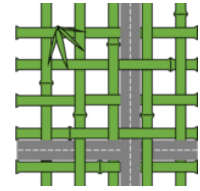


# Incorporating Nature in Infrastructure Development

Insights from the Fall 2020 Infrastructure and Nature Webinar Series



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## Introduction

The impacts of infrastructure development on ecosystems and biodiversity are now starkly clear. Roads are the first machetes of deforestation and degradation, opening thousands of hectares of previously intact habitat to land-use change, agricultural expansion, human settlement, wildlife exploitation and trade, and increasing zoonotic disease risk. Roads have already carved terrestrial ecosystems into over 600,000 individual patches, the majority less than a square kilometer and only 7% larger than 100km<sup>2</sup>.<sup>1</sup> Animal-vehicle collisions around the world cause billions of dollars in damages every year and are a leading cause of wildlife mortality in many countries.<sup>2</sup> Free-flowing rivers supporting biodiversity and crucial natural processes are in danger. Studies find that two-thirds of all major rivers are already severed by large scale hydropower dams, with nearly 4,000 more planned in the coming decades, threatening connectivity by as much as 40%.<sup>3,4</sup> This infrastructure development and associated land use change contributes to profound impacts on the planet: aquatic biodiversity has declined by more than 80% and terrestrial biodiversity by at least 70% since the 1970s, according to the Living Planet Index.<sup>5</sup> The impacts of a rapidly warming planet — as emissions continue to rise and carbon sinks degrade — have already begun to permanently change ecosystems and affect biodiversity, threatening the extinction of more than a million species in the coming decades.<sup>6</sup> This is further exacerbated by extreme events, such as more than a billion animals dying in the unprecedented extreme 2020 Australian fire season alone.<sup>7</sup>

In sum, the world is facing multiple simultaneous crises: the COVID-19 pandemic and resulting economic devastation, biodiversity loss, and climate change. As is already evident in economic rescue and stimulus packages, infrastructure development is central to whether countries can effectively meet national and global sustainability targets. The coming tsunami of investment demonstrates the opportunity to change course: an estimated \$95 trillion in new infrastructure is needed by 2040 to meet global demand for growth, double what existed in 2012.<sup>8,9</sup> A paradigm shift is necessary toward policies that support comprehensive planning, rapid decarbonization, and ecosystem conservation to ensure investment in resilient infrastructure that taps the powerful potential of nature-based solutions, aligned with the global goals.<sup>1</sup> A society-wide response, including the private, financial, and public sectors, is essential to deliver the combined technical capacity, data, and expertise necessary for implementation.

<sup>1</sup> Defined by the International Union for the Conservation of Nature (IUCN) as: “Actions to protect, sustainably use, manage and restore natural or modified ecosystems, which address societal challenges, effectively and adaptively, providing human well-being and biodiversity benefits”.

<https://portals.iucn.org/library/sites/library/files/documents/2020-020-En.pdf>.



## Collaboration to Drive Solutions: The Infrastructure and Nature Coalition

In this context, 24 public and private sector organizations joined together in 2020 to create the *Infrastructure and Nature Coalition* to organize a series of webinar discussions in preparation for the delayed September 2021 IUCN World Conservation Congress (WCC) to discuss barriers and opportunities for integrating nature into infrastructure development business models.<sup>2</sup> The aim was to provide recommendations for policy makers and the private, financial, and public sectors and other key actors around the world to bolster countries' efforts to meet previous targets and make stronger commitments for mitigating climate change and biodiversity loss during the 2021 "Super Year" for nature, including meetings of the IUCN World Conservation Congress, the Convention on Biological Diversity's (CBD) 15<sup>th</sup> Conference of the Parties (COP 15), and the Framework Convention on Climate Change's (UNFCCC) 26<sup>th</sup> Conference of the Parties (COP 26).

Over the course of the webinar series, six sessions were organized addressing biodiversity, natural capital and ecosystem services, and climate change at all stages of the infrastructure lifecycle, from planning, policy, and finance enabling conditions to design and construction. This document summarizes the common themes that emerged from all six sessions, including barriers, opportunities and solutions, and recommendations for key actors in upcoming policy discussions. Full detailed session summaries can be found in Annex 1.<sup>3</sup>

### Key Barriers and Opportunities

All six sessions covered a range of topics and included diverse representation from government ministries, universities, NGOs, private sector planners and developers, and private and public sector financiers. Key cross-cutting themes regularly emerged as central to leveraging systemic change in infrastructure development for enhanced sustainability, climate resilience, and nature-positivity. These included data and standards, technical capacity and decision-maker awareness, participation and collaboration, and policy and regulatory incentives.

#### Data and Standards

- While the world is increasingly awash in information, all sessions outlined a lack of decision-relevant biodiversity data at the right scale as a challenge. Insufficient data on ecosystem and biodiversity costs and benefits, including standards across all investment types, continues to prevent system-scale action to filter poor projects out of investor portfolios and thus limits more sustainable design, especially in developing countries. Furthermore, the lack of performance metrics for nature-based solutions (NbS) that provide infrastructure services, as compared to mainstream approaches, for engineers and developers continues to prevent greater scaling beyond localized pilot projects.

