What Is Sustainable Infrastructure?

A Framework to Guide Sustainability Across the Project Cycle

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IDB Invest

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http://www.iadb.org

bidcambioclima@iadb.org

www.iadb.org/climatechange

Abstract

This document presents a framework for both public and private sectors to support planning, designing, and financing of infrastructure that is economically, financially, socially, environmentally, and institutionally sustainable. This document is intended to generate discussion amongst key stakeholders and serve as a basis for research and experimentation within the IDB and with clients; it should be considered as a working document.

This framework forms the basis of the IDB Group working definition of sustainable infrastructure as "***infrastructure projects that are planned, designed, constructed, operated, and decommissioned in a manner to ensure economic and financial, social, environmental (including climate resilience), and institutional sustainability over the entire life cycle of the project.***"

The purpose of the framework is to enhance clarity, reduce risks, and realize the opportunities that sustainable infrastructure supports inclusive growth and productivity, enhancing coverage and quality of services embodied in the SDGs, and accelerating the transition to low carbon growth and climate resilient economies in Latin America and the Caribbean. The framework presents four main principles of sustainability covering economic and financial, environmental, social, and institutional dimensions, and it proposes that each of these needs to be considered across the project cycle including, critically, how upstream policy, legislation, regulations, planning, and organizational capacities contribute to delivering sustainability. Within this framework, the document proposes a menu of over 60 criteria that are important for operationalizing sustainability.

The framework will help to identify key actions across the project cycle that can ensure sustainable infrastructure—from strategies and planning to portfolio and project design, construction, operations and maintenance, and ultimately decommissioning.
The purpose of the framework is to help promote convergence among key stakeholders on the objectives for sustainable infrastructure, to provide a common language for dialogue around sustainable infrastructure, and to ensure a more consistent approach toward key challenges and opportunities across the project cycle.

The framework should therefore help promote scaled-up investment in sustainable infrastructure as needed for delivery of the Addis Ababa Action Agenda, the 2030 Agenda for Sustainable Development, and the Paris Agreement on climate.

JEL Classifications: Q51, Q54, Q56
Keywords: Sustainability, Sustainable Infrastructure, Inclusive growth, Environmental, SDGs, Low carbon, Climate

Table of Contents

1. Background

Why Should Infrastructure Be Sustainable?

Infrastructure services, such as the supply of drinking water and electricity, the disposal and treatment of waste water, the mobility of people and goods, and the provision of information and communication technologies, are the backbone for economic development, competitiveness and inclusive growth in Latin America and the Caribbean (Serebrisky, 2014; Calderón and Servén, 2014; Serebrisky et al., 2015; The New Climate Economy, 2016; Bhattacharya et al., 2016). Infrastructure investment needs in the region are estimated to be 3-8% of gross domestic product (GDP), yet investments range between 2% and 3% of GDP (Serebrisky, 2014: Fay et al., 2017). An increase of US$120–150 billion per year is required to achieve the region's development objectives (Serebrisky et al., 2015), with particular challenges in the urban context (Bonilla-Roth and Zapparoli, 2017). Closing this investment gap will require mobilizing new sources of long-term finance, including from institutional investors (Bielenberg et al., 2016).

Closing the infrastructure gap needs both spending more on roads, power plants, and water sewage systems, but also spending differently transforming the way infrastructure is planned, developed and operated. Infrastructure that is built now will determine our climate future. It is estimated that globally, 60% of carbon emissions arise from the construction and operation of the existing infrastructure stock and a further 35–60% of the future carbon budget will be taken up by infrastructure (Müller et al., 2013; The New Climate Economy, 2016). Technological lock-in and the inherent inertia of long-lived assets such as infrastructure underscore the need to consider carefully the viability of new fossil fuel power generation, particularly coal, if the Paris Agreement objective of maintaining the global temperature increase well below 2 degrees Celsius is to be achieved (Hansen et al., 2013). Indeed, Pfeiffer et al. (2016) suggest that during 2017 we had already reached the "2°C capital stock" limit for fossil-fuel-based electricity generation.

