacts, including loss of wildlife habitat, contamination of soil and watercourses, noise and air pollution, among others. Measures to avoid or mitigate these impacts need to be taken in the planning, design and procurement phases of the project, as discussed earlier. In other words, the construction phase is only about the implementation of the project, as the environmental footprint of the asset is determined in the earlier stages through proper siting, sustainable design and performance-based specifications minimizing environmental impacts.

However, there are some notable environmental risks linked to the developer and to the construction process: 1. the construction company deviating from the environmental specifications or other contractual obligations of the project causing further biodiversity loss; 2. operations and on-site business practices of the construction company causing environmental harm.

Construction delays, a common way to deviate from contractual obligations in infrastructure development, not only have an impact on the bankability of the project, but can increase the duration and intensity of environmental impacts that could not be avoided, but only mitigated, during construction. Furthermore, developer non-compliance with performance specifications intended to address biodiversity loss can cause negative impacts that were thought to have been avoided through project design to resurface.

In addition, the construction company's operations can potentially cause significant damage to biodiversity. The location and design of complementary facilities, camps and borrow pits, as well as the storage of toxic materials should be carefully planned. Appropriate measures need to be put in place to manage erosion and runoff to avoid water pollution. The lack of environmental guidelines for machine maintenance can also result in soil and water contamination affecting biodiversity.[10]

While most of these risks might be identified as part of the EIA and sufficiently addressed during project design and tendering, the implementation of these measures is often not part of the same level of scrutiny. This can result in an inaccurate assessment of the actual environmental footprint of the project. One way to improve the effectiveness of the EIA is to strengthen the Environmental Management Plan (EMP). EMPs are designed to ensure that project-specific environmental management practices are complied with. In addition, the adoption of an Environmental Management System (EMS) for developers should be encouraged during the procurement process. EMS provides

[8] *http://www.equator-principles.com/*
[9] *http://www.ifc.org/wps/wcm/connect/topics_ext_content/ifc_external_corporate_site/sustainability-at-ifc/publications/biodiversityguide_addressing_risks_maintaining*
[10] *http://documents.worldbank.org/curated/en/385081483595950470/111634-WP-PUBLIC-BIODIVERSITY-CONSERVATION-IN-ROAD-PROJECTS.doc*

the necessary framework to identify the environmental impact of the construction company's operations and monitor compliance.[11]

Why prepare an EMP:

- Define details of who, what, where and when environmental management and mitigation measures are to be implemented
- Provide government agencies and their contractors, developers and other stakeholders better on-site environmental management control over the life of a project
- Allow proponents to ensure their contractors fulfill environmental obligations on their behalf
- Demonstrate due diligence.

http://www.planning.nsw.gov.au/~/media/4AF3FA6E201B4482AB7C294157F880E3.ashx

Operation

The operating time of the asset can span over several decades. Therefore, the effective management of environmental risks in this phase is paramount to avoiding any long-term negative impact on biodiversity conservation such as disruption of natural habitats, noise and water pollution at the site and its surroundings.

The EIA, discussed earlier, also covers the operating phase. Similarly, to the construction phase, the risks identified as part of the EIA should be addressed in the design phase of the project. However, post-construction monitoring of compliance with performance specifications and establishing operating guidelines are necessary. These could be part of the Environmental and Social Management Plan (ESMP) developed for the project, providing a set of well-defined measures to manage the risks identified in the EIA as well as providing a monitoring plan during operation. These measures need to focus on prevention instead of compensation and mitigation. The objective of the EcoMP is to "avoid, where practicable, and reduce impacts on terrestrial and aquatic habitats and specific habitat features of ecological importance." It lists potential impacts, identifies their source, proposes mitigation measures, outlines the time and frequency of monitoring and allocates responsibility to the relevant party.[12]

Finally, it is important to note that a successful operating phase is about efficiency. This is an area where the interest of the project developer and biodiversity are often aligned. Improved resource efficiency does not only lower the operation and maintenance costs for the company, but also decreases the use of natural resources and pollution benefiting biodiversity. The skills and training needed for efficient operation and maintenance should not be underestimated. Projects might be implemented using the latest state-of-the-art technology and green engineering solutions, but if on-site personnel lack the necessary capacities to efficiently operate the asset, a range of unforeseen environmental impacts can surface, potentially decreasing the operating lifetime of the project.