#### Awareness, Technical Capacity, and Know-how

- General awareness across infrastructure-related sectors continues to be lacking for wildlife-friendly and nature-positive design, as well as the importance and value of ecosystem services and nature-based solutions which in turn is both reinforcing and resulting from data limitations.
- There are an increasing number of technical tools available for engineering solutions for infrastructure, including manuals providing guidance for enhancing and maintaining ecosystem connectivity, but the overall technical know-how among planners and engineers is extremely

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<sup>2</sup> See [www.infrastructureandnature.org](http://www.infrastructureandnature.org)

<sup>3</sup> See the Infrastructure and Nature Coalition homepage, [www.infrastructureandnature.org](http://www.infrastructureandnature.org), for full recordings of the sessions.

limited to enable integrated, larger scale solutions, e.g. designing infrastructure based on landscape-scale ecosystem services costs and benefits (nature-based solutions), regardless of the developed or developing country context.

### **Collaboration and Participatory Approaches**

- Collaboration emerged as an essential tool for overcoming these data and capacity barriers at multiple scales, including:
  - Inter-sectoral cooperation, for example between wildlife, forestry and transportation departments;
  - The need to shorten the feedback loop between research science and private sector developers in determining long-term solutions based on full-costing of biodiversity and ecosystem-services dependencies, benefits, and externalities;
  - The power of regional and global networks of infrastructure and ecology experts to share knowledge, data, training, and pilot solutions; and
  - Fuller participation of local communities and indigenous groups in planning and decision-making to enable implementation of larger scale solutions that push for more systemic solutions over traditional engineering.

### **Policy and Regulatory Incentives**

- Policy incentives and regulatory approaches are essential to address multiple challenges, including uncertainties about how to capture the long-term benefits from nature-based and biodiversity positive approaches in decision making. There is a need for public sector involvement to take on risk and manage what are inherently public goods. Multiple recent examples provide positive models, such as:
  - The European Taxonomy setting standards and metrics for sustainable investments<sup>4</sup>;
  - An International Organization for Standardization (ISO) effort for measuring biodiversity that is currently under development;
  - The Costa Rican government mandate for climate-resilient infrastructure screening; and
  - Multiple national and subnational laws enshrining ecological connectivity, from Bhutan to western U.S. states, in line with new IUCN policy resolutions related to ecological connectivity.
- This said, most of the spending devoted toward economic recovery from the COVID-19 pandemic continue to prop up fossil fuel reliant sectors, with less than 20% being invested in sustainable infrastructure or nature-based solutions.<sup>10</sup>
- Governments, financiers, and the private sector are still overly reliant on project and portfolio evaluations that do not properly value either ecosystem services and biodiversity benefits or internalize externalities of unsustainable investments.

### **Recommendations**

These four areas present clear and strategic opportunities for targeted solutions and investment from the international community, especially in countries desperately in need of recovery spending in economies largely reliant on foreign investment. Specifically, actors central to scaling infrastructure development that prioritizes biodiversity, decarbonization, and resilience, including investments in nature-based solutions and ecological connectivity should:

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<sup>4</sup> [https://ec.europa.eu/info/business-economy-euro/banking-and-finance/sustainable-finance/eu-taxonomy-sustainable-activities\\_en](https://ec.europa.eu/info/business-economy-euro/banking-and-finance/sustainable-finance/eu-taxonomy-sustainable-activities_en)

## Data and Standards

1. **Invest in country-based data development** and access to collect, improve, and make readily available necessary biodiversity, ecosystem services, and emissions and climate risk data in line with international standards to inform spatial and strategic planning that prioritizes delivery of green-grey approaches and maximizes nature-based, low- and zero-carbon solutions and ecological connectivity.
2. **Foster collaboration** between relevant government sectors, design-build firms, engineers, and conservation NGOs to pool and publicly share data on biodiversity and ecosystem services as part of integrated, stakeholder-based collaborative planning approaches that reduce regulatory risks and ultimately speed development of sustainable projects.
3. **Advance, harmonize, and rapidly scale standards for measuring biodiversity** and nature-positive infrastructure investments (e.g., demonstrated by Finance for A Sustainable Transition (FAST)-Infra and the Task Force for Nature-Related Disclosure (TNFD)), including updated internal funder screening protocols, to empower investors to properly screen out damaging brown investments and increase demand from client governments for developers that can deliver sustainable investments.

## Awareness, Capacity Building, and Technical Knowhow

1. **Increase investment in gold standard pilot projects** that demonstrate the full costs and benefits of integrating nature and infrastructure and developing NbS, relying on practical application of integrated, sound science; and significantly increase communication of their multiple benefits to larger audiences, from decision-makers in funding and oversight positions to the lay public.
2. **Establish new, and update existing, engineering and architecture advanced certification programs** to explicitly include rigorous course work on integrated planning and design for decarbonization, resilience, nature-based solutions, biodiversity, and ecological connectivity.
3. **Expand and increase funding for existing knowledge-transfer, exchange, and capacity building programs** in developing economies to demonstrate such approaches currently more widely adopted in northern, western countries. Existing global networks of expertise like the Infrastructure Ecology Network of Europe (IENE) and the Sustainable Infrastructure Community of Learners (SI-COL) are perfectly situated to deliver such programs.