Delivering infrastructure in Latin America and the Caribbean is increasingly complex given climate change, environmental concerns, and social challenges. At the same time, innovative technologies will transform the way infrastructure is designed, constructed, and financed. Innovative technologies and business models coupled with demographic and demand changes may make certain types of infrastructure obsolete. The need to attract new sources of private finance increases the legal and regulatory challenges faced by government agencies looking to increase investment in sustainable infrastructure. The impacts of climate change or physical climate risk are growing concerns, reducing the predictability of future infrastructure needs as well as increasing the vulnerability of assets (Reyer et al., 2017). The region is one of the most vulnerable to the impacts of a changing climate; in 2017 it experienced severe losses from natural events, including floods in Peru that cost US$3.1 billion and floods in Colombia that resulted in 329 fatalities (MunichRE NatCatService, 2017). Vergara et al. (2013) estimate that climate change will cause damages costing US$100 billion a year across the region by 2050.

Loss of natural resources or ecosystem services, pollution, minimal local benefits in terms of infrastructure services or job creation and reduced local access to resources are creating social conflicts. Coupled with deficient planning, inadequate consultation, and poor levels of transparency, conflict is leading to infrastructure project delays, cost overruns, and reputational damage for governments, financiers, and the private sector (Watkins et al., 2017). Meeting the demand for future infrastructure plays against the potential negative environmental and social externalities that might ensue from these projects; this is a source of growing dispute between local communities and project sponsors. The increasing power of civil society and social connectivity through technologies adds to the complexity of delivering infrastructure projects (Valenzuela et al., 2016; Watkins et al., 2017).

Globally, virtually all countries have committed to multi-sector sustainability objectives through the Sustainable Development Goals (SDGs). Countries throughout Latin America and the Caribbean have ratified the Paris Agreement and presented Nationally Determined Contributions setting out pledged mitigation and adaptation actions. The OECD suggests that decisive actions taken now for low-carbon investments can deliver significant growth benefits in the G20 countries (Organisation for Economic Co-operation and Development 2017c); climate-compatible policy frameworks can increase long-term GDP by 2.8%. Yet the window for achieving this is considered "uncomfortably narrow," with less than five years to make this decisive transition. Shifting infrastructure investments toward sustainable infrastructure that addresses and meets stakeholder concerns and that is consistent with a low-carbon and climate-resilient path of development is therefore critical to achieve the scale of investment needed to meet sustainability and growth demands.

Growing attention to the likelihood of stranded assets as a result of climate risk, which may be due to physical climate impacts, changing government regulations, technological change and relative costs, as well as litigation, can also affect the valuation of infrastructure assets over their long life cycles (Caldecott et al., 2016). The report of the FSB Task Force on Climate-related Financial Disclosures (Task Force on Climate-related Financial Disclosures, 2017) has raised the concerns of governments and investors alike over climate risk and stranded assets and for the potential for this to lead to systematic risk within the financial sector (Bak et al., 2017).

What Is the Role of Private Capital?

Governments have historically planned, regulated, and financed the bulk of infrastructure off their own balance sheets—whether directly through national development banks or indirectly through utilities. In Latin America and the Caribbean, however, fiscal constraints and a focus on deleveraging public sector balance sheets is placing greater emphasis on the role of the private sector in providing infrastructure services (Serebrisky et al., 2015). In addition to reducing the fiscal burden of public budgets, more private sector involvement may enhance performance and increase efficiency of infrastructure services (Youssef and Nahas, 2017).

However, a growing trend for decentralized decision-making to subnational entities – particularly in Latin America and the Caribbean, where 80% of people live in cities – makes it harder to mobilize private capital at scale (Serebrisky et al., 2015). At the same time, regulatory changes such as those proposed under Basel III which penalizes banks from holding assets for longer than five years, have reduced the role of commercial banks in project finance. It seems clear that governments alone applying approaches used in the past will not be able to meet projected demand for investment in sustainable infrastructure.

Increasing access to long-term capital at adequate rates to support investments in sustainable infrastructure will require enhanced participation from private actors (UN General Assembly, 2015: Bielenberg et al., 2016: Fay et al., 2017). To date, however, progress in engaging the private capital in sustainable infrastructure investments has been relatively slow (Serebrisky et al., 2015). Reforms undertaken since the mid-1990s have increased private sector investments in infrastructure in Latin America and the Caribbean; however, the public sector still accounts for almost two thirds of infrastructure investment, with the private sector more prominent in some smaller economies such as Honduras and Nicaragua (Serebrisky et al., 2017).