Decommissioning

Managing the biodiversity impact during decommission is particularly relevant in the mining, and the onshore and offshore oil and gas sectors. Management of marine growth and restoring ecosystems to a productive state after mine closure are particularly important. Given that decommissioning is so hugely expensive, debates arise on not just the level of restoration that is beneficial to taxpayers but also on who fits the bill. Decommissioning is often treated as a business expense, and many regimes offer a variety of tax rebates based on the overall costs of decommissioning. Do these tax rebates provide the best VfM for taxpayers? And is the restoration bringing real biodiversity benefits? The Rigs to Reef program in the Gulf of Mexico exemplifies this debate. Oil companies work in collaboration with local authorities and biodiversity experts to modify offshore platforms to serve as artificial reefs and support marine life. And funds left over from the reduced costs of decommissioning are an investment in other conservation priorities.[13]

[11] *http://www.planning.nsw.gov.au/~/media/4AF3FA6E201B4482AB7C294157F880E3.ashx*
[12] *https://www.miga.org/documents/BT20_ESMP.pdf*
[13] *http://www.rig2reefexploration.org/read-me/*

Regulators, planners, businesses and local communities need to work together to determine the future use of the site and asset and thereby determine how decommissioning should take place and what level of biodiversity restoration and land remediation is needed. Should decommissioning costs be lower than originally anticipated, business could be required to finance other priority conservation projects and thus bring taxpayers better VfM.

III. Nature-Based Infrastructure: The Opportunity to Reconcile Infrastructure and Conservation?

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Mangrove reforestation program in Dili – East Timor

From green roofs and the bio-adaptive microalgae building facades to the restoration of mangroves and dunes to protect against freak storms, floods and sea level rise, green infrastructure is fast emerging as a specialization of its own. The United Kingdom was one of the first to public a Green Infrastructure Strategy in 2010 followed by France and the 2014 and the EU in 2016.

Green infrastructure broadly refers to the use of natural ecosystems and habitats, sometimes combined with bio-engineered solutions to provide infrastructure services. In terms of definitions, the EU Green Infrastructure Strategy describes green infrastructure as a "strategically planned network of natural and semi-natural areas with other environmental features designed and managed to deliver a wide range of ecosystem services such as water purification, air quality, space for recreation and climate mitigation and adaptation. This network of green (land) and blue (water) spaces can improve environmental conditions and therefore citizens' health and quality of life. It also supports a green economy, creates job opportunities and enhances biodiversity". The EU Green Infrastructure Strategy goes further to suggest that "green infrastructure planning is a successfully tested tool to provide environmental, economic and social benefits through natural solutions and help reduce dependence on 'grey' infrastructure that is often more expensive to build and maintain".

What infrastructure services provided by natural ecosystems

- Contain flooding
- Air and water regulation
- Air and water purification
- Prevent soil erosion
- Regulate and lower noise
- Reduce oscillations between floods and droughts
- Increase real estate values
- Reduce spending on human health
- Provide for recreation
- Enhance productivity
- Provide for education and R&D
- Create greener jobs
- Lower fire hazards regulation
- Control air, soil and water pollution
- Defend coastlines
- Lower soil erosion

In terms of policy space, green infrastructure strategies can be pivotal to make biodiversity conservation more tangible across the infrastructure development processes. As green infrastructure builds in part on the long history and well established benefits of maintaining natural spaces in urban areas, it is building a common language between conservation experts and infrastructure planners. The scope of green infrastructure is also multifaceted ranging from vertical gardens, to the creation of habitats and altering the pathways of rivers to mitigate the impacts of oscillating weather patterns between drought and floods. Green infrastructure is therefore enabling ideas on the productivity of habitats and the value of diverse species, genes and populations to be communicated in a manner that can be appreciated by urban planes, infrastructure policy makers, businesses and financers.

On the other hand, green infrastructure also brings a range of risks to the conservation of biodiversity. Biodiversity experts rightly point out that linear trees lines, cycle paths, urban vegetated corridors and green roofs do not necessarily provide a breeding habitat for most species. They may greatly increase aesthetics and contribute to real estate value, but they do not provide the necessary ecological conditions for native populations to reproduce. Even in the case of larger corridors and the buffer zones of protected areas, scientists continue to debate on their net value to biodiversity. These areas are very useful to reduce the fragmentation ecosystems but their value depends on location and species-specific characteristics. In short, it is uncertain if the uninterrupted ecological connectivity necessary for promoting biodiversity can be accommodated in spatial planning of green infrastructure.