## Collaboration and Participatory Development

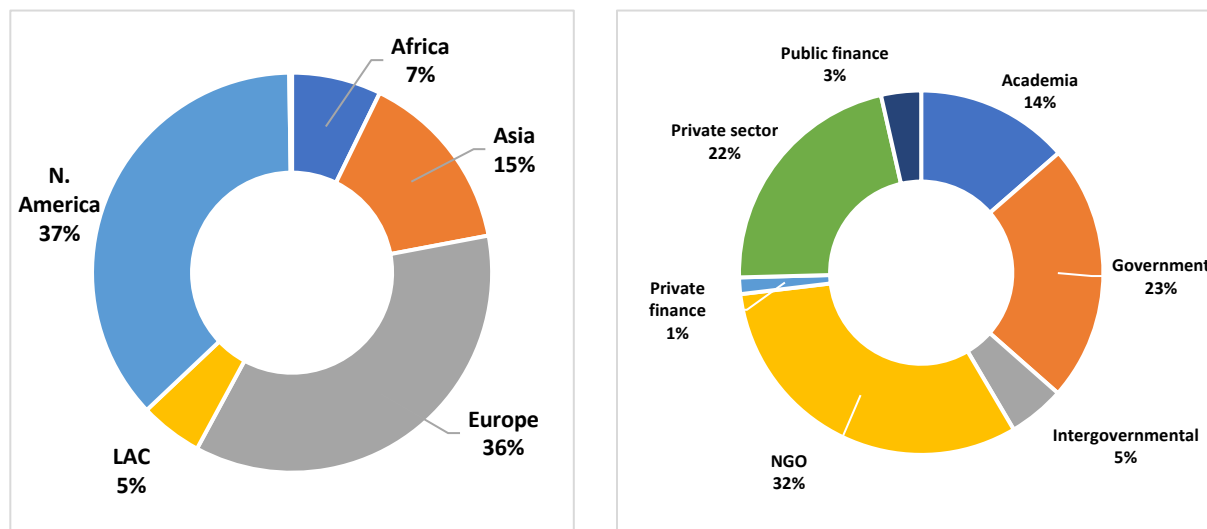
1. **Scale and replicate current successful examples of private-public collaboration** for nature-positive and biodiversity-beneficial infrastructure like the Club for Linear Infrastructure and Biodiversity (CILB) in France; and seek greater private sector participation in existing global infrastructure and ecology networks like the Infrastructure Ecology Network of Europe (IENE).
2. **Standardize norms for active participation of all affected stakeholders**, moving beyond minimum free, prior, and informed consent (FPIC) to full collaboration with local and indigenous communities in actual planning and design decisions, beginning with the earliest phases of land use planning and pre-feasibility. Given the additional time and resource costs of such collaboration and larger public benefits, public sector funding should significantly subsidize such processes.
3. **Establish coordinating mechanisms across government departments that currently have multiple, often conflicting mandates for infrastructure oversight**—protected areas, forests, public lands, and public works, energy, finance and planning and transportation (among

others)—to improve decision-making processes in early stages (upstream), regulatory certainty and oversight and reduce private sector investment risks for nature-based approaches.

### Policy and Regulatory Incentives

1. **Use the European Taxonomy or similar standards as models** to adapt and apply to infrastructure investments in different regulatory contexts around the world to guide procurement and tendering processes toward NbS and nature-positive investments aligned with national conservation, climate change commitments, and sustainable development objectives;
2. **Update engineering codes and manuals to incorporate performance metrics for ecological connectivity and large-scale delivery of nature-based solutions into infrastructure planning and design**, based on TNFD, UN System of Environmental Accounting, IUCN NbS Principles and other existing global standardization efforts.
3. **Change publicly and domestically funded project screening and procurement policies to require full-cost accounting** of negative environmental externalities and positive land/seascape scale benefits of nature-based solutions in larger surrounding project geographies.
4. **Support all countries to evaluate and spatially plan enhanced conservation and NbS commitments as part of sustainable infrastructure development** and create the necessary incentives under the CBD and Paris Agreement, including ensuring NbS and sustainable infrastructure are addressed through goals and metrics in NDCs and the CBD Post-2020 GBF. Countries need the technical support and funding to determine exactly which areas will contribute to their climate and biodiversity commitments and to what extent, and policy and regulatory support for actual implementation beyond public commitments.
5. **Significantly increase portions of green recovery stimulus packages dedicated to decarbonized, resilient, and nature-positive infrastructure development**, including public lands management to deliver NbS. Seizing this once-in-a-generation moment of public spending is essential to addressing climate and biodiversity goals, including protected area targets and long-term strategies. The trillions of dollars in stimulus and recovery spending in response to the pandemic, much of which is allocated to infrastructure, simply will not perform as well if invested in fossil fuel-based sectors compared to sustainable investments with significantly higher economic multipliers and potential for job creation.