Several key barriers reduce the likelihood of private investments in sustainable infrastructure: the absence of an articulated vision, for example, through a national infrastructure strategy or investment road maps; lack of well-articulated and transparent pipelines of bankable projects; the lack of financing structures to effectively mitigate risks and align financing with sustainability principles; and, opaque or confused market signals created by a growing number of sustainable infrastructure and green standards and by the lack of a shared definition of sustainable infrastructure. Additional barriers result from gaps in institutional arrangements leading to uncertainty over revenue streams, weak competition frameworks, the lack of clear sustainability criteria in upstream work and financing, and weak alignment between infrastructure planning and countries' own objectives under the Paris Agreement (Organisation for Economic Co-operation and Development, 2015a; Mercer and Inter-American Development Bank, 2016 and 2017). The way forward will be to create a more coherent set of signals to investors through a more harmonized approach to delivering sustainable infrastructure, through the alignment of key stakeholders, and through much greater collaboration to deliver sustainability across the whole project cycle (Mercer and Inter-American Development Bank, 2016 and 2017).

Why Define Sustainable Infrastructure?

As noted earlier, the level of investment throughout the region and the quality of infrastructure limit inclusive growth (International Monetary Fund, 2016). While support for sustainable infrastructure is growing, current progress is underwhelming (Mercer and Inter-American Development Bank, 2016 and 2017; Fay et al., 2017). The long time span and broad spatial consequences of infrastructure assets mean that projects can generate both positive and negative externalities that are difficult to capture and manage (Bak et al., 2017). The growing complexity of infrastructure, particularly for economic and sectoral decision-makers, coupled with the need to mobilize new sources of capital drives the need for a framework that promotes a collective understanding.

Thus, the IDB Group defines sustainable infrastructure as infrastructure projects that are planned, designed, constructed, operated, and decommissioned in a manner to ensure economic and financial, social, environmental (including climate resilience), and institutional sustainability over the entire life cycle of the project. The criteria that are the basis for this definition are described in section 2 and drawn from existing tools and approaches to sustainability.

Box 1: Why do we need a framework for investing in sustainable infrastructure?

- **Develop better projects:** Having a clear shared understanding of sustainable infrastructure ensures that we are heading towards the same objectives. This will allow us to measure progress and get feedback from peers and will result in better-quality infrastructure investments that are scalable.
- **Support upstream institutional strengthening:** The framework will help identify opportunities for institutional (policy, legislation, regulation, and organizations) capacity building to ensure systemic and long-lasting changes, leading to quality infrastructure project pipelines and better delivery of infrastructure services.
- **Establish clear financing ground rules:** The framework will give clarity to private investors as to investing in sustainable infrastructure. This will help align financial systems and incentivize and mobilize finance to drive transformation and increase the scale of investments.
- **Standardize tools and indicators:** There are transactional costs associated with the proliferation and fragmentation of tools and approaches to deliver sustainable infrastructure. The framework will aid analysis and standardization of tools and approaches to accelerate adoption.
- **Provide a conceptual base for change:** Sustainable infrastructure is complex and multifaceted, and the different dimensions of sustainability interact with each other, requiring consideration of synergies and trade-offs. Defining the attributes of sustainable infrastructure will clarify what we are trying to achieve across stakeholder groups and create space for strengthening the business case.

Most existing tools and approaches incorporate 60 or more criteria to show if an infrastructure project is sustainable. Many of these criteria are synergistic with others, driving the need for trade-off considerations. Infrastructure when viewed from the perspective of different disciplines—engineering, finance, economics, development, climate, social, and environmental—looks very different; some of these differences are so pronounced that they often create disagreement if not diverging approaches.

Consequently, there are many approaches to adding sustainability value to infrastructure projects (Watkins, 2014; Mercer and Inter-American Development Bank, 2016; Georgoulias et al., 2010). The proliferation of approaches creates confusion and hinders the ability to attract new players (Mercer and Inter-American Development Bank, 2016 and 2017). Hence, developing a common framework for understanding what constitutes sustainable infrastructure will help clarify end goals and give a valuable basis for analysis to identify key actions, including roles and responsibilities, at different stages across the whole project life cycle. In this regard, an agreed framework will also help measure advances toward sustainability.