Green infrastructure also interfaces with the natural capital agenda and the fledgling markets for Payment for Ecosystems Services (PES). These arrangements value and trade ecosystems based on their capacity to deliver environmental services, including but not limited to infrastructure services. Strong PES projects are based on service providers (sellers) that are fully committed to maintaining the integrity of natural resource and buyers that have a very clear understanding on how their payments are being used. Interest and investment in PES is on the rise. In 2014, the Global Environment Facility (GEF) reported to have invested:

- US$ $70 million and raised an additional US$ 395 in co-financing for 14 PES projects.
- US $73 million and raised $281 million in co-financing in 5 projects where PES was a part of the project design
- US$82 million and raised $918 million in co-financing for another 28 projects where PES was smaller element. (GEF 2014)

To extent to which PES contributes to biodiversity conservation is again debatable. In semi natural landscapes such as agricultural lands, managed pastures (prairies and grasslands) and forest plantations, PES arrangements may certainly be valuable. In more natural ecosystems the benefits are less obvious. The interconnection between biodiversity, environmental services and green infrastructure is complex, dynamic and extremely site specific. Hence improving environmental and green infrastructure services does not always mean that biodiversity conservation is advanced in a simultaneous effort.

It is also important to note that in the context of the green economy, green infrastructure does acknowledge that there will be trade-offs between environment protection and economic progress. This is recognized in the EU Green Infrastructure Strategy[14], which suggests that green infrastructure contributes to economic recovery by "fostering innovative approaches and creating new green business". This bring to play market mechanisms, the interests of capital holders and the economies of scale. Unless biodiversity can be valued and traded as a factor of production in green infrastructure markets, its conservation can become a secondary objective in policy and practice.

[14] *http://ec.europa.eu/environment/nature/ecosystems/index_en.htm*

IV. Policy Recommendations

The following is a set of recommendations for mainstreaming biodiversity conservation into the deployment of infrastructure projects. These cover a mix of policy, procedural and practical ideas, and they require multi-disciplinary work and bold leadership.

1. **Strong political leadership is needed to ensure full compliance with laws and policies on projected areas and natural reserves.** All efforts must to be made to prevent these areas from being opened to extractive and industrial activity, especially in times of economic downturn when there is added pressure to put immediate needs ahead longer-term prosperity. To this end, it would be beneficial to financially and economically value the infrastructure services provided by natural ecosystems in a much more concerted manner. The IISD SAVi tool takes an important step in this direction.

2. An **international network of parliamentarians could be established and tasked to lead political support for valuation and to mainstream biodiversity conservation into infrastructure deployment.** Inspiration could perhaps be drawn from the work of Climate Parliament, an international cross-party network of legislators who work on preventing climate change and promoting renewable energy.[15] Their achievements include master plans for smart grids, support for realizing renewable energy tax rebates in lower income countries and targeted support for the growing markets for decentralized solar technologies.

3. **Laws and policies on public procurement, public–private partnerships, power purchase agreements and concession agreements need to be upgraded to seek VfM across the asset life cycle**. For example, the EU Public Procurement Directive 2014/24/EU and the Directive on Works, Services and Concession Contracts 2014/23/EU mandate that procuring entities award tender to the "most economically advantageous tender." Similarly, the 2016 Word Bank Procurement Framework's vision emphasizes that the objective of procurement is "to achieve value for money with integrity to deliver sustainable development."[16]

4. Infrastructure planners and policy-makers **need more expertise and greater empowerment to make alterations during the project preparation phase to**:
    a) **Change the siting and design of assets**, taking into account trade-offs between long-term biodiversity conservation, environmental projection, fitness for purpose and capital and operating costs.
    b) **Conduct strategic EIAs** to provide for holistic infrastructure planning and thereby increase the spatial and ecological conditions for green infrastructure to contribute to biodiversity preservation.
    c) **Conduct EIAs** that include more systematic biodiversity proofing so that the siting, design and construction of assets could be altered as needed to minimize interference to species and populations.
    d) **Ensure environmental management plans could include express provisions on biodiversity conservation.**

5. Many stakeholders might argue that there is **too much emphasis on the integrity of EIAs and their ability to reduce the environmental and social impacts of infrastructure projects.** They also rightly suggest that **more time and money needs to go into preparing, siting and designing infrastructure in a more systemic manner.** This needs to take into account a range of parameters, including projected trends in urbanization and industrial development, future demand for infrastructure, the ability and willingness of users to contribute towards operating costs, cumulative impacts on the environment and more.