## Annex 1. Session Summaries



Overall participant attendance for the Infrastructure and Nature Webinar series, by region and general job sectors, of roughly 2,000 attendees across 6 sessions.

### 1. Setting the Scene: Converging Crises and Sustainable Infrastructure

Session 1 introduced the key topics to be addressed throughout the full series, highlighting the overarching context of sustainable infrastructure as the center of a global green recovery to the COVID-19 pandemic, all during worsening crises in biodiversity loss and climate change. With a keynote address from the Executive Secretary of the Convention on Migratory Species (CMS), the session featured presentations and discussion from: the Brookings Institution, European Union Directorate General of the Environment on the new EU Taxonomy for sustainable investments, the French electricity system operator RTE on private-public collaboration for habitat connectivity and restoration, Bancolombia on the current state of sustainable investment in Latin America, and the French Ministry of Ecological Transition on research and innovation needs for maintaining and enhancing wildlife connectivity. Relevant insights that emerged from the discussion included<sup>5</sup>:

#### Barriers

- **Trade-offs between immediate economic relief and climate and biodiversity objectives in stimulus and recovery packages, the majority of which continue “brown” rather than “green”.** Job losses and the socioeconomic impacts of the pandemic reality, especially in emerging markets are creating huge demand for shovel ready projects from governments. This creates profound challenges in how to connect these short-term objectives to longer term sustainability goals without locking in brown investments fundamentally misaligned with the necessary transition toward decarbonization, biodiversity-positivity, and resilience.

#### Opportunities

- **The European Union green stimulus package, European Green Deal, and EU taxonomy are examples of the necessary policy alignment to achieve a green recovery and sustainable transition.** While a model that should be replicated, there are limits to its transferability to

<sup>5</sup> See [www.infrastructureandnature.org](http://www.infrastructureandnature.org)

developing country contexts facing limitations in available financing, stimulus, and shovel-ready sustainable investments.

- **Voluntary private sector approaches in partnership with government regulators present an opportunity for progress in enhancing biodiversity and sustainability**, demonstrated by the Linear Infrastructures & Biodiversity Club (CILB) in France. The challenge is to scale this approach in other countries around the world, as examples grow of the private sector exploring opportunities to invest in nature beyond minimum requirements of environmental, social, and governance (ESG) safeguards.<sup>6</sup>
- **The need to tighten the feedback loop between science and policy to make science as useful as possible, as quickly as possible**, to change planning and design for nature- and biodiversity-positive investments. With increasing uncertainties and urgency to reverse dire trends in biodiversity and climate, the need for science to guide both the upstream enabling environment and all the way through the infrastructure development cycle is essential. France is demonstrating strong examples of this with the Land Transport Infrastructures, Ecosystems and Landscapes (ITTECOP) program, born out of a meeting of several organizations, including the French Ministry of Ecological Transition (MTE), the French Foundation for Research on Biodiversity (FRB), and members of the Linear Infrastructures and Biodiversity Club (CILB), aiming at anticipating and supporting future needs for public and private decision support from the current institutional context.

## 2. Enabling Conditions, Policy and Planning Upstream

Session 2 explored relevant policies, financial incentives, planning tools, and overall enabling conditions “upstream” of any single infrastructure investment that either facilitate or impede current investment in sustainable infrastructure. The session began with a keynote from the Convention on Biodiversity Post-2020 Framework Working Group, highlighting the links between the objectives of the new framework and infrastructure development, including the essential role of improved spatial and land use planning, which is the first target for measuring framework success.<sup>7</sup> Presentations included the University of Pennsylvania School of Urbanism and Ecology highlighting the spatial impacts of urban expansion, particularly in cities near biodiversity hotspots, directly resulting in failures for many countries to meet their Aichi targets under the CBD; a private sector planner and developer, Biomimicry Frontiers, demonstrating the potential and power of biomimicry as an innovative tool for enabling more sustainable, nature-positive infrastructure planning and development; GIZ and the Government of Costa Rica demonstrating the power of policy change in enabling more resilient infrastructure via mandated use of climate risk screening; inputs from the design-build firm Arup on the particular challenges of scaling nature-based approaches; and again from the CBD Post-2020 Framework Working Group on the strong positive signals for major shifts toward investments in sustainable infrastructure sector. Panelists and presenters highlighted several barriers and opportunities in improving enabling conditions for sustainable infrastructure:

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<sup>6</sup> WWF and ARUP. 2019. Case Studies on Integrating Ecosystem Services and Climate Resilience in Infrastructure Development: Lessons for Advocacy.

<https://www.worldwildlife.org/publications/case-studies-on-integrating-ecosystem-services-and-climate-resilience-in-infrastructure-development-lessons-for-advocacy>

<sup>7</sup> See, for example, Target 1: “By 2030, [50%] of land and sea areas globally are under spatial planning addressing land/sea use change, retaining most of the existing intact and wilderness areas, and allow to restore [X%] of degraded freshwater, marine and terrestrial natural ecosystems and connectivity among them.” CBD, 2020.