The multiple and different uses of the term "sustainable infrastructure" can create ambiguity; evaluating and selecting any one of the many approaches can increase transaction costs, discourage uptake, and lead to inconsistent system-level results (Mercer and Inter-American Development Bank, 2016). The term "sustainable infrastructure" is also often confused with terms such as "green infrastructure" or "smart infrastructure"[1]. The concept of sustainable

[1] Green Infrastructure generally refers to a *strategically planned network of high quality natural and semi-natural areas with other environmental features, designed and managed to deliver a wide range of ecosystem services and protect biodiversity in both rural*

infrastructure needs to help drive transformational change rather than becoming a trivial buzz word to repackage old ways of preparing, constructing, operating, and investing in infrastructure.

Given the temporal and spatial complexity of infrastructure projects, many different stakeholder groups must be engaged in both defining and delivering sustainable infrastructure. Improvements in upstream regulation and planning need to be accompanied by better project preparation, design, construction, operations, and decommissioning. This will depend both on the capacities of national and subnational governments and sector agencies as well as their relations and ability to effectively engage with the private sector, including project developers, construction and operations firms, sustainability standards setters, and private finance.

Multilateral development banks (MDBs) are well positioned to help tackle the barriers to delivering sustainable infrastructure and mobilizing finance at scale. MDBs are already engaged in developing the sustainable infrastructure agenda by supporting knowledge agendas, strengthening national and subnational institutional capacities, supporting project preparation and design, and accessing and delivering finance.

Stronger engagement with organizations such as the International Monetary Fund and the Organisation for Economic Co-operation and Development will also be important in aiding Governments with the institutional changes needed to regulate, plan, and attract financing for pipelines of sustainable infrastructure projects.

An OECD summary of the Long-term Infrastructure Investors Association policy dialogue to develop infrastructure as an asset class notes that "while investors are adopting a global diversification of infrastructure portfolios, international infrastructure investment policy has to maintain its flexibility to account for different approaches to sustainable infrastructure investment across countries" (Organisation for Economic Co-operation and Development, 2017d). In a forthcoming report, *Breaking Silos: Actions to Develop Infrastructure as an Asset Class and Address the Infrastructure Gap* (unpublished), the OECD calls for promoting a definition of sustainable and quality infrastructure to facilitate consistency of data collection and for standardization and harmonization of project preparation as, for example, through SOURCE[2] — an online platform developed with the MDBs to present sustainable, bankable, and investment-ready infrastructure projects and to improve project preparation. As this framework evolves it will also be important to ensure coordination with other international initiatives such as the Global Infrastructure Hub and the Infrastructure Data Initiative.

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and urban settings (European Commission 2013). Smart infrastructure *results from combining physical infrastructure with digital information technologies* (Bowers et al. 2017).

[2] https://public.sif-source.org

2. A Definition of Sustainable Infrastructure

The **Global Commission on the Economy and Climate** defined Infrastructure as:

"*structures and facilities that underpin power and other energy systems (including upstream infrastructure, such as the fuel production sector), transport, telecommunications, water, and waste management. It includes investments in systems that improve resource efficiency and demand-side management, such as energy and water efficiency measures. Infrastructure includes both traditional types of infrastructure (including energy to public transport, buildings, water supply and sanitation) and, critically, also natural infrastructure (such as forest landscapes, wetlands and watershed protection)"* (Bhattacharya, Oppenheim, and Stern, 2015; The New Climate Economy, 2016).

Thirty years earlier the **World Commission on Environment and Development** defined sustainable development as:

"*development that meets the needs of the present without compromising the ability of future generations to meet their own needs*" (World Commission on Environment and Development, 1987).

Combining these concepts provides a starting point for a definition of sustainable infrastructure and subsequent higher-level frameworks for sustainability and sustainable infrastructure give further guidance:

The **UN Commission for Sustainable Development 2001 Framework for Sustainability** includes the following indicators (Wu and Wu, 2012):

- Social—equity, health, education, housing, security, population
- Environmental—atmosphere; land; oceans, seas, and coasts; freshwater; biodiversity
- Economic—economic structure; consumption and production
- Institutional —frameworks and capacities

The **Wuppertal Sustainable Development Indicator Framework** includes indicators covering environmental, social, economic, and institutional dimensions (Singh et al., 2012).

The **Sustainable Infrastructure Action Plan** of the World Bank identifies economic and financial sustainability, social sustainability, and environmental sustainability as key elements of sustainable infrastructure—underlain by good governance (World Bank Group, 2008).

The **G7 Ise-Shima Principles for Promoting Quality Infrastructure Investment** of 2016 names five principles that cover governance, efficiency, resilience, job creation, capacity building, social and environmental impacts, alignment with economic and development strategies, and effective resource mobilization.