    In reality however, governments, donors and MDBs are all in a hurry to deploy infrastructure. They want to get projects to their financial closure as soon as possible as they need to show voters in both donor and beneficiary countries that capital is being deployed and development is at work. **Good due diligence and sustainable infrastructure project planning take time,** and stakeholders often have no time or appetite for extended analysis or systemic thinking, especially given that infrastructure projects are inherently so very complex to plan, finance and deploy.

    To reduce the transaction costs associated with sustainable infrastructure planning, stakeholders would do well to consider the use of blockchain technologies to record, update and share the wide range of pluri-disciplinary data that is required for effective due diligence. This includes national biodiversity plans and inventories, mapping of projected areas, demographics and patterns of urbanization, forecasts of industrial development, infrastructure pipelines, records of financing arrangements, data on

[15] *http://www.climateparl.net*
[16] http://www.worldbank.org/en/projects-operations/products-and-services/brief/procurement-new-framework

infrastructure projects under construction and much more. **Blockchain technologies** can help bring efficiency and transparency to record keeping, market predictions, simulations on environmental and biodiversity change, governance, community micro planning (such as micro grids), smart contracts, auditing in infrastructure projects across the life cycle and much more. It has the potential to radically change the way stakeholders interact and plan infrastructure projects. It will enable, for the first time, conservationists, infrastructure planners, scientists and politicians to work together and determine the most acceptable trade-offs for sustainable development.

6. Policy-makers, planners, businesses and financiers need to **increase the use of natural ecosystems as infrastructure service providers.** To this end, infrastructure, planning regulations should systematically require that technical feasibility studies, costs and revenue forecasts (conducted in the project planning phase) also consider natural and nature-based infrastructure and bioengineered solutions alongside civil-engineered options. This is particularly important for: a) coastal areas including coastal cities, where a large portion of the worlds' population reside and work; b) the buffer zones of protected landscapes that provide critical ecosystem and infrastructure services for preventing climate change, agriculture, water and a range of other fundamentals. In the case of coastal cities, for example, the creation and restoration of dunes, mangroves and lagoons will bring a host of economic benefits, as discussed earlier in this paper. Moreover, bioengineered solutions such as green roofs, permeable roads and green pavements can reduce storm water runoff and work in a symbiotic manner with larger nature-based infrastructure assets, and make cities more resilient to freak weather and flooding.

7. To enable stakeholders to systematically evaluate nature-based infrastructure options (as suggested in point 6) the following policy improvements will be of value:

   a) Regulations on **infrastructure planning and infrastructure project preparation should also systematically require the consultation of national biodiversity action plans** (national programs designed to protect and restore biological systems). This would make the integration of biodiversity conservation needs into infrastructure planning pipelines much more achievable. It would also help planners and policy-makers realize the potential to consider natural and nature-based infrastructure and bioengineered solutions earlier in the infrastructure planning process.
   b) **National biodiversity plans need to point out opportunities to use natural and nature-based infrastructure as a part of the overall biodiversity conservation strategy**. This will help planners, scientists and conservations work together to determine the biodiversity value of different options and determine the more acceptable trade-offs to all stakeholders. To this end, we welcome leadership from the European Union, as the EU Biodiversity Action Plan highlights the importance of the development of "green infrastructure."
   c) **National climate change adaptation plans and mitigation plans need to intersect with national infrastructure plans, urban development plans and national biodiversity plans.** This will help planners, policy-makers and financiers also systematically look at climate reliance as a part of the infrastructure puzzle rather than a stand-alone activity.