<https://www.cbd.int/doc/c/3064/749a/0f65ac7f9def86707f4eafa/post2020-prep-02-01-en.pdf>

## Barriers

- **Contradictions between private sector business and financing models reliant on short term returns and the long timeframes for achieving benefits of sustainability, especially from nature-based solutions.** Time is needed for nature-based projects to function (i.e., trees to grow for afforestation/reforestation), requiring lenders, investors, and developers that are willing to wait for payoffs and returns-on-investment; and alternative financial models with combined public-private blended capital, with public investments shouldering some of the long-term risk.
- **Limited or insufficient essential data on environmental performance of nature-based solutions and engineered approaches under climate uncertainty.** Data essential for quantifying the services delivered by nature-based solutions or natural infrastructure—e.g., the services provided by intact ecosystems in lieu of or complimentary to engineered projects—continues to be insufficient, limiting adoption of such approaches and perpetuating reliance on more standard, business-as-usual (BAU) engineered projects. There is a similar lack of sufficient data to support comprehensive risk assessment and associated pricing, including fuller costing of environmental externalities, resulting in both over-valuing the benefits of BAU approaches and under-valuing nature-based solutions.
- **The high administrative costs of coordination across multiple layers of government necessary for integrated, stakeholder-based upstream planning.** Effective land-use planning to maximize benefits for multiple stakeholders and meet multiple sustainability objectives requires regular coordination across ministries and departments that each have strong incentives, especially budgeting, for siloed management and oversight. Ensuring ownership and participation of indigenous peoples and local communities similarly requires lengthy time and resource commitments many public and private institutions are often either unwilling or unable to allocate.
- **Powerful trends in urbanization and population growth are driving urban expansion and sprawl.** [Spatial assessments clearly demonstrate](#) how and why countries have failed to meet their Aichi targets as population growth and migration in cities have driven further expansion into habitats, including in biodiversity hotspots. Governments face enormous pressures to plan for and manage this growth, often with constrained budgets, and urgent needs for housing, infrastructure, and services, with natural capital and ecosystem services in surrounding areas insufficiently evaluated, valued, and protected to provide such services.

## Opportunities/Solutions

- **Redefining project evaluation approaches to include fuller-cost** accounting of both environmental dependencies (ecosystem services), risks (climate or otherwise), externalities (environmental impacts), and operating and capital expenses over entire project lifetimes, rather than more immediate-term returns on investment. This is especially essential for investments in resilience and nature-based approaches, both of which may take considerably longer to generate real return on investment.
- **Facilitating a systemic shift towards more holistic planning** at a country or regional level, combining bottom-up (e.g., prioritizing Indigenous peoples and local communities, and local and regional stakeholders) and top-down (government-led) planning processes; systematically upscaling successful pilots; and moving away from single project, developer-driven planning. With increasingly easy to use and affordable spatial analysis tools and data, planning for



biodiversity and nature-positive development no longer faces many of the constraints that prevented wider uptake.

- **Promoting a necessary paradigm shift in multiple aspects of infrastructure design from the standards of the 20<sup>th</sup> century to the 21<sup>st</sup>:** from resistant to resilient, from engineered to hybrid and nature-based, from fixed to adaptive to changing conditions, from single purpose to multi-functional and flexible, from centralised to decentralised, from standardised to site-specific, from cheap to value, and from quantity to quality. [Biomimicry](#), for example, has huge potential as a paradigm shift toward nature-based, flexible, multi-purpose design.
- **Targets of the Convention on Biodiversity (CBD) post-2020 Global Biodiversity Framework and enhanced Nationally Determined Contributions (NDCs)** that explicitly link to both infrastructure and strategic land use planning, create new goals for government to aim for in spatial and strategic planning, and incentives for private sector collaboration to reach them (e.g., through collaborations with consulting and engineering firms).

**Infrastructure Relevant Targets of the CBD Draft Global Biodiversity Framework zero draft**

- **T1:** By 2030, [50%] of land and sea areas globally are under spatial planning addressing land/sea use change, retaining most of the existing intact and wilderness areas, and allow to restore [X%] of degraded freshwater, marine and terrestrial natural ecosystems and connectivity among them
- **T11:** By 2030, increase benefits from biodiversity and green/blue spaces for human health and well-being, including the proportion of people with access to such spaces by at least [100%], especially for urban dwellers
- **T13:** By 2030, integrate biodiversity values into policies, regulations, planning, development processes, poverty reduction strategies and accounts at all levels, ensuring that biodiversity values are mainstreamed across all sectors and integrated into assessments of environmental impacts
- **T17:** By 2030, redirect, repurpose, reform or eliminate incentives harmful for biodiversity, including [X] reduction in the most harmful subsidies, ensuring that incentives, including public and private economic and regulatory incentives, are either positive or neutral for biodiversity
- **T18:** By 2030, increase by [X%] financial resources from all international and domestic sources, through new, additional and effective financial resources commensurate with the ambition of the goals and targets of the Framework and implement the strategy for capacity-building and technology transfer and scientific cooperation to meet the needs for implementing the post2020 global biodiversity framework