Box 2: Tools considered in developing the framework

- CEEQUAL (UK & Ireland Projects/International Projects)
- ENVISION Rating System (ISI & Harvard University)
- IS Rating Scheme by Infrastructure Sustainability Council of Australia (ISCA)
- Infrastructure Voluntary Evaluation Sustainability Tool (INVEST)
- SuRe® Standard for Sustainable and Resilient Infrastructure
- Sustainable Transportation Appraisal Rating System framework (STARS)
- Hydropower Sustainability Assessment Protocol
- IDB Safeguards
- IFC Performance Standards on Environmental and Social Sustainability
- World Bank Environmental and Social Framework

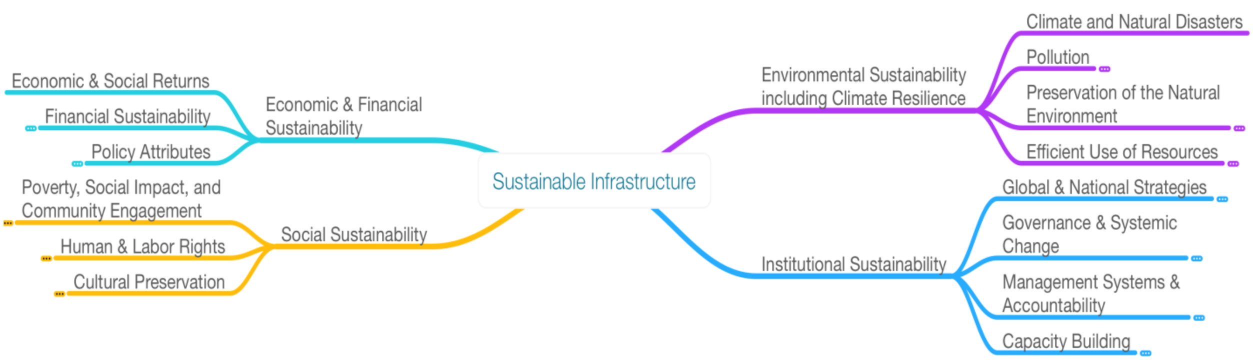
We also drew extensively on approaches and assessment tools for sustainable infrastructure (see Box 2.) The framework builds on and complements these approaches and tools; we are not creating another tool. Instead, the purpose of the framework is to help show gaps, ensure consistent approaches, and improve the coverage of existing approaches and tools.

Considering the above-mentioned frameworks, principles, and standards the IDB Group defines sustainable infrastructure as follows:

"***Sustainable infrastructure refers to infrastructure projects that are planned, designed, constructed, operated, and decommissioned in a manner to ensure economic and financial, social, environmental (including climate resilience), and institutional sustainability over the entire life cycle of the project**.*"

We formulated guiding principles for each of the dimensions of sustainability (see Figure 1).

Figure 1: The Four Dimensions of Infrastructure Sustainability



Economic and Financial Sustainability

Infrastructure is economically sustainable if it generates a positive net economic return, considering all benefits and costs over the project life cycle, including positive and negative externalities and spillovers. In addition, the infrastructure must generate an adequate risk-adjusted rate of return for project investors. Sustainable infrastructure projects must therefore generate a sound revenue stream based on adequate cost recovery and be supported, where necessary, by well-targeted subsidies (to address affordability) or availability payments (when users cannot be identified), or where there are large spillover effects. Sustainable infrastructure must be designed to support inclusive and sustainable growth and boost productivity and to deliver high-quality and affordable services. Risks must be fairly and transparently distributed to the entities most able to control the risk or to absorb its impact on the investment outcomes over the life cycle of the project.

Environmental Sustainability, including Climate Resilience

Sustainable infrastructure preserves, restores, and integrates the natural environment, including biodiversity and ecosystems. It supports the sustainable and efficient use of natural resources, including energy, water, and materials. It also limits all types of pollution over the life cycle of the project and contributes to a low-carbon, resilient, and resource-efficient economy. Sustainable infrastructure projects are (or should be) sited and designed to ensure resilience to climate and natural disaster risks. Sustainable infrastructure often depends on national circumstances, where the overall performance will need to be measured compared to what could have been built or developed instead.

