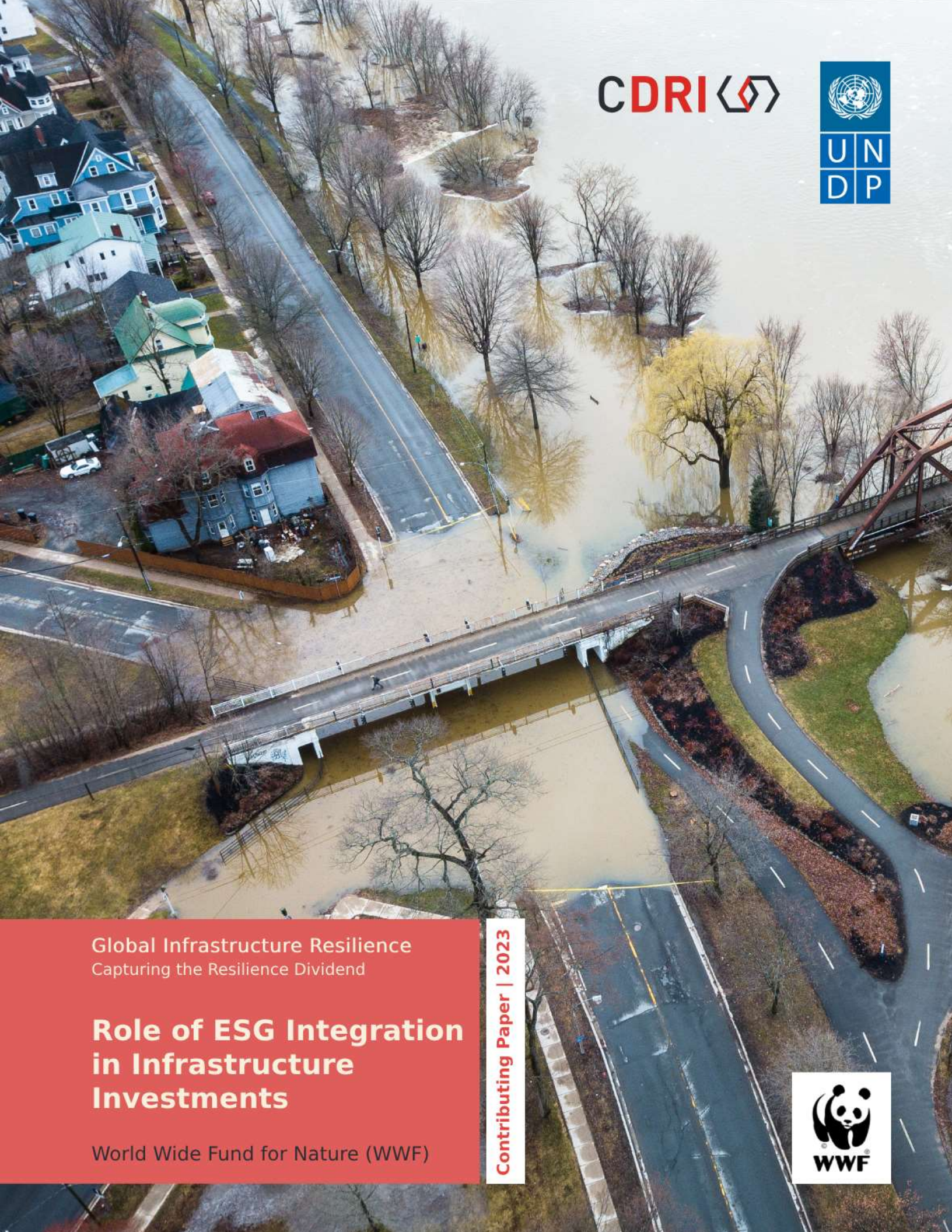


Global Infrastructure Resilience
Capturing the Resilience Dividend

Role of ESG Integration in Infrastructure Investments

World Wide Fund for Nature (WWF)

Contributing Paper | 2023

FINANCING FOR DISASTER AND CLIMATE RESILIENT INFRASTRUCTURE: PILLAR 5

TITLE: ROLE OF ESG INTEGRATION IN INFRASTRUCTURE INVESTMENTS

ABSTRACT

In the past decade and a half, post the global financial crisis, the infrastructure sector has undergone a significant transformation. According to the G20's Global Infrastructure Outlook, $97 trillion will be needed for infrastructure investment by 2040[1] (including investments to meet SDGs) and around 60-70 per cent of the investments are likely to be made in emerging market economies[2]. However, despite the interest of the private sector, participation remains low and making the investment environment more attractive to private investors remains a challenge, due to multiple reasons including lack of knowledge and capacity to design and implement bankable infrastructure projects, lack of knowledge on new technologies, lack of alternative financing structures, low governance capacity and weak institutions. Since infrastructure is a highly illiquid asset class, typically held for long periods of time, infrastructure assets are especially vulnerable to long-term sustainability risks, such as climate and biodiversity impacts, changing environmental regulations, and changes to consumer health and safety regulations. Though difficult to quantify, these risks have material impacts on the financial performance of an asset over its life-cycle. While investors do see the relevance and potential financial impact of these ESG issues on their assets, they report they have neither the data nor suitable integration methodologies available to take ESG integration a step further and amplify their investments in Infrastructure (WWF & Cadmus Group, 2018).This position paper seeks to establish a business case for integration of sustainability principles at the core of infrastructure investments and evaluate how this can mobilise the flow of private capital into the sector.

Building on the current body of work done by WWF to understand the ESG integration landscape in infrastructure investments, **SECTION 1** of this paper aims to analyse the current trends and practices in ESG analysis of infrastructure investments by assessing how ESG considerations impact these investments and benchmarking prevalent infrastructure related sustainability standards in practice (labels, principles, evaluation tools, valuation tools, standards, reporting tools etc.). Through a case study on FAST- Infra meta-standard (Finance to Accelerate the Sustainable Transition-Infrastructure), it showcases what a universal approach to identify sustainable and resilient infrastructure projects can look like. By analysing the risks and opportunities associated with ecosystem services in infrastructure development, **SECTION 2** of this paper builds a case for accounting for natural assets as an imperative for building resilience in infrastructure projects. To build this narrative, it utilises case studies on successful bankable nature solutions (BNS) and environmental safeguard adoption in linear infrastructure projects.

SECTION 1

1.1 SUSTAINABLE INFRASTRUCTURE: ROLE OF ESG

With the public finances strained in the post-pandemic world, there is an increased thrust to scale up private sector investments in infrastructure. At the same time, institutional investors are turning to infrastructure to meet their needs for long-term, stable returns which are protected from economic and

[1] https://outlook.gihub.org/

[2] https://www.oecd-ilibrary.org/docserver/9789264273528-5-en.pdf?expires=1612863903&id=id&accname=guest&checksum=45D3840DE7E16597AE2F1B23467A39AF

cyclical risks. Since infrastructure is a highly illiquid asset class typically held for periods of over ten years, infrastructure assets are especially vulnerable to long-term sustainability risks, such as climate impacts and shifts in environmental and social regulations. Infrastructure investments are also vulnerable to externalities, such as carbon emissions or environmental degradation, which are usually borne by the public, but often go unaccounted on project balance sheets. Though difficult to quantify, these risks can have material impacts on the financial performance of the asset over its life-cycle[3].

A recent WWF India study found that in September 2017, infrastructure projects worth USD 176 bn were stalled with almost 14 per cent of total projects under implementation stalled as a result of failing to obtain green clearances due to inadequate considerations of environmental factors, which accounted for the largest proportion of stalled projects and the highest costs resulting from stalling of these projects.

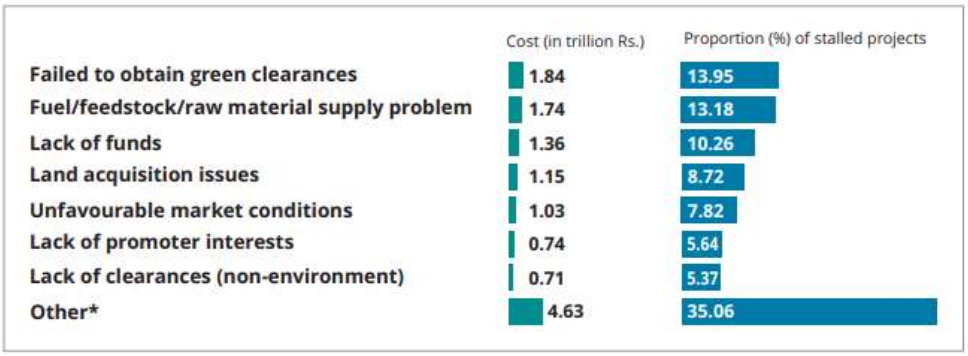


Figure 1. Reasons for stalling of infrastructure projects in India (WWF India 2021)

With the growing private investment in the infrastructure sector, there is an increased demand for inclusion of externalities and sustainability related risks in financial models and asset balance sheets which can enable investors to understand their portfolio risks and shift investments towards more 'sustainable' infrastructure.

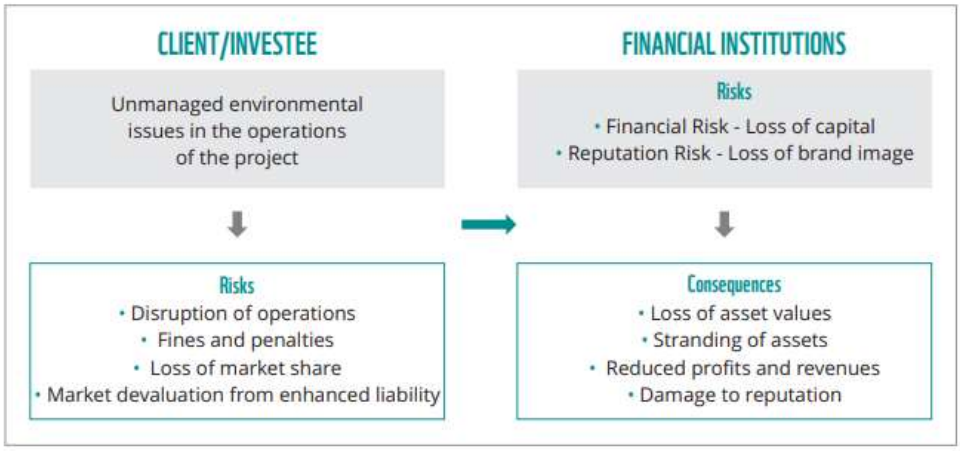


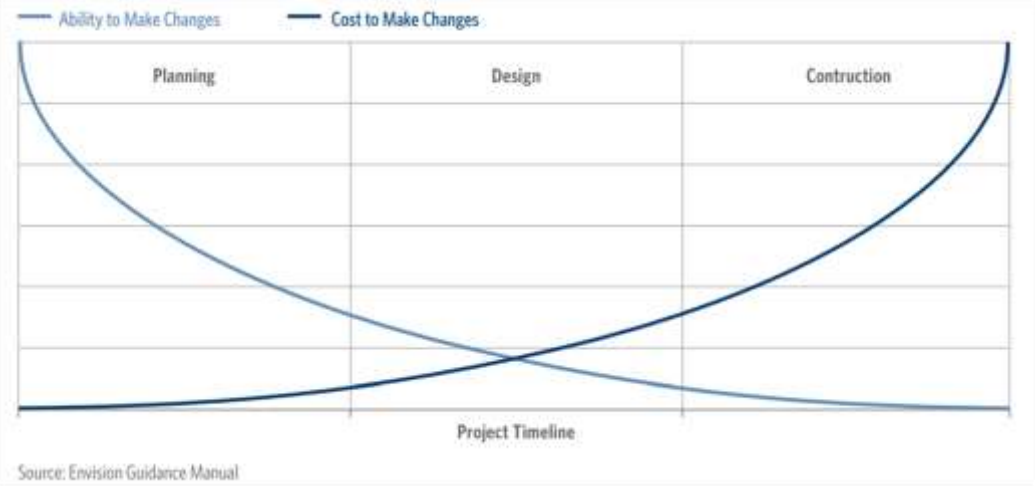
Figure 2. How environmental risks translate to financial risks (Adapted from IFC framing)

3 AMP Capital. "Infrastructure ESG Policy Guidelines

CASE STUDY: TIME AND COST OVERRUNS FOR A ROAD PROJECT DUE TO LACK OF INTEGRATION OF ENVIRONMENTAL RISKS

In 2009, the National Highway Authority of India gave a contract (for Rs 1170 Cr) for four-laning (from two lane) of NH 7 between Seoni and Nagpur of length 125km, of which 65km falls under forest area (around Kanha and Pench Tiger Reserves).

Construction started in 2010, but due to some protests by animal activists, and a court case, 37 km of forest stretch through the tiger reserve was banned. In 2011, the Supreme Court refused to sanction the stretch. Mitigation measures worth Rs 750Cr were suggested by WII (Wildlife Institute of India). In 2015, NHAI agreed to embed an additional cost into the contract to account for the underpasses and bridges. To protect the animals, NHAI also agreed to construct guide walls and nine underpasses of 50-750 m width at various places on the 37-km road. Constructing the stretch through the forests took another four years and the project got completed in 2019. Protests and Supreme Court rulings against the project, lead to stalling of the project, which in turn lead to time and cost overruns.