### 3. Addressing Biodiversity Risks in Infrastructure Investment

Session 3 explored why biodiversity related risks are insufficiently evaluated in lending and investment decisions, exposing financial institutions to material financial risks; and practical ways forward on how to identify, measure and manage biodiversity-related financial risks in the infrastructure sector. With facilitation from the UNEP Sustainable Finance Initiative, the session was framed with a report from WWF and Oliver Wyman surveying the 30 largest infrastructure investors in how they are integrating environmental and social safeguard concerns in their portfolios. Findings showed that biodiversity was the least disclosed and least well integrated, compared to energy efficiency, GHG emissions, air pollution,

and physical climate risks.<sup>8</sup> It was also the least used to factor for screening potential investments, compared to, for example, projects with high carbon intensity. This set the stage for discussion with Standard Bank Group, Macquarie Capital, the European Investment Bank, Swiss Re, and WWF, moderated by United Nations Environment Programme Finance Initiative around additional barriers and opportunities, with particular attention to insufficient biodiversity data standardization and access for financial institutions to increase disclosure and ultimately reduce biodiversity risks.

### **Barriers**

- **Still limited ability to capture biodiversity data comprehensively and accurately at the right scale** to reflect risks in infrastructure development; while still challenging with climate change, it is nonetheless much easier due to simpler and fewer variables, i.e., measuring GHG emissions of a project is far simpler than its biodiversity impacts.
- **Overcoming old paradigms that addressing biodiversity is not just philanthropy** but fundamental to overall company success and the bottom line; banks have to change the way they think and model.
- **The lack of a consistent, broadly applied standards for measuring biodiversity risks** to understand the baseline and improve upon it
- **Biodiversity and ecosystems externalities are still not adequately priced in project cost-benefit assessments**, so the costs of potential harmful projects are underestimated, with inflated rates of return not accounting for their long-term impacts.
- **Significantly fewer projects coming to the market that capture nature-based solutions and are biodiversity-positive, compared to renewables** due to the challenges in measuring and evaluating biodiversity risks.
- **Need to convince investors about the materiality of biodiversity-related risks**; limited track-record in the right products that make it attractive for the financial community to invest
- **Investors have limited influence in integrating biodiversity into projects** because they invest at different rates of maturity, resulting in strict requirements largely being cosmetic because they can't change the fundamental design of the project once permitted; ultimately this makes engendering larger scale change in screening and approval processes fundamentally challenging.

### **Opportunities/Solutions**

- **Where biodiversity data availability is still limited, particularly in developing economies, proxy indicators can work to measure risks**, alongside increasingly high-resolution global satellite and geospatial data.
- **New standards for assessing, evaluating, measuring and reporting on biodiversity related risks**, including the European Taxonomy and the Task Force for Nature Related Disclosure (TNFD), are essential to drive change: policy makers, business, and regulators need to standardize and require reporting on risks and impacts to biodiversity.
- **Integrating the economic impacts of biodiversity risks into internal appraisal and trade-off evaluation processes by large funders** is essential to properly screen projects with unacceptably high or insufficient consideration of biodiversity impacts, so funders can exert actual influence rather than affect cosmetic changes on already designed and permitted projects.
- **Civil society can play an essential role in holding investors and governments accountable** with increased transparency and disclosure from TNFD and similar standards, to ensure biodiversity risks are properly avoided or mitigated.

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<sup>8</sup> See [oliverwyman.com/our-expertise/insights/2020/oct/incorporating-sustainability-into-infrastructure.html](https://oliverwyman.com/our-expertise/insights/2020/oct/incorporating-sustainability-into-infrastructure.html)

- **Huge new commitments from funders to increase investments in financing climate action and environmental sustainability** (supporting more than \$1T in the critical decade 2021-2030 from EIB), that simultaneously present enormous challenges to achieve given the lack of projects meeting ESG criteria.

#### 4. Engineering with Nature

Session 4 explored the overall enabling conditions necessary to develop nature-based infrastructure solutions and examples, from coastal protection and water supply to building greater flexibility into transportation networks. Keynote presentations addressed road ecology (explored in greater detail in Session 5) and the US Army Corps of Engineers' Engineering with Nature program, highlighting important lessons from innovative US case studies. Additional presentations from the Los Angeles (LA) Transportation Authority highlighted examples from a portfolio of green/hybrid engineering approaches, like permeable pavements and vegetated flood retention areas as part of larger sustainability and climate resilience strategies. The Nature Conservancy (TNC) presented the increasingly clear business case for NbS, including high benefit to cost ratios for investing in coastal mangroves and the innovative coastal reef insurance program in the Yucatan Peninsula. AECOM further highlighted both the overall benefits and challenges they see in implementing NbS from a developer perspective, including multiple benefits and limitations around scale, data, awareness, and technical capacity. Moffat and Nichol presented a case study on rebuilding coastline in Alabama after decades of erosion through a hybrid approach of engineered breakwaters and ecosystem restoration. TNC South Africa closed with a final case study of vegetation management in the Cape Town watershed to address water security through removal of invasive, high water demand species.