Social Sustainability

Sustainable infrastructure is inclusive and should have the broad support of affected communities—it serves all stakeholders, including the poor—and contributes to enhanced livelihoods and social well-being over the life cycle of the project. Projects must be constructed according to good labor, health, and safety standards. Benefits generated by sustainable infrastructure services should be shared equitably and transparently. Services provided by such projects should promote gender equity, health, safety, and diversity while complying with human and labor rights. Involuntary resettlement should be avoided to the extent possible and when avoidance is not possible, displacement should be minimized by exploring alternative project designs. Where economic displacement and relocation of people is unavoidable, it must be managed in a consultative, fair, and equitable manner and must integrate cultural and heritage preservation.

Institutional Sustainability

Institutionally, sustainable infrastructure is aligned with national and international commitments, including the Paris Agreement, and is based on transparent and consistent governance systems over the project cycle. Robust institutional capacity and clearly defined procedures for project planning, procurement, and operation are enablers for institutional sustainability. The development of local capacity—including mechanisms of knowledge transfer, promotion of innovative thinking, and project management—is critical to enhance sustainability and promote systemic change. Sustainable infrastructure must develop technical and engineering capacities as well as systems for data collection, monitoring, and evaluation, to generate empirical evidence and quantify impacts or benefits.

3. Delivering Sustainable Infrastructure

To operationalize infrastructure sustainability, the definition and principles should be translated into practical and measurable criteria. The criteria across all four sustainability dimensions and across the project cycle must be consistent with the delivery of sustainability in infrastructure projects. Notably, addressing some sustainability aspects upstream could be much more cost-effective than trying to address sustainability when projects are designed or in operation (Georgoulias, Arrasate, and Georgoulias 2016). There are many publications that provide insights into how to deliver sustainable infrastructure (see references)— the most easily analyzed are approaches to sustainability assessment and to ensuring environmental and social sustainability during project preparation and design. Consequently, this document begins with an examination of how to deliver sustainability during project preparation and, then—with this as a basis—describes actions that can be taken earlier in the project cycle and during financing to help to deliver sustainability.

Criteria for Project Preparation and Design

Based on the framework, we identified 66 criteria that should be addressed during project preparation and design to ensure that we "do projects right." These criteria are relatively easy to identify because of the consistency among the different approaches to sustainability, to sustainability assessment, and to environmental, social, and governance (ESG) standards. Tables 1–4 present sustainability criteria across the four principles at the project preparation and design phase. These criteria apply to all project components including elements such as access roads, transmission lines, raw material extraction areas that are necessary for delivering the project. Appendix 1 gives more detailed descriptions for each criterion.

Table 1: Sustainability criteria under the economic and financial sustainability principle for project preparation and design.

Economic and Financial Sustainability		
Economic and Social Returns	1	Project design for optimal economic growth
	2	Economic and social return over project life cycle
	3	Increase of local investment
	4	Service access and affordability
	5	Service efficiency, quality, and reliability
	6	Infrastructure asset maintenance and optimal use
Financial Sustainability	7	Positive net present asset value
	8	Adequate risk-adjusted rate of return
	9	Clarity on revenue streams
	10	Operating profitability
	11	Asset profitability
	12	Debt and fiscal sustainability
	13	Liquidity ratios
	14	Solvency ratios
Policy Attributes	15	Efficient risk allocation
	16	Commercial and regulatory incentives for sustainability

Table 2: Sustainability criteria under the environmental sustainability (including climate resilience) principle for project preparation and design.

Environmental Sustainability, including Climate Resilience		
Climate and Natural Disasters	1	Project design for low GHG emissions
	2	Assessment of climate risks and project-resilient design
	3	Project design and systems optimization for disaster risk management
	4	Durability, flexibility, and recovery of design elements and technological systems
Pollution	5	Project design and systems optimization to minimize air pollutant emissions
	6	Project design and systems optimization to minimize water contamination
	7	Project design and systems optimization to minimize soil and other pollution
Preservation of the Natural Environment	8	Environmental assessment of project impacts
	9	Project design for maximum ecological connectivity
	10	Preserve natural areas, areas with high ecological values, and farmlands
	11	Project design and technology to minimize invasive species
	12	Project design and technology to optimize soils management
Efficient Use of Resources	13	Efficient use of water resources
	14	Material use and recycling
	15	Project design to minimize energy consumption and maximize use of renewable
	16	Waste management and recycling
	17	Hazardous materials

Table 3: Sustainability criteria under the social sustainability principle for project preparation and design.