The above graph indicates the inverse relationship between the ability to make changes and cost of making changes for an infrastructure project. Therefore, proper assessment of biodiversity risks, and their mitigation measures is critical before construction of any infrastructure project. Mitigation measures must be included in the planning phase for proper estimation of costs, and avoidance of hurdles in construction phase of the project.

Source: Integration of environmental risks in infrastructure investments in India (WWF 2021)

While there is no universal definition for 'sustainable' infrastructure, it can be broadly classified as system that is planned, designed, constructed, operated, and decommissioned in a manner that ensures economic and financial, social, environmental (including climate resilience), and institutional sustainability over the entire infrastructure lifecycle, helping put the world on a path towards sustainable and inclusive growth, in line with global agendas, particularly the Sustainable Development Goals and Paris Climate Agreement[4]. Thus, sustainable infrastructure encompasses environmental, social, institutional, and economic dimensions such as enhancing, protecting, and restoring ecosystems; reducing our dependence on fossil fuels; increasing resilience to climate and other risks; serving all stakeholders; improving quality

4 McKinsey Centre for Business and Environment, 2016

of life and addressing poverty; supporting the effective and equitable governance of local institutions; and strengthening economies through growth, jobs, and a holistic view of the full life-cycle costs of the project. Thus, it integrates science-based and inclusive planning, nature and climate risk, mitigation, and resilience analysis, and applicable nature-based solutions (NbS).

CASE STUDY: FINANCIAL AND REPUTATIONAL RISKS DUE TO LACK OF INTEGRATION OF ENVIRONMENTAL CONSIDERATIONS IN A HYDROPOWER PROJECT

The government of Arunachal Pradesh awarded the Nyamjang Chu hydropower project (a run-of-the-river project on Nyamjang Chu River, in Tawang district) to Bhilwara Energy Limited. The initial estimated cost of the project was INR 6,400 crore, while the total time schedule for project construction was 74 months, including 12 months for construction of ancillary facilities and other pre-construction activities.

The environmental clearance, which was granted in April 2012, was obtained on the basis of an incomplete or faulty environmental impact assessment (EIA). However, the local communities protested against the project, as a 3 km stretch of the Nyamjang Chu River, between Brokenthang and Zemithang township, falling under the project area, was a rich biodiversity area and also one of the only two wintering sites in the State for the black-necked cranes. Black-necked crane, locally known as Thrung-Thrung Karmo in Tawang, is a vulnerable species as per IUCN Red List of threatened species and the locals see the winter arrival of the bird as norbu (good fortune).

Later on, the project was challenged at the National NGT by Save Mon Region Federation, a local conservation group led by the Buddhist Lamas. Subsequently, in 2016, the NGT suspended the environmental clearance after observing some serious errors in the EIA study (based on which the environmental clearance was granted) and asked the MoEFCC to conduct a revised study to ascertain the potential ecological impacts of the dam.

Following this, the Wildlife Institute of India (WII) conducted the revised impact assessment study and their report asserted the premise that the construction of the dam would **submerge the entire habitat of vulnerable black-necked crane**, leading to local extinction of the species in Zemithang Valley. The NGT withheld its decision on suspension of environmental clearance and the project was stalled. This shows how incomplete information and faulty EIA study leads to failed investment decisions. There is an urgent need to have robust scientific EIA studies, with involvement of local communities for secure and sustainable execution of infrastructure projects.

Source: Integration of environmental risks in infrastructure investments in India (WWF 2021)

With the emergence of climate and sustainable development commitments, different strategies are being used by the investors to understand their material non-financial risks and opportunities. These include investment exclusions, identification of most impactful projects, as well as quantitative and qualitative assessments. At the heart of this process is the inclusion of environmental, social and governance (ESG) performance indicators that directly and indirectly affect the financial performance of investments. Being largely subjective, these criteria are often determined by investors based on unique investment philosophies, client preferences and type of asset.

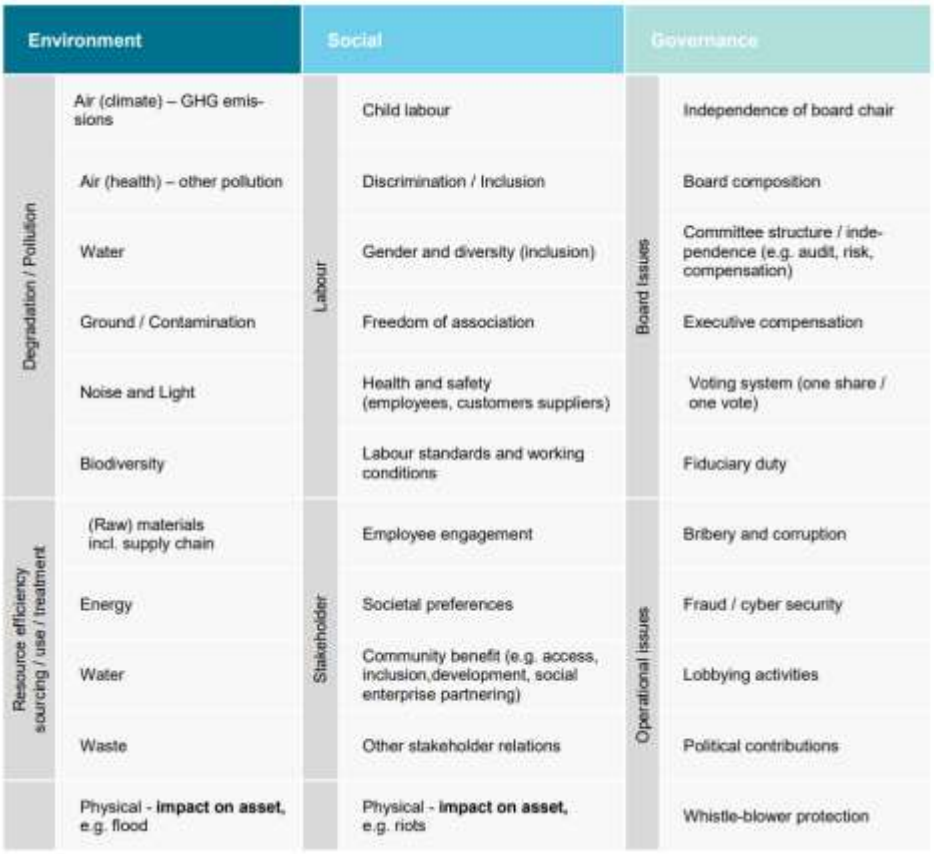


Figure 3 An in-exhaustive list of environment-related ESG factors (WWF 2021)

Most critical ESG factors for infrastructure include location, type and nature of infrastructure, stage of investment, and expectations from stakeholders. The impacts of an infrastructure asset can be classified as external impacts - originating outside the asset (e.g., temperature rise, increased water scarcity, changing regulations, tariffs), and internal - inherent to the asset, which may affect the surrounding environment and communities (e.g., water effluent, quality of life of communities, labour conditions, etc.), which impact an asset's financial performance via various feedback loops (e.g., protests of the surrounding community)[5]. This is referred to as the 'double materiality' and it emphasises the need of a comprehensive approach to risk management by the financial institutions which accounts for both the impacts from and to the infrastructure assets.

Impact FROM Infrastructure asset	**Impact TO Infrastructure asset**
Infrastructure assets can have a positive or negative impact on the surrounding (environment and/or society)	Infrastructure assets may be positively or negatively affected by its surrounding (environment and/or society)
Examples: environmental degradation, pollution, improved access to basic services, health and safety for workers, corruption etc.	Such external impact on the asset is primarily of physical or regulatory nature
Feedback loops, i.e. a reaction from the surrounding back onto the asset may occur, e.g. tax breaks, or societal backlash such as strikes and boycotts	Examples: floods, droughts, (natural) resource constraints, pollution, demographics, riots, regulatory changes etc.

5 WWF and B Capital Partners, 2019

Financial consequences can be direct or indirect, e.g. via reputational risks	Assets resilient towards external impacts can anticipate, accommodate, absorb or recover from such impacts

Figure 4. ESG impact on and from an infrastructure asset (Adapted from B Capital partners' AG)

A systematic approach to ESG analysis may not only help to identify risks but also opportunities such as potential for resource efficiencies and reduction of the company's environmental footprint. It may further foster innovation and staff retention, enhance community relations, as well as provide and protect the social license to operate.[6] Consequently, a range of tools and standards have emerged to help infrastructure investors integrate ESG into their decision-making processes by mapping most relevant ESG criteria for the selected asset, outlining which ESG criteria should be measured and reported, and quantifying and assigning monetary value to ESG metrics; thereby allowing investors, developers, and procuring entities to incorporate ESG criteria in project financial models and balance sheets.

1.2 Infrastructure value chain and sustainability standards

Infrastructure project's financial viability is the most critical measure for attracting the capital needed to finance infrastructure projects making all actors in the infrastructure project lifecycle (procuring entities, developers, and financial investors) responsible to conduct detailed analyses to understand the project's risks and commercial feasibility. ESG considerations are often applied to these analyses, usually to comply with regulatory requirements. Increasingly, this data is being used by investors to manage ESG risk or to meet certain voluntary commitments. It is also increasingly being used to quantify and incorporate into financial analyses such as internal rate of return (IRR) or net present value (NPV) using discounted cash flow models. For instance, a wind power plant that need to be shut down annually due to bird migratory patterns experiences a predictable and quantifiable impact on cash flows that impact the return of the asset.[7]

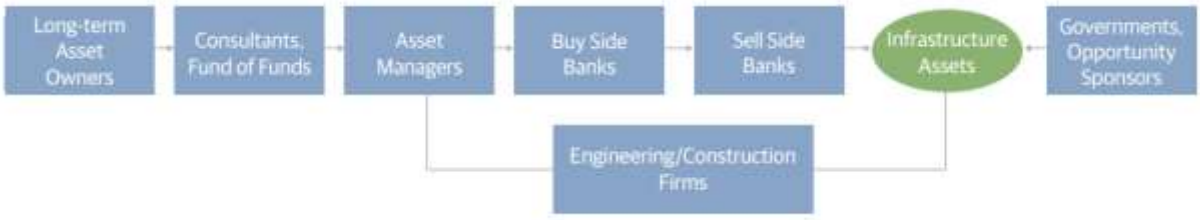


Figure 4 Infrastructure Investment Value Chain- (WWF 2020)

The infrastructure investment process is usually lengthy and complex given the number of entities involved and the timeframe of the project and the application of ESG assessments, therefore, vary heavily on the basis of the stage of project lifecycle, the stakeholders, and sub-sector. The application also defers from greenfield, where the environmental and regulatory policies of the government is prominent, and brownfield assets, where historical data is available and modelling is easier.

Typically, during the project development phase, ESG analyses are focused on supporting feasibility studies and cost benefit analyses (CBAs) of procuring entities to make a decision on whether to initiate the project. Developers conduct ESG analyses EIAs/ESIAs and other financial feasibility assessments

6 PRI Primer on Responsible Investment for Infrastructure.
7 WWF and Cadmus Group, 2018

which may feed into IRR analyses and NPV calculations carried out by the investors. During the construction phase, developers monitor and report on ESG performance of the project which is used to prepare and monitor the project risk. The reporting on these parameters support the refinancing of the asset. During the operation phase, the ESG-related performance data is continued to be collected and used to develop regular reports for the shareholders and external investors and to properly steward their investments.

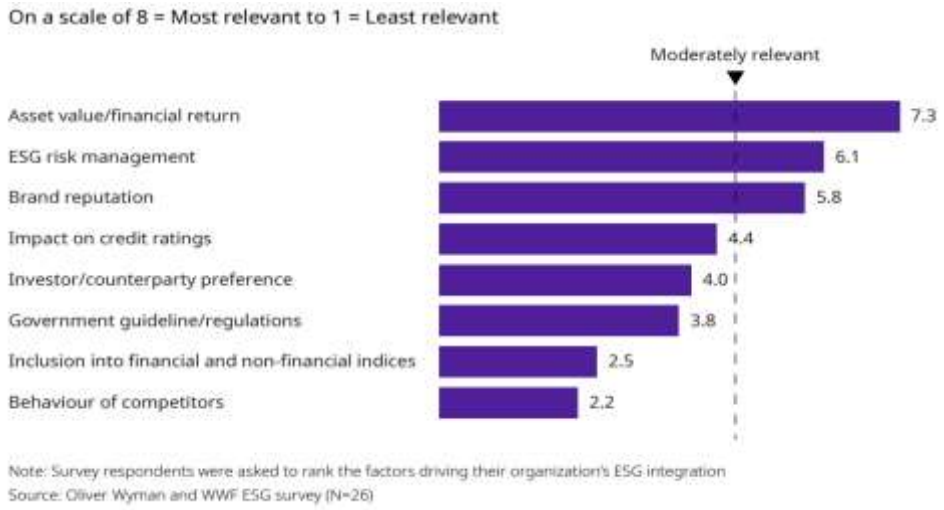
FACTORS DRIVING ESG INTEGRATION

Institutional investors are increasing their commitment to ESG considerations for a variety of reasons. A survey conducted by Oliver Wyman and WWF found that the top three motivating factors include-

• **Financial returns:** The primary motivation for investors to consider ESG integration is the financial gain expected from investing in sustainable businesses.

• **ESG risk management:** Investors seek to protect against downside to physical risks from natural catastrophes and climate-related events, increasingly considering these as part of an investment due diligence. In 2017 and 2018, wildfires caused record-breaking economic losses, including over $20 billion annually in California. The catastrophic fires led to the world's first climate-change bankruptcy: PG&E was found liable for damage because its power lines had potentially caused the wildfires.