#### Barriers

- **The challenges of cross-sectoral and jurisdictional collaboration** to scale up from local, small-scale pilot projects to truly addressing current and future climate impacts and risks and biodiversity needs.
- **While the benefits to nature are better understood, there is insufficient quantification and communication of the financial benefits of NbS** especially in like and in-kind comparisons to more traditional approaches.
- **For developers, a general lack of awareness in clients to demand more nature-based approaches, or the lack of associated regulatory requirements/incentives**, e.g., procurement, that would increase demand for NbS.
- **Fundamentally insufficient technical and engineering knowhow** around nature-based solutions, especially in current engineering education and training programs.
- **Rigid policies and silos within both public and private institutions** creating barriers for more innovative financial models for multiple benefits delivered by NbS; the multitude of committees regulating and funding infrastructure limits investment in NbS for infrastructure services.

#### Opportunities/Solutions

- **Increasing investment in academic and technical training programs** to build the necessary technical engineering know how and expertise.
- **The huge untapped potential for communications** to much wider audiences to demonstrate the value of NbS.
- **New, innovative financial models that can capitalize and reinvest environmental benefits in local markets** of nature-based or hybrid projects, demonstrated by the LA Transportation Authority that reinvests revenues from green bonds back into program and project budgets.

- **Public policy harmonization across agencies and ministries** to break down silos to increase budgets, standardize requirements, and reduce oversight and administrative costs for NbS approaches.
- **Still a significant need for more NbS pilots and standardized metrics to compare across** them to demonstrate effectiveness and scale successes to match interventions to the scale of current climate and biodiversity challenges.
- **Collaboration is essential to break down jurisdictional silos and leverage outside expertise** that the local public agencies most often implementing projects do not have the capacity to implement innovations like nature-based approaches.

## 5. Linear Infrastructure and Ecological Connectivity

Through a mix of presenting prevailing science, innovative policy, and local case studies, Session 5 explored the global challenge of meeting the enormous demand for linear infrastructure while maintaining, enhancing, and restoring the ecological connectivity that is essential to reverse wildlife population declines and allow species to adapt to a rapidly warming world. The session began with an overview from the Center for Large Landscape Conservation (CLLC) about the challenges of increasing habitat fragmentation, the many technical tools now available for addressing them, increasing collaboration around the world, and new policy changes in progress to incentivize change, including IUCN policy resolutions on wildlife-friendly linear infrastructure and ecological connectivity. WWF outlined momentum by public, private, and academic actors developing new policy guidance, pushing innovative science, and facilitating corporate action. A presentation from the Swedish University for Agriculture and the Infrastructure Ecology Network of Europe (IENE) highlighted the overall barriers limiting greater global action, and focusing in particular on the importance of cross-sectoral and public-private collaboration for mutual learning and innovation, as exemplified by IENE. The session then turned to specific case studies from Kenya, South Asia, North America, and Eastern Europe highlighting unique challenges to these geographies and the innovations employed. These include:

- Applying consistent methodologies and Identifying hotspots of road-wildlife impacts in Kenya;
- New guidance developed by the Asian Development Bank for project design and implementation, as well as meeting the challenges of prevailing engineering practice;
- Cross-sectoral collaboration to construct wildlife crossings in Slovakia; and
- Exemplary practices on the Blackfeet Indian Reservation and the importance of building relationships between indigenous tribes and U.S. federal and state actors for more holistic solutions.

### Barriers

- **Continuing reliance on transportation development practices of the past** leads to the same solutions, such as the fundamental need to think at systems scale rather than just minor design changes.
- **Science is still too focused on theory, and insufficiently on practical implementation, which can result in** poor communication about the results of practical application and weak institutionalization of learning from pilot projects.
- **Wildlife mortality in transportation networks is not just a factor of linear infrastructure itself** but also surrounding landscape features, requiring multiple interventions beyond just technical design that address ecological, social, and engineering factors.
- **Insufficient training of engineers in the basics of ecology and its importance in overall linear infrastructure design**, including why costlier designs may ultimately be worth the additional cost to maintain wildlife connectivity.

- **Insufficient evidence and case studies about the costs and benefits of designing for ecological connectivity in developing countries** is especially lacking (most well-known examples are from North America and Europe), creating challenges to prove the need for locally relevant, contextualized design.