Social Sustainability		
Poverty, Social Impact, and Community Engagement	1	Social impact assessment of project
	2	Social sustainability and development plan
	3	Stakeholder engagement process
	4	Community consultation and participation
	5	Project design for fair benefit sharing and compensation to project-affected communities
	6	Project design to minimize impacts of resettlement and economic displacement
	7	Provision of public amenities within project's area of influence
	8	Project design to maximize community mobility and connectivity
Human and Labor Rights	9	Universally accessible project design and technologies
	10	Community health, safety, and security, and crime prevention
	11	Occupational health, safety, and labor standards throughout the project
	12	Project design that preserves the rights of vulnerable groups
	13	Gender-inclusive project design
Cultural Preservation	14	Project design that does not limit communities' access to resources
	15	Cultural resources and heritage
	16	Indigenous and traditional peoples

Table 4: Sustainability criteria under the institutional sustainability principle for project preparation and design

Institutional Sustainability		
Global and National Strategies	1	Project contribution to national and international commitments for sustainable development
	2	Project alignment with national and sectoral infrastructure plans
	3	Land use and urban planning integration
Governance and Systemic Change	4	Project alignment with economic, territorial, and urban strategies
	5	Project alignment with natural, environment, and social strategies
	6	Establishment of corporate governance structures
	7	Environmental management systems
	8	Social management systems and grievance redress mechanisms for external stakeholders and for workers, including contractors
	9	Project design and systems selection in alignment with certified providers
	10	Anti-corruption and transparency framework
Management Systems, Accountability	11	Project design and systems for engineering and technological feasibility
	12	Project organization to ensure accountability, collaboration, and innovation
	13	Project design and planning to ensure optimal implementation
	14	Project information sustainability monitoring and tracking
Capacity Building	15	Project design and systems to promote institutional capacity building
	16	Local capacities and awareness
	17	Project design and engineering studies for sustainability performance

Upstream Institutional Actions to Enable Delivery of Sustainable Infrastructure

The upstream institutional context includes the policies, plans, legislation, regulations, and organizational capacities that enable projects to be sustainable. A robust institutional context ensures selection of the "right" projects, incentivizes private sector investment in sustainable infrastructure, and promotes sustainability from policy to planning to procurement. There is a substantive literature describing approaches to ensure sustainability in projects through changes in institutional contexts, portfolio planning, and procurement (See Rajaram et al., 2010; Corfee-Morlot et al., 2012; Qureshi, 2015; Morrison-Saunders, Pope, and Bond, 2015; Bhattacharya et al., 2016; Schwab, 2017; Organisation for Economic Co-operation and Development, 2017c, a, b; World Bank Group, 2017; PPIAF, 2017; Alexander et al., 2017; Banerjee et al., 2017; Bak et al., 2017). We cross-referenced the recommendations from these studies with the sustainability criteria for project preparation and design just described to derive ideas of the issues to be considered upstream in the project cycle to deliver sustainable infrastructure projects.

For economic and financial sustainability: National and sectoral productivity growth strategies should establish the need for individual infrastructure projects to support sustainable and inclusive growth. National and sectoral institutional frameworks should provide incentives to ensure institutional, social, and environmental returns from infrastructure. Job creation must be factored into infrastructure investment strategies and plans. Trade institutions should incentivize sustainability transformation. Taxation and pricing should also incentivize sustainability and address perverse subsidies and price distortions. Procurement processes should ensure level playing fields for public and private enterprises. Finally, governments should develop and apply sustainability certification schemes for infrastructure providers. (See Inter-American Development Bank, 2006a; International Hydropower Association, 2010; World Bank Group, 2014; Serebrisky, 2014; Organisation for Economic Co-operation and Development, 2015b; Organisation for Economic Co-operation and Development et al., 2015; Bhattacharya et al., 2016; Qureshi, 2016; Egler and Frazao, 2016; The New Climate Economy, 2016; Organisation for Economic Co-operation and Development, 2017c; EU High Level Expert Group on Sustainable Finance, 2017.)

Aligned with long-term investment plans, infrastructure projects should be delivered in the context of multi-year public sector budgets. Through institutional measures, governments should ensure sustainability risk analysis and management in infrastructure investment evaluations. Similarly, governments should ensure life-cycle costing of infrastructure assets, including addressing present and expected externalities. National and subnational government infrastructure procurement and public-private partnership processes should be transparent and incorporate sustainability as well as ensure allocation of risks fairly between the private and public sectors. Procurement bids should be evaluated holistically across all dimensions of sustainability and incentivize inclusion of optimal sustainability features in project designs. Institutional frameworks for private investment in infrastructure should focus on risk distribution and management.