8. It will be valuable to expand ongoing work on **PES to expressly support natural infrastructure.** PES involves payments to land or other natural resource owners in return for a guaranteed flow of ecosystem services or certain actions likely to enhance their provision over and above what would otherwise be provided in the absence of payment.[17] The Global Environment Fund, United Nations Development Programme and many other organizations and governments are already taking action. A recent example is the Green Alliance in the United Kingdom, which launched a proposal for the Natural Infrastructure Scheme that delivers environmental improvements by bringing together groups of land managers to sell ecosystem services.[18]

9. Stakeholders need to reduce the **systematic dependence on biodiversity offsets as compensation for unacceptable levels of environmental degradation and biodiversity loss.** This is particularly important in infrastructure development, as offsets can be regarded as an easy way out of due diligence planning, which is always expensive and time consuming. Managing impacts on ecosystems should be prioritized following the mitigation hierarchy: 1. avoidance, 2. minimization, 3. restoration, 4. offset.

10. Engage with financing institutions that are signatories of the Equator Principles[19] to further the debate on the **financial valuation of biodiversity**. To this end, the methodologies that merit closer examination include

[17] *http://www.undp.org/content/sdfinance/en/home/solutions/payments-for-ecosystem-services.html*
[18] *http://www.green-alliance.org.uk/resources/New_markets_for_land_and_nature.pdf*
[19] *http://www.equator-principles.com/*

SAVi by IISD,[20] the Natural Capital Protocol developed by the Natural Capital Coalition,[21] the Integrated Biodiversity Assessment Tool developed by the International Union for the Conservation of Nature[22] and The Economics of Ecosystems and Biodiversity (TEEB) initiative of UN Environment.[23]

11. Gain experience with a range of **innovative financing instruments** to help cover the increased planning and capital costs that are often associated with sustainable infrastructure. A few examples follow:

    a) Offer dedicated **credit enhancement** through a regulated and ring-fenced pool of funds to cover the higher capital expenditures associated with flagship sustainable infrastructure projects.
    b) Many countries have experimented with the use of **Viability Gap Funds**, in the forms of grants or concessional loans, to make economically and socially important projects financially viable. Could stakeholders experiment on the use of Viability Gap Funds for infrastructure projects that push the boundaries on sustainable infrastructure and biodiversity conservation?
    c) Explore the use of **debt-for-nature swaps**, agreements to decrease the sovereign debt of a developing country in return for that country spending the same amount of funds on conservation projects such as green infrastructure. For example, as part of a debt-for-nature swap facilitated by the Nature Conservancy, the U.S. government forgave Guatemala USD 24 million in debt, which was spent instead on forest conservation over 15 years.[24]
    d) Study the use of **tax increment financing,** which allows local governments to pay for infrastructure by capturing the increase in property tax revenues after infrastructure is built. Anecdotal evidence abounds that sustainable infrastructure is associated with higher real estate values. Can local governments therefore plan to expect higher income and property taxes from sustainable infrastructure once they are in operation?
    e) Investigate the feasibility to **levy higher stamp duties for greenfield projects** to encourage the development of brownfield projects, which often have a lower environmental footprint.

12. The management of climate risks is taking on a new level of urgency. In 2017, the **Financial Stability Board's Taskforce on Climate-Related Disclosures**[25] **recommended that all financial institutions assess and disclose the financial impacts of climate risk on their assets and portfolios**. These assets include public and private infrastructure.

    Biodiversity proponents would be well served to observe the developments in this regard. The relationship between changing climates and the migration and adaption of genes, species and populations is highly symbiotic. This could also be the starting point for discussions with the financial services sector on the consequences of biodiversity loss. In time, similar recommendations on biodiversity could be envisaged.

[20] *http://www.iisd.org/project/SAVi-sustainable-asset-valuation-tool*
[21] *https://naturalcapitalcoalition.org/protocol/*
[22] *https://www.iucn.org/theme/business-and-biodiversity/our-work/business-approaches-and-tools/integrated-biodiversity-assessment-tool-ibat-business*
[23] *http://www.teebweb.org*
[24] *https://www.nature.org/ourinitiatives/regions/centralamerica/guatemala/guatemala-debt-for-nature-swap-is-a-win-for-tropical-forest-conservation.xml*
[25] *https://www.fsb-tcfd.org/wp-content/uploads/2017/06/FINAL-TCFD-Report-062817.pdf*

Why we are here
To stop the degradation of the planet's natural environment and to build a future in which humans live in harmony with nature.

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