• **Brand reputation:** Reputational risk is a key concern. As investors' ESG performance comes under greater scrutiny, stronger ESG standards brings a positive image of responsible investment and broader alignment to the UN PRI commitments. Insufficient efforts may increase reputational risk and potentially result in higher costs for investors.



Another survey conducted by WWF and ADFIAP, to understand ESG integration by APAC's leading DFIs found that government regulation and guidelines, investor or counterparty preference, and brand reputation are the key motivators for DFIs to integrate ESG factors in their infrastructure investments. While physical climate risks and greenhouse gas (GHG) emissions were cited by DFIs as the most important environmental factors to assess the environmental performance, biodiversity and habitat loss issues are the least important environmental factors being considered by them.

Box 1. Investors' rationale for considering ESG factors (Source: Oliver Wyman and WWF 2020)

1.3 Classification of ESG frameworks and tools for infrastructure investments

The most prevalent way for integration of sustainability into the investment decision-making process in infrastructure investments has been through the adoption of Environmental Social Governance (ESG) decision criteria, which directly and indirectly affect the financial performance of investments. Many institutional investors have adopted responsible investment frameworks such as the the United Nations' Principles for Responsible Investment, the leading global network of investors to demonstrate their commitment to responsible investment and the incorporation of ESG into the investment process.

The investment strategies have evolved over the years to provide avenues for better ESG integration to the institutional investors; responsible investment ranges from an exclusionary ESG investment analysis to a norms based best-in-class screening, which not only offers competitive financial returns but also benefits the involved stakeholders. Impact investment, on the other hand, focuses on specific sustainability themes and pursues ESG opportunities to deliver large-scale social impact.

Figure 5 Strategies for ESG integration and sustainable infrastructure finance (WWF 2021)- Adapted from UN PRI, BNP Paribas, and Credit Suisse

Since a project's financial viability is critical to attracting the capital needed, all stakeholders involved in infrastructure project life-cycle have incentives to conduct detailed analyses to understand the project's risks and commercial feasibility. While ESG considerations are often incorporated to mitigate regulatory and reputational risks associated with infrastructure investments, they are increasingly being used in financial analysis to ascertain which projects should be pursued. This has resulted in the development of a wide variety of general and infrastructure specific principles, standards and tools.

ESG schemes for infrastructure investors can be broadly classified as:

- **ESG standards,** which are either used as reporting guidelines or certification schemes;
- **ESG tools,** which are used to produce ESG ratings, scores, or classification; and
- **ESG risk management/mapping** scenarios

Examples of best practices that are widely adopted in infrastructure ESG analysis include (but are not limited to) the Equator Principles, IFC Performance Standards, SuRe and GRESB.

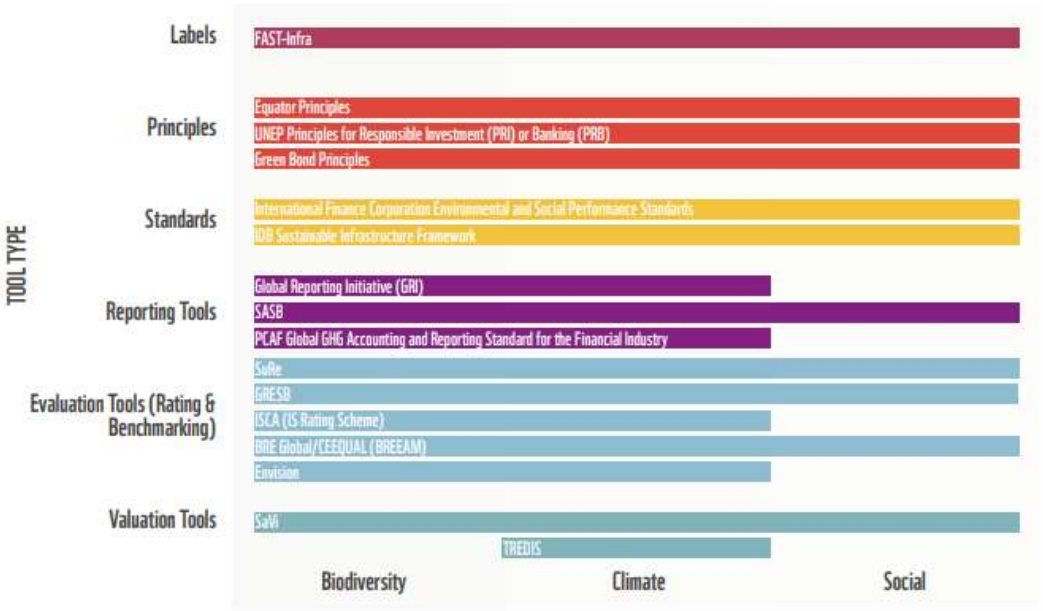


Figure 6. Mapping exercise showing some of the principles, standards, frameworks, and tools most used by DFIs in the context of infrastructure investments (WWF 2021)

While the use of ESG tools for infrastructure assessments is evolving, several tools have been developed to support the incorporation of ESG metrics. These tools utilise existing internationally accepted standards such as the UN-supported Principles for Responsible Investing (PRI), the International Organization for Standardization (ISO), the International Framework for Integrated Reporting (IR), the Global Reporting Initiative (GRI), to define a set of to ESG criteria that produce a practical output (rating, certification, or financial figure) that may be used to inform the decision-making of an infrastructure project stakeholder. Despite having a multitude of principles, standards, tools and frameworks that these stakeholders utilise, at present no single, comprehensive set of criteria for ESG in infrastructure is universally recognized. ESG tools, therefore, support infrastructure investors, procuring entities, and developers by drawing on this range of frameworks and industry expertise to establish unique, measurable criteria deemed most relevant to asset sustainability or financial materiality[8], supporting them to analyse and benchmark ESG performance of the project, as well as the impact of ESG criteria on financial returns. Generally, these ESG investment analysis tools are utilised for 1) assessing the ESG performance of an asset; and/ or 2) quantifying the selected ESG criteria in a way that can be integrated into a financial model[9]. The ESG tools can be categorized across several characteristics[10]:

A. Evaluation and Valuation:

ESG Evaluation is an assessment of quantitative and qualitative ESG criteria, which is often reported as a set of information, and typically results in a score or rating. Evaluation can be useful during the due

8 WWF and Cadmus Group, 2018
9 UN Principles for Responsible Investment
10 WWF 2021

diligence process, for benchmarking investments or projects, as a tool for reporting and stewardship, and for considering how a project addresses various ESG criteria across a portfolio.

Source: Valuing Sustainability in Infrastructure Investments: Market Status, Barriers and Opportunities (WWF 2019)

CASE STUDY: ENVISION RATING OF PERALTA WIND POWER PROJECT

The Peralta Wind Farm was developed by PAMLATIR S.A. to bring clean energy to approximately 74,000 Uruguayans and to increase the resiliency of Uruguay's energy supply, which is largely dependent on hydroelectric power. The project, which consists of 25 turbines, a High Tension Line and substation, cost approximately $143.8 million. It was financed with 27 percent equity and 73 percent long-term loans from the Inter-American Development Bank (IDB) and the U.S. Exim Bank, respectively. To determine the sustainability of the proposed project, the wind farm was evaluated using the Envision Rating System for Sustainable Infrastructure during its development.

Envision includes five categories: quality of life; leadership; resource allocation; natural world; and climate and risk. A project is assessed based on its planned or actual performance in each category as either improved, enhanced, superior, conserving, restorative, or innovative relative to the baseline condition. Examples of ESG criteria evaluated by Envision for the Peralta Wind Farm project include:

- Quality of Life: clean energy production, job creation, plans for historical sites, assessment of impacts of health and quality of life on nearby residents;
- Leadership: fulfillment of Kyoto protocol, adherence to Environmental Management Plan, sustainable procurement, net-embodied energy and potable water consumption;
- Natural World: ecological value of land, environmental impacts; and
- Climate and Risk: GHG emissions and air pollution credits, inventory of GHG emissions, and assessment of climatic threats and long-term adaptability

Envision's Rating System demonstrated how the wind farm could support Uruguay's and Peralta's sustainable development commitments, which include complying with Article 12 of the Kyoto Protocol's Clean Development Mechanisms. Uruguay's commitment to wind energy was an ESG impact on the project – the country set a goal for 38% of its electricity to be supplied by wind projects. Notably, the project earned an Innovation credit for its use of a GHG inventory to manage and track the emissions of the project's suppliers.

The evaluation also identified areas where there were opportunities for improvement, which included the potential for additional reductions in embodied energy and potable water consumption and an increased attention to climate change resiliency. Overall, the evaluation of the project earned it a Gold Award from the Envision Rating System, clearly demonstrating its commitment to sustainability. The wind farm's construction was completed in spring 2017.

ESG Valuation is assigning a monetary value to an ESG risk or benefit in order to understand the full economic impacts of an infrastructure asset and its externalities, which can be then incorporated into a financial model, as either costs or benefits. However, due to the diversity in types of assets included within the infrastructure asset class and lack of monetizing approaches across a wide range of criteria, practical approaches for implementing ESG valuation in the infrastructure space remain fragmented.

B. Asset Type(s):

Some of the tools can be utilised for a wide-array of infrastructure assets including telecommunications, transportation, water, waste, and energy. Others were designed for specific asset types and have a more specialized set of ESG metrics.

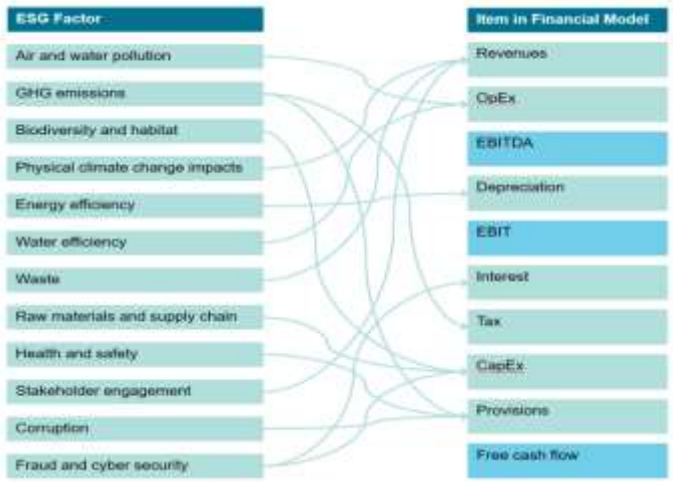


Figure 7. Impact of ESG factors on specific elements in financial models (WWF & B Capital Partners 2019)

	Name	Types of Assets	Primary User Type(s)	Methodology	Output(s)
Evaluation Tools	GRESB Infrastructure Asset Assessment	Energy, Water, Waste, Transportation, Telecom, Data, Social, Real Estate	Financial Investors, Managers, Operators	• User-provided data • Point scoring system • Validation • Peer benchmarking	**Rating:** Absolute score (out of 100), peer and overall rankings , Scorecard and Benchmark Report
	Envision	Energy, Water, Waste, Transportation, Landscape, Information	Procuring Entities, Developers	• User-provided data • Publicly available point scoring system	**Certification:** Bronze, Silver, Gold, and Platinum levels
	SuRe	Energy, Water, Waste, Transport, Communication, Social, Food Systems, Mining	Procuring Entities, Developers, Financial Investors	• User-provided data • Publicly available achievement scoring system	**Certification:** Bronze, Silver, and Gold levels
	RepRisk	34 sectors (including beyond infrastructure)	Companies, Investors, Governments, NGOs	• Media scanning • Private point scoring system and rating system	**Score or Rating:** RepRisk Index score or RepRisk Rating (AAA-D)
	CEEQUAL	Infrastructure, civil engineering, public spaces, and landscaping	Governments, Developers/Designers	• User-provided data • External validation and scoring	**Score and Rating:** Assessment score (percentage out of 100%) and award (excellent, very good, good, pass)
	ISCA Tools (Planning, Design & As-Built, and Operations)[xvi]	Energy, Water, Waste, Transportation, Information	Governments, Developers/Designers, Operators/Owners	• User-provided data • External validation and scoring	**Score and Rating:** Assessment score (out of 100) and rating (Bronze, Silver, Gold, Platinum, and Diamond)
Valuation Tools	SAVi	Energy, Buildings, Roads, Water, Natural Capital (under development)	Procuring Entities, Financial Investors	• System dynamics modeling • Project finance modeling	**Financial Impact:** Cost benefit analysis, gross margin, net present value, value for money, internal rate of return, credit ratio
	TREDIS	Transportation	Procuring Entities, Developers	• Regional economic and transportation modeling • Project finance modeling	**Financial Impact, Market Access:** Cost benefit analysis, project finance analysis, economic development impact
	Autocase	Buildings and Project Sites	Procuring Entity, Developers	• Economic analysis modeling	**Financial Impact:** Cost benefit analysis, net present value
	Zofnass Economic Process Tool	Energy, Water, Waste, Transport, Landscape, Information	Procuring Entity, Developers	• Economic analysis modeling (based on Envision framework)	**Financial Impact:** Cost benefit analysis, net present value

Figure 8. ESG tools and characteristics (WWF 2020)

CASE STUDY: SAVI ANALYSIS FOR OFFSHORE WIND

In late 2017, Rijkswaterstaat—the Netherland's Ministry of Infrastructure and Water Management—contacted the International Institute for Sustainable Development (IISD) to apply their Sustainable Asset Evaluation (SAVi) tool to a planned 9.5 GW offshore wind farm in the North Sea. Rijkswaterstaat wanted to assess the financial attractiveness of the planned development versus alternative energy generation options in light of positive and negative climate impacts and externalities.