### Opportunities/Solutions

- **Increasing policies at global, sub-national, and local scales to require or incentivize enhancing, maintaining, or restoring ecological connectivity:** The Convention on Migratory Species, Convention on Biodiversity, and numerous national and subnational examples can be leveraged including Bhutan as the only country requiring landscape connectivity in federal policy to a number of US states requiring wildlife friendly approaches.
- **The private sector increasingly demonstrating and calling for action,** such as new incentives like the TNFD that explicitly calls for enhanced connectivity.
- **Advancing consistent technical guidance** for conserving ecological connectivity through the application of the mitigation hierarchy in engineering and design manuals.
- **Increasing project-based collaboration between scientists and practitioners across sectors,** connecting infrastructure engineers, wildlife/forestry departments, and the public and private sectors to achieve mutually beneficial implementation for ecological connectivity that is exemplified by the Transport Working Group under the IUCN WCPA Connectivity Conservation Specialist Group (CCSG), ITTECOP, CILB in France and the EU-funded project Biodiversity and Infrastructure Synergies and Opportunities for European Transport Networks ( [citation: [Home - BISON project \(bison-transport.eu\)](https://www.bison-transport.eu) ] .
- **The power of joint cross-disciplinary platforms to enable better communication and collaboration** to advance learning and dissemination of best practice for both public and private sectors, as demonstrated by IENE International Conferences and other regionally-focused meetings.
- **Training programs with well-reputed national and international experts that are** increasing capacity in multiple sectors and government agencies for financing, planning, constructing, and operating more sustainable infrastructure.
- **Increasing investment** in data collection and monitoring to enhance the evidence base that design changes are beneficial for biodiversity and nature, while also supporting strong cost-benefit assessments that properly internalize externalities.

## 6. Ramifications for 2021 and Beyond

The sixth and final session closed out the series with a discussion of the key insights, barriers, and opportunities discussed throughout, adding new voices to conclude the series with recommendations for policymakers in the upcoming “super year” of negotiations at Biodiversity COP 15, UNFCCC COP 26, the IUCN World Conservation Congress and beyond. With moderation from the engineering and consulting firm Golder, the session opened with a keynote from the Global Policy Director for IUCN to set the stage for sustainable infrastructure policy opportunities in 2021. Panelists from the German Federal Ministry for the Environment (BMU), InterAmerican Development Bank (IDB), Arup, the Convention on Biodiversity (CBD), City Developments Limited (CDL) Singapore, the French Ministry of Ecological Transition, and an expert in Indigenous peoples’ rights and Harvard lecturer each discussed their key barriers and opportunities for action in scaling and implementation of sustainable infrastructure in 2021 and beyond.

## Barriers

- **The failures of business-as-usual approaches**, evidenced by the fundamental failures to meet the Aichi Targets, driven in part by the disconnect between national plans and local implementation, due to corruption, power struggles between governments and developers, and limited technical capacity and data to match the need.
- **Professional engineering codes and norms that simply do not deliver biodiversity gains**; while mainstreaming has been an objective for some time, silos between engineering and biodiversity have prevented real integration into engineering and architecture. Changing codes and blueprints is inherently challenging, but still just beginning.
- **Lack of public knowledge about the impacts of biodiversity** from development and poor planning, insufficient stakeholder engagement and transparency.
- **Regulatory uncertainty and internal corporate policy limits innovation** and adoption of NbS and nature-positive projects; change is also hard to see when it does occur because shifts are slow, since it takes so long to build projects.
- **Fundamentally still brown recovery programs risk locking in unsustainable trajectories**, demonstrated by the Vivid Economics green recovery index.

## Opportunities/Solutions

- **Growing recognition of major funders of the importance of increased investment in environmental and social safeguards in green recovery** because it performs better than brown; huge benefits over the long term in ESG investments, e.g., \$40B from Costa Rica in decarbonizing, even with the upfront cost.
- **The most important gains are made “upstream” of individual projects** in policies, planning, and governance; improved governance can pay significant dividends in avoiding conflicts. Recognizing this, the German government, for example has embedding green economic advisors in 20+ countries.
- **Clear long-term targets and goals at the country level around climate and biodiversity are essential signals for private sector investments**, alongside the legal/policy incentives for development, e.g., land rights; and clear identification of risks and benefits; clear evidence of the benefits of solutions reliant on and based in nature.
- **Collaboration is essential to break silos and align goals** between government, private sector, and academia to co-develop approaches for successful mainstreaming, both vertically and horizontally across levels of government, national to sub-national; via direct engagement with the private sector, finance, and civil society.
- **Demands for sustainability and green space from a new generation of consumers**, especially as a result of the pandemic.
- **Sustainable, rights-based and collaborative development above and beyond free, prior, and informed consent (FPIC) to achieve social and environmental justice** and the need for a paradigm shift toward people-centric development moving forward. Alignment between community priorities and developer/project priorities is essential; impacted people and communities have to be at the heart of development, moving beyond consultation and consent.
- **Futures planning to design and develop regenerative infrastructure** that avoids key biodiversity areas, maintains ecological connectivity, including addressing One Health priorities and increased awareness around holistic considerations of environmental health.
- **Need for champions pushing finance for nature agendas with biodiversity at the heart of development** and showcase them to the rest of the world, e.g., Rwanda and Singapore.

- **The need to increase the costs of inaction:** Blackrock and other companies are demonstrating leadership by putting companies on watch lists, where directors can be fired for inaction on climate.
- **Norms are already shifting toward sustainable investment** due to substantial progress in renewables.
- **The contribution of sub-national governments in driving change**—Sao Paolo, California, Quebec—and innovation in executing sustainable infrastructure development.

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