To help perform this ESG valuation, the Ministry selected a range of metrics to include in the financial analyses. They picked two key sustainability risk metrics with impacts on the project: (1) the physical impacts from an increase in temperature of 1.5 degrees Celsius; and (2) the policy and economic risks of a EUR 16.27/MWh carbon tax levied by the European Union. The Ministry also identified key ESG metrics related to impacts from the project as relevant to Dutch taxpayers. These metrics included:

- A valuation of emissions and their impacts on human health;
- The project's impact on labor income, including additional employment created, average income, and proportion of discretionary income utilized in the Netherlands;
- The opportunity cost of land based on the productivity of other uses precluded by power generation;
- Lost fishing industry revenue from offshore wind farm;
- Revenue impacts on coastal real estate, tourism, and recreation;
- Possibility of wind farm limiting sand mining; and
- Development of a new seaweed farming industry between the wind turbines.

IISD quantified each metric and included them in the analysis, along with traditional costs and benefits of the asset, to create a comprehensive cost benefit analysis using SAVi. The SAVi tool also integrated the ESG metrics into analysis of key financial performance indicators, including levelized cost of electricity, gross margin, Internal Rate of Return (IRR), debt service coverage ratio, loan life coverage ratio, and net present value (NPV). These calculations were used to assess the financial return of the wind farm compared to other forms of energy generation. Using only conventional assumptions, the offshore wind asset had significantly lower financial performance than coal. However, when material climate risks are included, coal was only slightly more competitive than wind. When the material externalities are included (e.g. the health impacts of emissions), wind had no competition among generating sources—it was the clear winner

Source: Valuing Sustainability in Infrastructure Investments: Market Status, Barriers and Opportunities (WWF 2019)

C. Primary User Type(s):

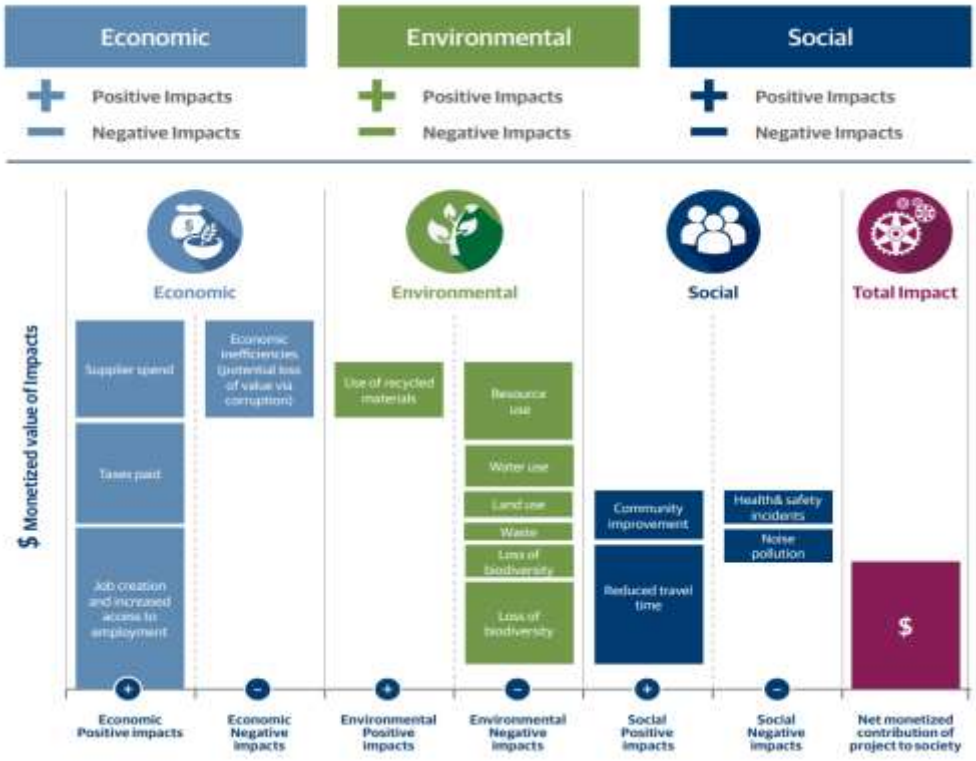
The primary users of these tools fall into three categories: procuring entities (e.g. governments, utilities, or other organizations); developers (e.g. engineers, architects, facilitates managers, and construction firms); corporate and financial investors (e.g. fund managers, pension funds, insurance companies, institutional investors, and sovereign funds). Most tools have been designed for specific user types, but many are flexible and can be used to support a variety of user types.

Different user types often utilise specific types of tools that fit their ESG assessment and integration rationale. Typically, ESG criteria with impacts on the asset include risks and benefits posed by the regulatory and the local environmental factors and resilience, which are easier to assess and quantify and therefore more likely to be used in ESG evaluation. On the other hand, ESG criteria related to impacts from the asset include risks and benefits that the infrastructure asset generates on the external environment and community, often termed as externalities, and are less likely to be incorporated into project investment decisions. The private sector actors, especially those looking at a short term investment horizon are less likely to utilize valuation tools, that incorporate ESG risks which have a long term horizon while the public sector is more likely to use valuation tools as they will can prioritize

investments by incorporating positive and negative externalities resulting from a project. The above comparison indicates that some tools are designed to apply across infrastructure asset types, while others are designed for specific infrastructure subsectors and that there is a need for a greater alignment between evaluation and valuation tools that may encourage increased tool adoption by standardising the data used for ESG analysis across each phase of the investment process. In an ideal scenario, ESG valuation tools used by financial investors in the operation phase (i.e. in assessing brownfield investment opportunities) would draw directly on the data monitored and reported using evaluation tools during the development and construction phases.[11] This relationship is most closely represented by the alignment between the Envision evaluation tool and the Autocase valuation tool, wherein Autocase allows the qualitative data from Envision, collected during the development, construction, and operation phases to be integrated into economic valuation and financial models.

IMPACT MEASUREMENT AND VALUATION TOOL

An impact measurement and valuation assessment assigns a monetary value to economic, environmental and social impacts of an infrastructure project. It begins with setting the scope of the valuation and the time period over which the impacts will be valued, while establishing a baseline against which the impacts can be measured. Post collection of data, valuation factors are applied to provide a monetized value for each impact.



For an identified highway project, IMV suggested that road connection creates a monetized positive NPV to society, around half of which was accounted for by the time saved by users, and the rest through generation of GDP through supplier spend, resulting in economic benefits accounting for over 1/3 of project's total value.

Box 2 Impact measurement and Valuation tool (KPMG analysis 2020)

11 WWF and Cadmus Group, 2018

1.4 Towards a universal approach for ESG analyses of infrastructure investments

While financial institutions, primarily institutional investors such as pension funds are increasingly seeking sustainable, low-risk investments for their rapidly expanding ESG funds, the pace at which sustainable, quality infrastructure is being constructed is not commensurate to our global goals. This is due to a multitude of reasons, including absence of adequate number of cases that demonstrate correlation between asset financial performance and ESG performance, lack of a unified methodology on assigning monetary value of ESG externalities, limited awareness and policy support, among others.

While there is no singular answer to the identified challenges, a reliable and widely recognized global infrastructure assessment standard or label that objectively evaluates ESG related risks and opportunities while ensuring reliable economic returns, will infuse greater confidence and clarity in selecting which infrastructure investments will support contextual needs. The trend towards identifying common denominators and alignment among various sustainability instruments is good news for project preparation officials who seek to mainstream sustainability considerations within their operations: the reduced complexity will make their task of navigating the universe of instruments easier, and it will lower transaction costs and help mobilise private capital[12].

Key initiatives that promote a common approach to identify sustainable, quality, and/or green infrastructure projects include the 'meta-standards'- FASTInfra (Finance to Accelerate the Sustainable Transition-Infrastructure) label and the Blue Dot Network (BDN). FAST-Infra, led primarily by finance-sector institutions, launched the Sustainable Infrastructure Label (SI Label) to identify sustainable infrastructure projects. The Blue Dot Network, led by the Governments of the United States, Australia, and Japan, introduced the Blue Dot Network framework for certifying quality infrastructure projects[13]. Both of these standards draw the inspiration from the best available existing principles, guidelines, standards, rating systems, and certifications and aim. While the BDN focuses on 'quality' and 'sustainable' infrastructure projects, FAST-infra targets only 'sustainable' infrastructure.

Both the standards have a minimum criterion across its categories that must be met to receive the label, certification, or classification. While FAST-infra requires a positive contribution in at least one of the areas, along with baseline conditions being met, in order for a project to be certified, BDN grants the second dot and the third dot to projects that exceed the essential requirements. FAST-infra is being led by, primarily the private sector (HSBC, Global Infrastructure Facility, International Finance Corporation, Climate Policy Initiative, and OECD) and has been primarily focused on financial investors, BDN is being led by the governments of USA, Australia and Japan with support from OECD. Both FAST-Infra and Blue Dot Network propose hosting digital data platforms that will serve as a repository of all projects.

Going forward, it is essential that the two 'meta-standards' are aligned with each other and address the user-needs across all infrastructure sub-sectors, especially for the emerging geographies where majority of new infrastructure is expected to be created. Both could utilise each-other's proposed best-practices and provide geography, sector and context-based guidance and support for wide and easy adoption of the standards by the stakeholders, such that there is more clarity than confusion in selecting and evaluating infrastructure investments.

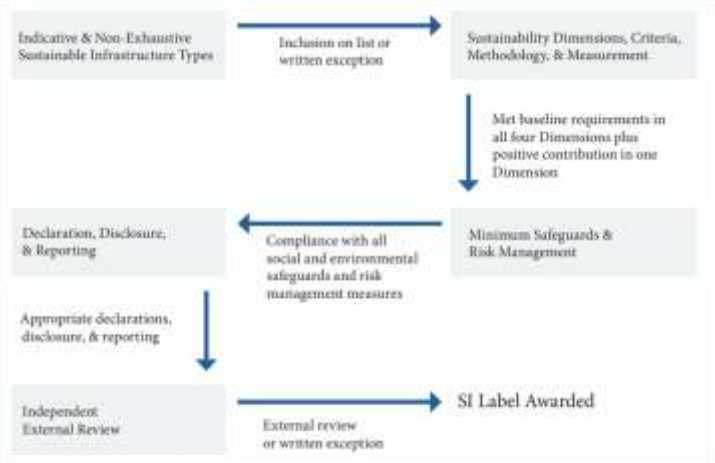
12 Inter-American Development Bank, 2020
13 Building a Common Approach: Global Infrastructure Standards (Duke University 2022)

CASE STUDY: FAST - INFRA SUSTAINABLE INFRASTRUCTURE LABEL: FRAMEWORK

FAST-Infra was a product of French President Emmanuel Macron's One Planet Lab think tank, with an aim to promote innovative solutions to the global challenges related to climate change, biodiversity loss, and the well-being of societies (One Planet Summit 2022). A globally recognized and trusted label which harmonized existing standards could build the confidence that financiers was identified to increase private investments to sustainable infrastructure, especially within emerging and developing markets.

The FAST-Infra Initiative has two major components: the SI Label and the FAST-Infra Tech Platform.

The SI Label aims to be a widely recognized and transparent label that reliably communicates that an infrastructure asset meets international sustainability standards in terms of four dimensions: (1) Environmental, (2) Social, (3) Governance, and (4) Adaptation & Resilience. The Label rests on the IFC Performance Standards, as well as filling gaps in the current standards, together with making a positive contribution towards a set of criteria drawn from good market practice. The 14 sustainability criteria that underpin the SI label were developed by extensive mapping of leading standards, taxonomies, and principles in the market. Under each criterion, baseline requirements would be the minimum standards that all SI Label infrastructure projects/assets are required to adhere to. Beyond the baseline requirements, there must be a quantifiable positive contribution to a sustainability objective. The strength of the SI Label framework is that stakeholders have the flexibility to use the best available techniques and metrics to demonstrate compliance with the 14 sustainability criteria.



Use of the SI Framework and application of the associated SI Label are voluntary. The SI Label can be applied at all lifecycle stages including planning, designing, sponsoring, developing, constructing, operating, financing, and decommissioning. The SI framework has five key requirements-

- Indicative & Non-Exhaustive Sustainable Infrastructure Types
- Sustainability Dimensions, Criteria, Methodology, & Measurement
- Minimum Safeguards & Risk Management
- Declaration, Disclosure, & Reporting
- Independent External Review

FAST-Infra is currently in the pilot testing phase, as moving towards full release post which the focus will be on continuing to applying the SI Label, raising its visibility and encouraging the adoption of the label.

Source: Building a Common Approach: Global Infrastructure Standards (Duke University 2022)

SECTION 2

2.1 RISKS AND OPPORTUNITIES ASSOCIATED WITH BIODIVERSITY AND ECOSYSTEM SERVICES FOR INFRASTRUCTURE DEVELOPMENT

Infrastructure projects have significant economic and social benefits, however, they have to be designed and managed with adequate environmental and social safeguards, otherwise, they can cause serious and at times irreparable damage to natural capital. Lack of effective and responsible management of infrastructure projects could lead to significant environmental and social impacts that, in turn, impede long-term economic growth [14]. Construction of infrastructure projects can adversely affect natural ecosystems, such as forests, freshwater, oceans, air, drainage systems, and natural habitats. Whether a highway cuts through a dense forest or a mining concession is granted in a wildlife corridor, infrastructure projects carry inherent environmental risks across different stages of the project lifecycle that, if not considered adequately, translate into financial risks.[15] The first step in effectively managing these risks is proactively identifying them at an early stage in the project life cycle and understanding that multiple projects in the same region may have a much deeper cumulative impact on the area's natural ecosystems, necessitating adequate assessment and mitigation plans.

Figure 9. Impacts of infrastructure on biodiversity and ecosystems (WWF India 2021)

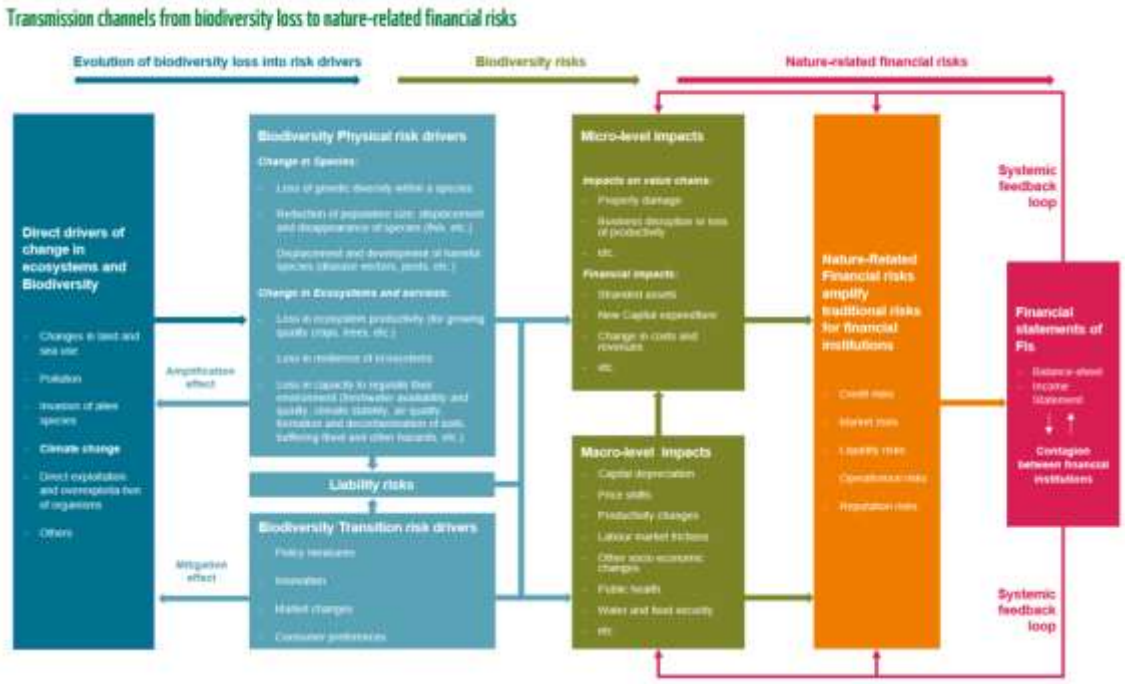
As infrastructure is crucial for the attainment of key global goals like the UN Sustainable Development Goals (SDGs) and is recognized as such in SDG 9: "Industry, Innovation & Infrastructure: build resilient infrastructure, promote inclusive and sustainable industrialization and foster innovation", it has to be managed in a way that diversity of natural habitats and ecosystems is systematically included in the development, industrial and innovation policies. If infrastructure is planned in a way that results in a positive outcome for the surrounding ecosystems, it will yield long-term benefits for the project stakeholders and the society at large. For instance, it has been estimated that in the Asia Pacific, nature-positive infrastructure and built environment opportunities could create over US$1.2 trillion in incremental annual business value in 2030 (together with over 65 million new jobs), while bringing with them a range of biodiversity benefits in key impact areas[16]. Realising these benefits would require a shift

14 Integration of environmental risks in infrastructure investments, WWF India 2021
15 Integration of environmental risks in infrastructure investments, WWF India 2021
16 Temasek, World Economic Forum and AlphaBeta, 2021 and IBID

in terms of how projects are planned, executed and monitored, for instance, transport infrastructure would have to be thought of from the larger biodiversity and climate lens instead of just optimising for time and distance considerations and resilience will have to be built at all stages of the lifecycle- at the planning stage, to avoid fragmentation of intact ecosystems, in design, by including wildlife corridors in sensitive areas and in construction stage to ensure these considerations are implemented and disclosed to stakeholders periodically.

RELATIONSHIP BETWEEN NATURE AND THE FINANCE SECTOR

Ecosystems provide some of the most fundamental services required for our survival, usually divided into four categories: provisioning (e.g. food production), regulating (e.g. surface water purification), cultural (e.g. tourism); and supporting services (e.g. nutrient cycling) (OECD, 2019). Therefore, sectors are directly dependent on ecosystem services (face physical risk): agriculture and forestry, clothing, brewers, electric utilities and other power producers and, to a lesser extent, tourism and consumer goods (UNEP Finance Initiative, 2020) as well as the sectors that have a strong negative impact on ecosystems (face transition risk): mining, energy, transport and infrastructure (WWF & AXA, 2019), will be deeply affected to due to decline in ecosystem services which will result in financial consequences for companies, households and governments, which will, in turn, feed the traditional risks faced by financial institutions.



This is further exacerbated by the negative feedback loop between biodiversity and climate change, as biodiversity loss impedes carbon sequestration and climate resilience and climate change is a direct drives of biodiversity loss. However, assessments indicate that FIs tend to disproportionately lend in countries that have relatively high levels of biodiversity, highly resource-intensive economies, and weak environmental regulation (Finance for Biodiversity (F4B), 2020).

Box 3 Nature related financial risks (WWF 2021)

So far, the financial sector has failed to channel large scale capital into biodiversity due to a variety of reasons, some of which include-

- Lack of understanding of biodiversity and its assessment methodologies by the finance sector
- Lack of adequate guidance on the available tools and universally accepted performance indicators
- Lack of adequate number of successful, financially viable cases that demonstrate the benefits of biodiversity and ecosystem restoration

However, to close the sustainable infrastructure funding gap, more public and private investments must be channelled in projects which support the development of more climate resilient and sustainable landscapes and economies. These investments are often termed as Nature-based solutions (NbS), which are actions to protect, sustainably manage and restore natural or modified ecosystems that address societal challenges while simultaneously providing human well-being and biodiversity benefits. NbS is an approach that can be used in conservation, and conservation action is essential to maintain the nature used in NbS. However, they are not synonymous. NbS interventions must be explicitly designed to address an identified societal challenge and be able to show how it is doing so through monitoring of robust indicators, making NbS a tool for social development that has biodiversity benefits[17].

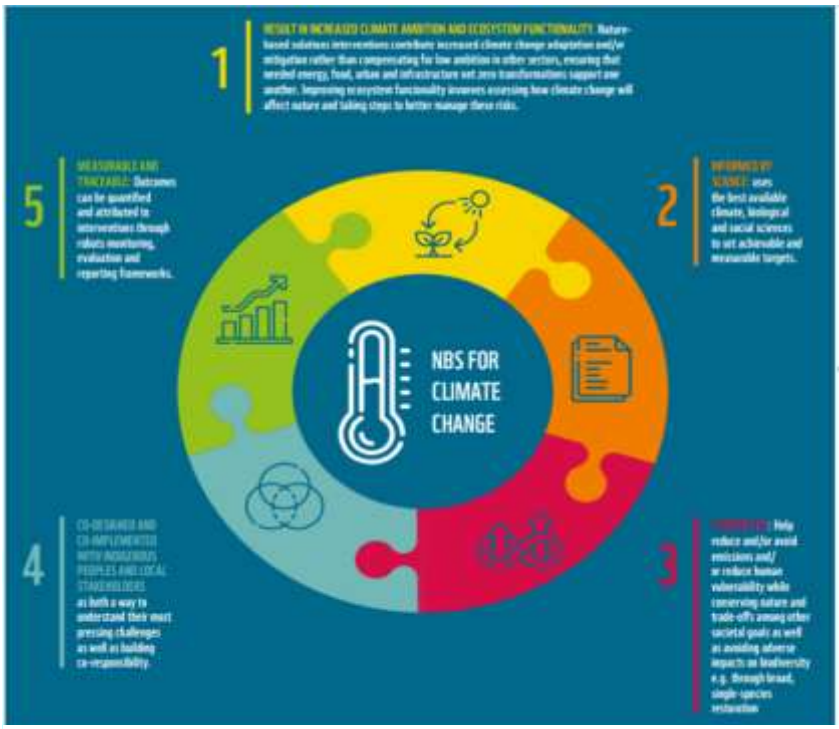


Figure 10 Principles for NbS for climate change. Source WWF, 2021

More recently, a subset of such projects has been termed as- Bankable Nature Solutions (BNS) which are solutions for environmental challenges that at the same time generate an acceptable (risk-adjusted) return on the money invested, enabling projects to accelerate scaling and replication, realizing large-scale positive impact on nature and communities[18]. Bankable Nature Solutions can be found across

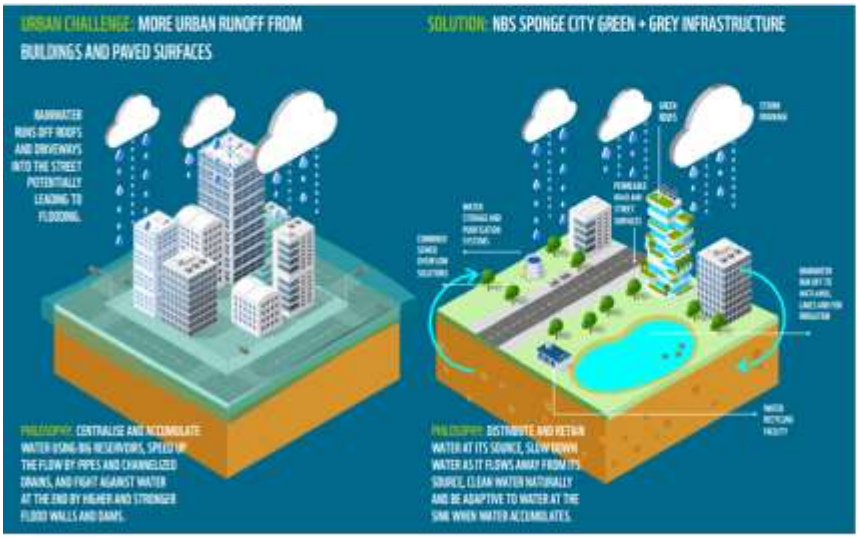
17 WWF 2021
18 Bankable nature solutions, WWF 2021

different themes – such as climate-smart agriculture, environmental protection, forestry, water and sanitation, and renewable energy, distinctly characterised by the project typically having blended sources of capital which includes private investment, developmental finance and philanthropic funds and generating sufficient money to pay back investors and generate a positive return.

CASE STUDY: HOW CHINA'S SPONGE CITIES ADOPTED NATURE BASED SOLUTIONS TO IMPROVE DISASTER RESILIENCE IN RURAL-URBAN INFRASTRUCTURE

The sponge city concept was developed in 2014 to address urban water management challenges relating to both scarcity and abundance in China. It promotes integrated urban water resources management especially of rainwater and storm water. This helps cities to resolve urban flooding and waterlogging, improve water storage and discharge capacity, enhance water quality, and alleviate heat island effects through NbS. This is achieved by applying the concept's six technical measures: infiltration, retention, storage, purification, utilization, and discharge.

China piloted a sponge city program in 30 cities including Pingxiang in Jiangxi Province, which witnessed a rise in the frequency and severity of floods since 1998. Funded by a DFI loan, the Jiangxi Pingxiang Integrated Rural-Urban Infrastructure Development Project helped protect floodplains, restored wetlands, created wider green spaces along rivers and enhanced ecology and erosion protection through fortifications and green embankments with native plants. Through such initiatives, the project addressed key challenge of flooding, river pollution, untreated wastewater, and lack of rural-urban linkages and flood risk partnership arrangements, in a connected manner. The embankments and wetlands along rivers were rehabilitated and landscaped, increasing flow capacity and cleansing rainwater runoff. Rural embankments were planned as agriculture shelterbelts with edible crops and flood-resilient farming was promoted through training for farmers in advanced methods of organic crop growing.



Several key points emerged as ingredients to the successful delivery of the Sponge City Programme:

- Applying whole-process management in waterlogging prevention
- Integrating sponge projects in planning with the collaboration of different city departments;
- Developing localized strategies and technical standards; and
- Establishing a fundraising mechanism and engaging communities in awareness raising, planning, disaster preparedness and risk- and benefit sharing.

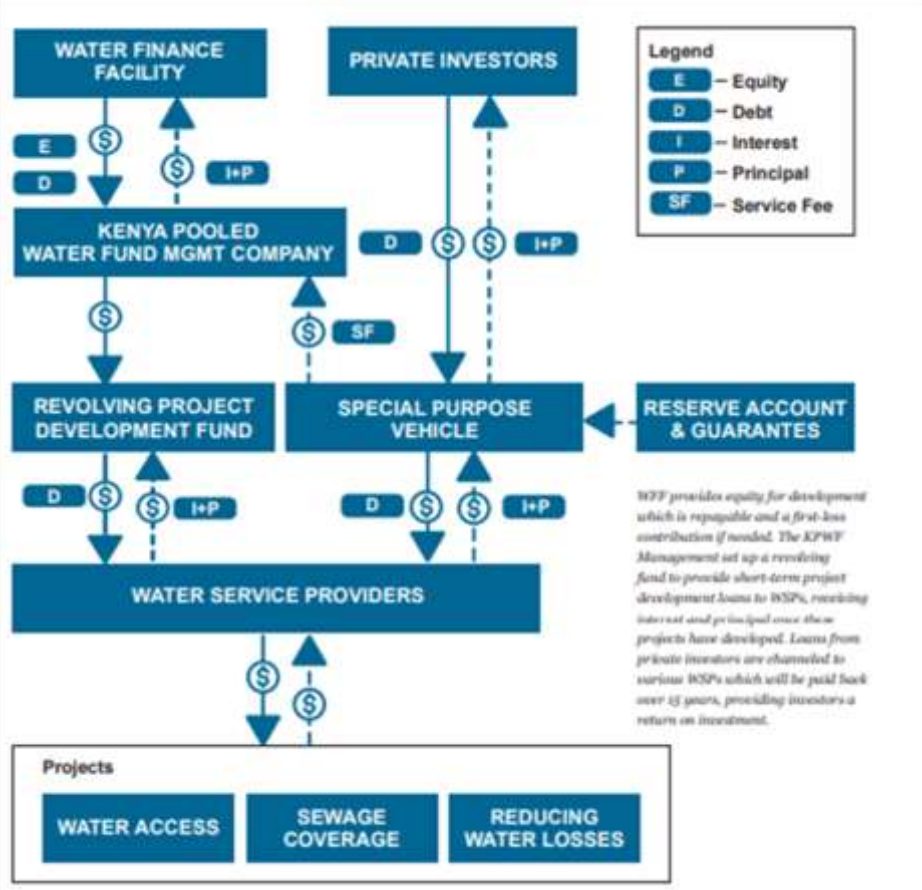
Source: Mapping ESG integration in public infrastructure finance in Asia Pacific (WWF 2022)

CASE STUDY: KENYA POOLED WATER FUND

The Kenyan government has the ambition to realize universal access to safe sanitation for all by 2030. However, in 2017 water coverage stood at 55% in areas covered by Water Service Providers (WSP), while sewage coverage stood even lower (16%). Water demand in Kenya is expected to rise significantly, fuelled by population growth, urbanization, industrialization and climate change.

The KPWF is a non-profit company and is the first National Water Finance Facility (NWFF). It has been established to close the wide funding gap in Kenya's water sector. The overall goal is to enable access to water and/or sanitation for about one billion people of which 25% live in designated low-income areas. The KPWF annual funding program will provide Water Service providers (WSPs) access to long-term financing through the local capital markets to finance sanitation infrastructure projects. KPWF aims to establish an annual funding program of KES 1 billion (about US$10+ million) in the medium term. The KPWF will issue a long-tenor bond (~15 years) to Kenyan institutional investors, the bond proceeds are on-lent to WSPs to fund projects. Credit enhancements are provided to the fund through a reserve account and guarantees to secure bond repayments to the investors. Financial returns are being generated from payment of interest and principal on the loans which have been realized by:

- Reducing Non-Revenue Water - reducing the amount of water that has been produced and is lost before reaching the customer;
- Establishing new water connections - for the six projects that are ready to receive investment, 400,000 people will be connected to sanitation.



Source: Bankable nature solutions (WWF 2020)

2.2 TOOLS AND FRAMEWORKS TO ASSESS BIODIVERSITY RISKS AND OPPORTUNITIES IN INFRASTRUCTURE INVESTMENTS

The investment strategies that promote investments in the enhancement of existing biodiversity has thus far been impact/thematic investing and philanthropic grants. However, the emergence of successful bankable nature projects through blended finance holds a significant promise in channelling capital into projects that aid biodiversity conservation while also providing economic benefits that make the project financially viable. Consequently, many approaches and tools (though nascent in their application) have been developed to help investors and FIs identify, assess, and report on biodiversity- and natural capital-related impacts and dependencies which include-

- **Safeguard policies:** The World Bank Group and International Finance Corporation (IFC) have mandatory requirements as a condition for direct investment, which recognises the importance of biodiversity and sustainable management of living natural resources. The IFC's Performance Standard 6 (PS6) provides detailed guidance to avoid or reduce adverse impacts on biodiversity and living natural resources, requiring clients to assess the direct, indirect, and residual risks to biodiversity and avoid of minimise these risks. It follows the mitigation hierarchy which is a step-wise framework – Avoid, Minimise, Restore and Offset, used for managing risks and potential impacts on biodiversity and ecosystem services. Safeguard policies provide an efficient mechanism for making decisions that balance conservation needs with development priorities.

Table 1 Key elements of a well-developed safeguard system (WWF 2021)

ELEMENT	***DESCRIPTION***
Safeguard Policy	Sets high level E&S objectives. Compliance is mandatory
Performance Standards (PS) / Requirements (PR)	Sets out specific performance requirements. Compliance is mandatory. DFIs typically have a suite of PS/PRs covering a range of E&S topics including biodiversity. These are updated periodically (e.g., 5-10 years). Examples include EBRD PR6, IFC PS6. They are typically risk-based and tend to prescribe expected outcomes but not prescribe how outcomes should be achieved. Broad performance standard may also be accompanied by more specific and prescriptive Environment, Health and Safety (EHS) Guidelines that set out minimum requirements for individual activities and sectors, for example, maximum permitted concentrations of pollutants in emitted water. EHS Guidelines typically include a mix of minimum requirements (which are mandatory) and guidelines for which compliance is not mandatory.
Guidance	More detailed guidance to inform proper application of PS/PRs. Guidance, not policy (compliance expected is not mandatory if the objectives of the PS are met). Updated more frequently (e.g., 2-5 years). Examples include IFC PS6 GN6.
Risk categorisation	Initial desktop assessment (may include site visit). Carried out when a lender is first considering financing a project. Consequently, project is categorised as e.g.: Category A – High Risk. Requires intensive Due Diligence process. Category B – Medium Risk. Category C – Low Risk
Environmental and Social Action Plan (ESAP)	The lender's ESAP will require the project to produce a set of assessments and plans that demonstrate compliance with the requirements of the relevant PS/PRs. For biodiversity this may include: **Assessments** e.g., Critical Habitat assessment (CHA), residual impact assessment (RIA) **Action Plans** e.g., Biodiversity Action Plan (BAP) **Management Plans** e.g., on-site Biodiversity Management Plan (BMP) **Monitoring Plans** e.g., Biodiversity Monitoring & Evaluation Plan (BMEP) If biodiversity offsets are necessary, the project will be required to produce additional assessments and plans such as e.g., an Offset Strategy, Offset Feasibility Assessment, Offset Implementation Plan, etc. The documentation required by the lender depends upon the risk categorisation: For **lower-risk projects**, documentation requirements will be simpler and compliance with PS/PRs may often adequately be demonstrated in the Environmental and Social Impact Assessment (ESIA) and Environmental and Social Management Plan (ESMP) that is produced as part of the permitting process.

	For **higher-risk projects**, standard ESIAs are typically not sufficient to demonstrate compliance with PS/PRs and additional standalone plans (as listed above) may be required. The project will be expected to document and implement these actions through an Environmental and Social Management System (ESMS).
Independent Environmental and Social Consultant (IESC)	The lender hires an IESC (typically a group of topic-matter experts rather than a single individual) to provide independent review of a project's compliance with the lender's PS/PRs. The IESC will review project assessments and plans and conduct periodic site visits prior to the loan agreement and during the period of the loan agreement to ensure that the project's assessments and plans, and implementation of such plans, is in compliance with the lender's PS/PRs.
Ombudsman	The Ombudsman is part of the lender's grievance mechanism. Its role is to investigate individuals' complaints against the lender independently and impartially.

- **Risk management tools**: The risk management tool approaches include tools which are used for measuring and reporting biodiversity risks, for example the International Biodiversity Assessment Tool (IBAT), the Natural Capital Finance Alliance's Exploring Natural Capital Opportunities, Risks and Exposure (ENCORE) tool and the Trase forest-risk commodity supply chain database
- **Impact measurement tools**: These tools are aimed to enable the correlation between environmental degradation and business financial risks and include the Biodiversity Footprint FIs method developed by ASN Bank, a Biodiversity Impact Metric developed by the Natural Capital Impact Group, among others.
- **Disclosure tools and policies**: These include the recent and most comprehensive disclosure tool-Taskforce on Nature-related Financial Disclosures (TNFD), the EU Sustainable Finance Taxonomy, which will be extended to address biodiversity, among others. TNFD, when combined with target based tools such as the forthcoming Science Based Targets for Nature guidance for FIs, will enable the FIs to assess their portfolio alignment as well

These tools, methodologies and frameworks are expected to become more comprehensive and wide-spread in its use in the coming years, while the ESG integration approaches, discussed in the previous section, are increasingly embedding biodiversity and ecosystem related criteria in their frameworks. Over a period of time, a converged, comprehensive and universal approach should supersede current methodologies or act as an umbrella methodology, which will result in better transparency, comparability and confidence for the stakeholders.

Table 2 Infrastructure tools for climate and biodiversity (WWF 2021)

NAME	*SECTOR/S*	*LIFECYCLE PHASE/S*	*TYPE*
C40 cities finance facility - an ecological infrastructure and socio-ecological toolkit	Natural Infrastructure	Strategic Planning, Prioritization, Project Planning	Guidelines
IDB Climate Resilient Public Private Partnerships: A Toolkit for Decision Makers		Strategic Planning, Project Planning, Procurement	Project Preparation Tools
C40 Cities Finance Facility - Estimating Climate Impacts: A Guidebook on GHG Emissions Impact Analysis	Tools applicable to all sectors	Project Planning	Guidelines
IUCN's Global Standard for Nature-based Solutions	Natural Infrastructure	Strategic Planning, Project Planning, Concept Design, Detailed Design	Standards
MobiliseYourCity Emissions Calculator	Transportation	Strategic Planning, Project Planning, Concept Design, Detailed Design	Modelling Tools
World Bank - Adaptation Principles: A Guide for Designing Strategies for	Tools applicable to all sectors	Enabling Environment, Strategic Planning, Prioritization, Project Planning, Concept Design, Procurement, Finance,	Guidelines, Principles

Climate Change Adaptation and Resilience		Detailed Design, Construction, Operation and Maintenance, Decommissioning/Repurposing	
GFDRR - ThinkHazard	Tools applicable to all sectors	Strategic Planning, Prioritization, Project Planning, Concept Design, Procurement, Finance, Detailed Design, Construction, Operation and Maintenance	Modelling Tools
National Infrastructure Systems Model (NISMOD-Int)	Tools applicable to all sectors	Strategic Planning	Modelling Tools
AfDB - Environmental and Social Assessment Procedures (ESAP)	Tools applicable to all sectors	Enabling Environment, Strategic Planning, Prioritization, Project Planning, Concept Design, Procurement, Finance, Detailed Design, Construction, Operation and Maintenance, Decommissioning/Repurposing	Guidelines
UN, EC, FAO, OECD, World Bank - System of Environmental Economic Accounting (SEEA) Experimental Ecosystem Accounting – Manual	Tools applicable to all sectors	Strategic Planning, Project Planning	Guidelines
EPA - Visualizing Ecosystems for Land Management Assessment (VELMA) Model	Natural Infrastructure	Operation and Maintenance	Modelling Tools
Stanford University - Integrated Valuation of Ecosystem Services and Tradeoffs (InVEST)	Natural Infrastructure	Strategic Planning	Modelling Tools
Climate-ADAPT - European Climate Adaptation Platform - Urban Adaptation Support Tool (UAST)	Urban Planning	Operation and Maintenance	Guidelines
Vermont Transportation Resilience Planning Tool (TRPT)	Transportation	Project Planning, Concept Design, Finance, Detailed Design, Construction, Operation and Maintenance	Project Preparation Tools
SuRe Standard: Sustainable and Resilient Infrastructure	Tools applicable to all sectors	Project Planning, Concept Design, Detailed Design, Construction, Operation and Maintenance, Decommissioning/Repurposing	Rating Systems
SITES Rating System	Urban Planning, Natural Infrastructure	Strategic Planning, Prioritization, Concept Design, Detailed Design, Construction, Operation and Maintenance	Rating Systems
EO100 Standard for Responsible Energy	Energy	Project Planning, Concept Design, Detailed Design, Construction	Principles
ENVISION Rating system	Tools applicable to all sectors	Project Planning, Concept Design, Detailed Design, Construction, Operation and Maintenance, Decommissioning/Repurposing	Rating Systems
World Bank Environmental and Social Framework	Tools applicable to all sectors	Prioritization, Project Planning, Concept Design, Procurement, Finance, Detailed Design, Construction	Guidelines
Climate Bonds Standard	Tools applicable to all sectors	Finance	Standards

2.3 CASE FOR INTEGRATION OF NATURAL RESOURCE SAFEGUARDS IN LINEAR INFRASTRUCTURE PROJECTS

Linear infrastructure refers to infrastructure which is constructed in a line and spans large distances. It includes roads, railway lines, power and communications lines, energy distribution lines, canals and more. Linear infrastructure serves as connector between cities, and is essential to societal functioning as it allows people, goods and information to move, serving as a backbone for economic prosperity. Because of its linear nature, linear infrastructure crosses geographies which results in unique environmental, social and political issues and it can have long-lasting impact due to the changing environment.

Due to its nature, linear infrastructure, if not planned and managed properly, poses unique biodiversity and ecosystem disruptions. Some of these impacts include-

CASE STUDY: SOUTHERN EAST-WEST NATIONAL HIGHWAY (BHUTAN)

As Bhutan's economy expands and the population continues to increase, so does the need for reliable and enduring transportation options. Bhutan's 2007–2027 Road Sector Master Plan includes the Road Network Project (RNP) II, which prioritizes the construction of the Southern East-West highway to better connect communities and suppolrt economic development in the south of the country.

Bhutan's Department of Roads proposed three potential road alignments through the Phipsoo Wildlife Sanctuary (PWS). The PWS lies along the Indo-Bhutan border and has historically been an area of intense conflict (poaching, smuggling, and armed conflict). This part of the project was classified as a Category A project in accordance with the ADB's Safeguard Policy Statement, and an EIA was required.

The EIA confirmed that NH2 and NH5 of the RNP II, may impact the daily movements of wildlife. To ensure compliance with the environmental requirements, planners devised an alternative alignment that avoided critical habitat and resulted in no net loss of biodiversity, showcasing a viable alternative for conservation and development

The EIA utilized Asian elephants as the focal species for both the NH2 and NH5 segments due to their endangered conservation status and their role as an "umbrella species," where their protection benefits a myriad of other species. The EIA identified road segments that were likely to limit the movement of elephants and other migratory wildlife; these road segments were considered high priority for mitigation. Previous report findings indicated that elephants frequently use stream channels and riverbeds as regular feeding routes and for long distance travel, and so wildlife crossings were constructed to allow for continued use of these drainages below bridge structures and through enlarged steel culverts.

Underpasses for elephants were constructed on all known elephant crossing points. This project resulted in the first wildlife crossings constructed in Bhutan, and post-construction monitoring revealed that a high wildlife passage rate was achieved for a wide range of species within the first two years, with quick adaptation to the underpasses by elephants. The project also showed that successful crossings were possible without the inclusion of costly and maintenance-intensive wildlife fencing.

Source: Building a foundation for linear infrastructure safeguards in Asia (USAID 2021)

- Habitat fragmentation of mammals by creating a barrier effect which can also lead to complete habitat conversion or loss
- Human-wildlife conflict and wildlife strikes significantly increases in case of unplanned linear infrastructure
- Cases of poaching and infiltration into preserved ecosystems increase

- Trap mortality increases due to improperly designed structures for wildlife movement
- Chances of spread of invasive species and disruption of wildlife habitats and corridors increase

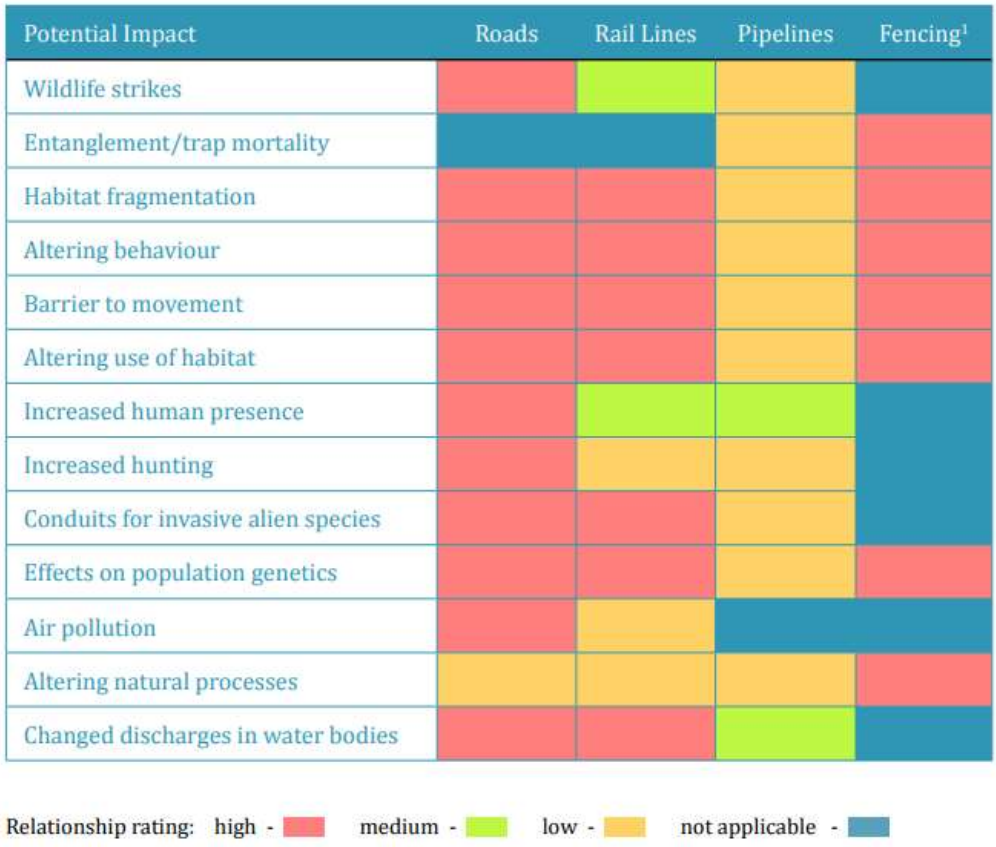


Figure 11 Potential Impacts to Wildlife by Type of Linear Infrastructure (UNEP and CMS 2017)

Despite multiple examples where failure to manage the negative impacts of infrastructure projects on the environment, including biodiversity, has resulted in delays, increased costs or lead to stalling of projects, the prevalence of incorporation of best practice safeguards by project proponents and financiers is limited. Investment funds have faced increased pressure from subscribers to amend the investment strategies around sustainability in recent years. For instance, In 2019, a Canadian pension fund, which owned a significant stake in an airport in the UK, came under scrutiny when teenagers living around the airport highlighted the negative impacts the airport's planned expansion 28 could have on the environment around it, which has led to sustained pressure on the fund from its subscribers to disclose, manage, and prevent these impacts[19].

The most important safeguard policies at a country level relate to the scope, development and presentation of an environmental impact assessment (EIA) and its corresponding environmental management plan (EMP), wherein typically the bidding consortium awarded the contract is required to conduct this assessment[20].

19 Integration of environmental risks in infrastructure investments, WWF India 2021
20 WWF 2017

CASE STUDY: EAST-WEST HIGHWAY, NARAYANGHAT-BUTWAL (NEPAL)

The Narayanghat to Butwal (NB) section of Nepal's Mahendra Highway was a paved two-lane road that runs for 115 km through south-central Nepal, and there were plans to widen it to four lanes. It was a part of the SASEC roads improvement program (SRIP) project, which got approved by the Government of Nepal and the Asian Development Bank (ADB) on 23rd May 2017.

The project area had some of the most diverse wildlife species in Nepal, including the Asian elephant, one-horned rhino, and leopards. The area is also home to the Bengal tiger, which IUCN lists as endangered and Nepal's National Parks and Wildlife Conservation Act protects. As tigers and other species move between CNP and other forested areas to the north, they are forced to cross the NB road. The proposed widening of this road section was listed as Category A in accordance with the ADB's Safeguard Policy Statement. As per ADB, Category A projects are "likely to have significant adverse environmental impacts that are irreversible, diverse, or unprecedented".

The project's EIA recommended several mitigation measures to ensure no net loss of biodiversity and address potential risks to wildlife, including (1) construction of five wildlife underpasses, coupled with the planting of forests, to direct wildlife to the structures for safer road crossing; (2) implementation of a biodiversity conservation plan; and (3) implementation of a compensatory afforestation program (DoR, 2016).

USAID post-approval field review found several deficiencies of the project. The project guidelines for WFLI were insufficient and did not meet international standards. Pre-construction wildlife surveys were not designed to reliably determine the most suitable locations, numbers, and design of mitigation measures to protect biodiversity. The proposed recommendations did not follow international or regional design guidelines for structure type, frequency, spacing, dimensions, fencing, and sound attenuation. Funding for pre- and post-construction monitoring and evaluation was not adequate in the project budget. Overall, the project failed to adequately assess the adverse impacts to wildlife and properly develop a rigorous mitigation strategy based on pre-construction field research and best practices. USAID's request for a suspension of construction resulted in project delay.

Nepal's Department of Roads (DoR) and ADB to re-evaluated the project's impacts and developed a more comprehensive mitigation strategy by incorporating both field data and international best practices. This resulted in a new mitigation strategy recommendation that proposed 112 wildlife underpasses (varying in size from small to very large) and two wildlife overpasses (50 m wide) along the 115-km section of NB road. The recommended mitigation strategy included many existing drainage structures located in priority forest patch habitats, which could be upgraded to accommodate wildlife movement

Ultimately, this improved the capacity in Nepal to address the impacts of a highway more adequately, on wildlife and their need for habitat connectivity. Increased capacity resulted in the development of a BBA (biodiversity baseline assessment), better wildlife study designs, improved wildlife data collection methods, higher quality analyses, and the use of this information in more meaningful wildlife safeguard recommendations.

Source: Building a foundation for linear infrastructure safeguards in Asia (USAID 2021)

The objective of EIAs and EMPs is to ensure that the proposed infrastructure project will be compliant with national laws and regulations and the public agency deploying the project typically conduct a preliminary screening during the project preparation phase, alongside the technical (engineering and financing) feasibility analyses to determine the scope of the EIA will need.

CASE STUDY: INTEGRATION OF NATURAL RESOURCE SAFEGUARDS IN ASIA'S LINEAR INFRASTRUCTURE PROJECTS (LISA AND ALIGN)

Asia experiences unprecedented economic growth, and much of the region's natural heritage is threatened by the rapid expansion of roads, rails, and other linear infrastructure (LI) development. Without proper safeguards, ongoing and anticipated expansion of LI will further fragment vital habitats, impact biodiversity, and increase wildlife mortality. This will in turn reduce the resilience of natural ecosystems, which are vital for the services they provide for survival of humankind, including but not limited to, climate regulation and carbon sequestration.

To address the impacts of infrastructure growth on the natural world and Asian communities, USAID launched the Linear Infrastructure Safeguards in Asia (LISA) project in 2020. The project assessed preparedness of developing Asian countries, to safeguard their ecosystems and rich biodiversity, in the face of the ongoing extensive expansion of infrastructure. Twenty-eight Asian countries were assessed for their capacity to develop wildlife-friendly LI (WFLI). Five representative countries (Bangladesh, India, Mongolia, Nepal, and Thailand) were selected to evaluate their capacity at a finer scale. The LISA Project sought to lay a strong foundation for a capacity-building program that will promote measures that avoid, minimize, and mitigate environmental impacts through better linear infrastructure policies, planning, design, construction, and monitoring. The project provided for the creation of training materials, in-depth reports, and virtual capacity-building workshops. LISA found that

- **Governments** experience difficulties in committing to adequate safeguard provisions during an infrastructure project's development. International
- **Financial Institutions (IFIs)** were found to have the internal capacity to address wildlife safeguards through policies, standards, and guidelines, but they most often rely on recipient countries to pay for and implement their own safeguards and capacity-building efforts.
- **Private companies and consultants** are aware of the importance of wildlife safeguards, but they are inadequately trained to select and design effective mitigation measures.

These measures are primarily implemented when laws and regulations require them. The LISA Project's main recommendation was to increase capacity of all stakeholders to address natural resource safeguards in linear infrastructure.

To build on the LISA Project findings and those from other sources, USAID funded the Asia's Linear Infrastructure safeGuarding Nature (ALIGN) Project. The goal of this project, is to enhance the development and implementation of effective, high-quality linear infrastructure safeguards that protect people and nature from impacts of infrastructure growth. The ALIGN Project is being implemented by WWF (World Wildlife Fund) in partnership with the Centre for Large Landscape Conservation (CLLC).

Source: Adapted by authors from building a foundation for linear infrastructure safeguards in Asia (USAID 2020) and Asia Linear Infrastructure Safeguarding Nature (USAID 2022)

Most countries are also in the processes of fast tracking and streamlining EIA processes, which brings opportunities, but also fresh challenges for biodiversity conservation.

While strengthening policy and monitoring measures is crucial for ensuring sustainability and resilience for an infrastructure project, there is an urgent need to identify and promote incentives for application of high quality best practice natural resource safeguards by the finance sector and to build capacity of all stakeholders involved in the infrastructure project lifecycle to understand the international best practices of safeguard adoption in linear infrastructure projects, especially for emerging economies, where the national environmental assessment policy frameworks and regulatory environment might not result in effective implementation during execution.

SECTION 3: RECOMMENDATIONS

RECOMMENDATION 1: CONVERGENCE BETWEEN VARIOUS ESG TOOLS, FRAMEWORKS AND STANDARDS WOULD HELP INFRASTRUCTURE INVESTORS TO ADOPT A UNIFORM APPROACH TOWARDS SUSTAINABILITY ASSESSMENTS

Better alignment between different ESG tools is required for consistency in analysis of material ESG criteria, especially in context to the data and process alignment between evaluation and valuation tools, such that ESG qualitative information collected in the initial phases project assessment can be incorporated into financial analysis and modelling tools. Even in the case of meta-standards, there should be a common, minimum baseline definition, at a sub-sector level, complemented by common evaluation metrics, for what constitutes as a sustainable infrastructure investment.

RECOMMENDATION 2: MANDATORY NON-FINANCIAL DISCLOSURE GUIDELINES OF JURISDICTIONS, WHEN ALIGNED TO INTERNATIONAL BEST PRACTICE FRAMEWORKS, WOULD FACILITATE THE ADOPTION OF ESG TOOLS BY INVESTORS

Governments can play an enabling role in adoption of ESG tools and frameworks by investors for infrastructure projects by strengthening the ESG reporting requirements, which will result in availability of comparable and consistent ESG data and will encourage sustainable practices in the infrastructure sector.

RECOMMENDATION 3: MULTILATERAL DEVELOPMENT BANKS AND GOVERNMENTS HAVE A KEY ROLE TO PLAY IN INCREASING THE CAPACITY OF STAKEHOLDERS ON CLIMATE AND NATURE RELATED RISKS & OPPORTUNITIES

Governments and MDBs can lead the way in augmenting the capacity of infrastructure sector stakeholders by-

- developing and conducting capacity building programs for the stakeholders
- demonstrating efforts in internal actions through training and incentivising employees for capacity development in this area
- enabling/conducting research and assessments that demonstrate the economic and financial benefits of ESG integration

RECOMMENDATION 4: PUBLIC SECTOR, DFIS AND INSTITUTIONAL INVESTORS SHOULD WORK TOGETHER TO CHANNEL GREATER FINANCE INTO PROJECTS THAT HAVE NET POSITIVE OUTCOMES FOR NATURE AND CLIMATE

Governments (through incentive schemes) and DFIs (through concessional and blended finance) should support the development of a pipeline of bankable projects for scaling up nature based, climate aligned

and biodiversity positive outcomes; private sector can play a strong role in designing such projects that utilise the best available incentives and funds for making them financially viable and scalable.

RECOMMENDATION 5: FINANCIAL INSTITUTIONS INVESTING IN LINEAR INFRASTRUCTURE PROJECTS SHOULD ALIGN THEIR SAFEGUARD POLICIES WITH INTERNATIONAL BEST PRACTICES

Given the scale and quantum of linear infrastructure projects, especially in emerging economies, FIs have a critical role to play in order to assure that these long term assets are sustainable and resilient to climate and nature related physical and transition risks in their lifecycle. Therefore, these institutions, especially infrastructure specific DFIs should adopt and demand global best-in-class practices in implementation of climate and natural resource safeguards for linear infrastructure projects.

ANNEXURE

Frameworks and standards for Infrastructure ESG Analysis

Name	Type	Asset Type	Description
Principles for Responsible Investment (PRI)	Investment Framework	ESG in Infrastructure and other asset classes	This framework consists of six voluntary and aspirational principles thathelp guide sustainable investment practices. The framework furthers incorporation of ESG criteria into decision making by providing asset owners,investment managers, and service providers a menu of possible actions. Signatories-who pay a fee-are required to report on their responsible policies and processes annually.
International Integrated Reporting Framework (IR)	Reporting Framework	Listed Equity	Framework for annual corporate reporting that integrates a range of factors that impact an organization's ability to create value over time. The frameworkrequires companies to describe how they transform a variety of "capitals," including financial, manufactured, intellectual, human, social and relationship, and natural) into long-term value creation.
Global Reporting Initiative (GRI)	Reporting Framework	Corporations	Widely-adopted framework for annual corporate sustainability reporting that focuses on critical sustainability issues such as climate change, human rights, governance, and social well-being.
Sustainability Accounting Standards Board (SASB)	Accounting Standard	Listed Equity	Accounting standard designed to enhance high-quality disclosure of material sustainability information that meets investor needs. The standards apply to 79 industries in 11 sectors. Resources available include engagement guides, ESG integration insights, a climate risk bulletin, and a Materiality Map.
Equator Principles	Risk Management Framework	Infrastructure (EMDEs)	Adapted from the IFC Performance Standards, this framework of ten principlesis applied by financial institutions to projects in developing countries. These principles help investors determine, assess, and manage social and environmental risks in large infrastructure projects.
ISO 14007	Reporting Standard	Any Organization	Provides guidance to organizations on how to determine and communicate the environmental costs and benefits associated with the aspects of their organizations that relate to natural resources andecosystem services.
ISO 14008	Reporting Standard	Any Organization	Provides organizations with a common framework for monetary valuation of environmental impacts and natural resources. This standard will increase transparency in monetary valuation and provide a common framework and language for the valuation process (to be released in late 2018).
UNEP FI Responsible Property Investment	Investment Framework	Real Estate	Responsible Property Investment (RPI) is a framework for integrating environmental, social, and governance factors into investors' real estate decisions.
IFC Performance Standards on Environmental and Social Sustainability	Investment Framework	Infrastructure	Eight performance standards that a client of IFC must meet throughout the life of an investment with IFC. The standards cover a range of environmental,social, and governance criteria. Additionally, many private investors, multilaterals, and institutional investors require that their clients/assets are analyzed through this framework (or a very similar framework).

Evaluation Tools for Infrastructure ESG Analysis

GRESB Infrastructure Asset Management

The GRESB Infrastructure Asset Assessment framework is a tool to score and benchmark the ESG performance of infrastructure assets. It can be used for a variety of sectors, including energy (generation, distribution, and transmission), data infrastructure (telecommunications, data centers), transportation, waste, water and social infrastructure. Investments are grouped as asset type and assessed across approximately 40 different indicators and the results are based on the inputs around seven core areas including management, policy and disclosure, risks and opportunities, monitoring and EMS, stakeholder engagement, performance indicators, and certifications and awards. The process includes validation, scoring and peer benchmarking (against other similar assets using the framework).

Maintaining a GRESB portfolio allows investors to compare the environmental ESG performance of their assets within a sector and peer-group benchmark. In addition to the Infrastructure Asset tool, GRESB also provides a benchmarking framework for Infrastructure Funds and a Resilience Module

Envision

Envision is a flexible system of criteria and performance objectives to aid decision makers and help project teams identify sustainable approaches during planning, design and construction of infrastructure projects that will continue throughout the project's operations and maintenance and end-of-life phases. The Envision system consists of different components:

(1) The Envision Pre-Assessment Checklist can be applied early-phase and used to prepare later sustainability assessments;
(2) The Envision Online Scoresheet provides for a detailed online self-assessment;
(3) The Envision Verification provides for an independent third-party project review process;
(4) The Envision Awards offer recognition for qualifying verified projects.

Depending on the component used, Envision provides decision makers and project teams with detailed information on the sustainability performance of infrastructure projects and thereby outlines possibilities for improvement and guides decision making. Using the Envision Verification, stakeholders receive a third-party evaluation of their projects' sustainability. Under the Envision Awards, projects that have completed the Envision verification receive a sustainability award depending on their sustainability performance (Verified – Bronze – Silver – Gold – Platinum).

SuRe

SuRe – the Standard for Sustainable and Resilient Infrastructure is a third-party verified, global voluntary standard to drive the integration of sustainability and resilience aspects into infrastructure development and upgrade projects by providing guidance. The tool also serves as a globally applicable common language tool for infrastructure project developers, financiers and public sector institutions. Infrastructure projects wishing to undergo SuRe certification are subject to independent third-party audits provided by an independent accredited Certification Body. After initial certification, surveillance audits are carried out annually.

The Standard provides guidance on how to manage sustainability and resilience aspects of infrastructure projects, including through capacity building, certification, project registration, and impact measuring / monitoring, supporting public entities, project developers and financiers of infrastructure developments

to select more sustainable and resilient projects for development, to recognize their improved financial performance and to see a greater volume of more sustainable and resilient projects designed and financed. Based on the project's performance across SuRe®'s 61 sustainability criteria, projects are awarded different certifications (Bronze – Silver – Gold).

RepRisk

RepRisk is an ESG risk database that helps to systematically screen and monitor companies' portfolios of clients, investments and suppliers, and flag those companies with high ESG risk exposure. The tool systematically captures and analyzes adverse ESG and business conduct data, retrieved from media, stakeholders and other public resources, that can have a reputational, compliance, and financial impact on a company or project. Daily, the tool screens more than 90,000 sources in 20 languages by combining artificial and human intelligence to identify and assess risks early at the local, regional, and international level. Additional solutions to measure individual risks are available.

RepRisk provides research, analytics, and metrics on currently more than 125,000 public and private companies, as well as more than 30,000 infrastructure projects worldwide, thereby informing a broad set of interested stakeholders about the ESG-risk performance of these companies and projects. RepRisk provides different analysis: the RepRisk Index is a quantitative measure (0 to 100) of companies' or projects' ESG risk exposure; the RepRisk Rating consists in a letter rating (AAA to D) facilitating benchmarking and ESG integration; the RepRisk UNGC Violator Flag identifies companies with a high (potential) risk of violating one or more of the UN Global Compact Principles; the RepRisk Violator Index serves to monitor individual ESG policies of companies.

CEEQUAL

CEEQUAL Projects assists in delivering improved sustainability performance and strategy of infrastructure projects. Projects are assessed across a range of management, environmental and social criteria, using the CEEQUAL Online Assessment Tool. The individual version for Term Contracts has been specifically created for the sustainability assessment of civil engineering and public realm works that are undertaken through contracts over several years, offering two question sets, one for maintenance works and one for new works. Assessments are conducted by CEEQUAL-trained assessors and verified by CEEQUAL-appointed external verifiers (in case of Term Contracts in the first and penultimate years including yearly surveillance visits).

The CEEQUAL assessment results in a percentage score and a CEEQUAL award certificate demonstrating the level of achievement (Pass – Good – Very Good – Excellent – Outstanding). The performance assessment can be used to influence decision making toward sustainable practices. Furthermore, CEEQUAL can be used as an international benchmark for infrastructure sustainability to compare projects across markets and regions. For CEEQUAL for Term Contracts, there are two types of certification available: (1) to recognize the achievements of the whole contract team and (2) to recognize the achievements the delivery team only. The performance assessment can be used to influence decision making of contract teams toward enhanced sustainability.

ISCA Tools

The IS Rating Scheme is Australia and New Zealand's rating framework to assess the sustainability of the planning, design, construction and operation phases of infrastructure programs, projects, networks and assets. IS evaluates the sustainability performance of the quadruple bottom line (governance, economic,

environmental and social) of infrastructure development. Several manuals and resources are available, covering different phases of the infrastructure cycle, being the main ones IS Design & As Built v2.0 and IS Planning v2.0. The total score is calculated based on the points achieved in the different credits. Verification of the assessment result is undertaken by an independent third-party verifier. Based on the score achieved, projects receive a certification (Bronze – Silver – Gold – Platinum – Diamond). The scoring and certification provide a framework for consistent application and evaluation of sustainability in tendering process, help in scoping with risks and foster efficiency, innovation and continuous improvement in the sustainability outcomes from infrastructure.

Valuation Tools for Infrastructure ESG Analysis

SAVi

The Sustainable Asset Valuation (SAVi) helps policy makers and investors take informed decisions on infrastructure financing based on customized simulations. The tool forecasts how infrastructure projects will affect and be affected by the environmental, social and economic dynamics and simulates how different risk scenarios affect a project's financial viability across its life cycle and how material externalities can affect future cash flows. Thereby, SAVi allows to evaluate the financial attractiveness of infrastructure projects across the life cycle, considering important environmental, social, economic and governance factors that are overlooked in traditional valuations, and to compare different infrastructure scenarios and their financial viabilities. SAVi identifies externalities and risks of infrastructure projects and valuates their financial implications and provides developers and investors with an informative report. Moreover, SAVi compares and contrasts the environmental, social and economic performance of business-as-usual infrastructure with more sustainable alternatives. Thereby, SAVi informs policy makers and investors on the wider, second-order gains and trade-offs of infrastructure investments, which may not be reflected in a traditional valuation, guiding decision making towards sustainable infrastructure.

TREDIS

TREDIS is a transportation economics suite that helps transportation planners, and decision-makers calculate the economic impact, benefits and costs of proposed projects, programs and policies. The tool supports decision-making through economic impact analysis, cost-benefit analyses, financial analyses as well as freight and trade impact analyses. The software applies to passenger and freight transport via aviation, marine and rail modes, also including truck, car, bus, bicycle, and pedestrian travel, and can be used for deep analysis of a single project or simultaneous comparison of several projects. Impacts may be viewed at local, regional, state or national level.TREDIS provides cost-benefit, economic impact, and financial impact analyses to support transportation planning and project prioritization.

Autocase

Autocase is a software that supports design and investment decision-making for built environments with economic metrics. The tool provides designers and project owners with a triple bottom line cost-benefit analysis for buildings and related infrastructure assets, helping to quantify and attribute dollar values to financial, social and environmental impacts of project proposals. The tool allows for comparison of multiple design goals and investment options as well as evaluation of health impacts, water and energy efficiency and renewable energy use and effects on tenants, owners and communities. Autocase provides comprehensive cost-benefit analyses valuing social, financial and environmental sustainability criteria.