Governments should look to mobilize local capital markets for long-term infrastructure investments, matching project finance requirements (maturities, currency, and risks) to investor appetite. They should establish clear standards for sustainable finance that are fully coherent with sustainability and should consider carbon pricing as a mechanism for both removing perverse subsidies and providing funding to drive transformation. (See Inter-American Development Bank, 2006a; International Hydropower Association, 2010; Serebrisky, 2014; World Bank Group, 2014; Organisation for Economic Co-operation and Development et al., 2015; Bhattacharya et al., 2016; Egler and Frazao, 2016; Qureshi, 2016; Organisation for

Economic Co-operation and Development, 2017c; EU High Level Expert Group on Sustainable Finance, 2017.)

For environmental sustainability, including climate resilience: Projects should be consistent with national and sectoral infrastructure strategies and incentives designed for decarbonization. Governments should establish national, regional, and sectoral plans for climate resilience and adaptation. They should also establish national, regional, and sectoral institutional frameworks and strategies for disaster risk management and for managing air pollutant emissions. Governments should establish standards and strategies for durability, flexibility, and recovery of infrastructure systems. National requirements for project design should include systems optimization to minimize water contamination. Governments should establish and implement national and subnational soil and other pollution management systems. They should develop national and regional plans for biodiversity and ecosystem services management and ecological connectivity while also establishing institutional mechanisms to preserve natural areas, areas with high ecological values, and farmlands.

National institutional frameworks should effectively manage soils and water resources. National, regional, and sectoral plans should address the management of invasive species and the efficient use of material resources, should drive the sustainable use of energy resources, and should ensure sustainable waste management. (See International Hydropower Association, 2010; Quintero, 2012; Institute for Sustainable Infrastructure and Zofnass Program for Sustainable Infrastructure of the Graduate School of Design Harvard University, 2012; World Bank Group, 2014; Serebrisky, 2014; Organisation for Economic Co-operation and Development et al,. 2015; Bhattacharya et al., 2016; Egler and Frazao, 2016; Qureshi, 2016; US Department of Transportation: Federal Highway Administration, 2017; Global Infrastructure Basel, 2017; CEEQUAL Ltd, 2017; EU High Level Expert Group on Sustainable Finance, 2017; Organisation for Economic Co-operation and Development, 2017c; Infrastructure Sustainability Council of Australia, 2017.)

For social sustainability: Governments should establish institutional understanding and monitor social needs and trends. They should ensure decision making based on updated and reliable demographic and demand data and should ensure formal and functioning frameworks for effective stakeholder engagement and community consultation. Governments should establish an institutional framework for fair benefit sharing and compensation to project affected communities. They should establish standards and processes for fair resettlement and displacement of affected people, along with regional strategies and municipal plans for public amenities, community mobility, and connectivity.

Governments should ensure adoption of universal accessibility standards and codes for non-discrimination because of disabilities. Similarly, they should establish standards and capacities to ensure community health, safety, and security. Governments should also demonstrate commitment and capacities to ensure adherence to occupational health, safety, and labor standards as well as standards and capacities for the protection of vulnerable groups. They should ensure institutional commitment and capacities to ensure gender inclusion, adequate community access to resources, the efficient management of cultural resources and heritage, and the engagement of indigenous and traditional peoples. (See Inter-American Development Bank, 2006b; International Hydropower Association, 2010; Institute for Sustainable Infrastructure and Zofnass Program for Sustainable Infrastructure of the Graduate School of Design Harvard University, 2012; Bhattacharya et al., 2016; CEEQUAL Ltd, 2017; US Department of Transportation: Federal Highway Administration, 2017; Infrastructure Sustainability Council of Australia, 2017; Global Infrastructure Basel, 2017.)

For institutional sustainability: Ensuring the rule of law, transparency, and stability over time is critical to both engaging the private sector and delivering sustainable infrastructure. National and subnational infrastructure policies and plans are needed to scale up infrastructure services. Government commitment and capacities are critical to ensure effective sector planning; integrated planning for economic, territorial, and urban development; and integrated planning for natural, environmental, and social development. Governments should also ensure national frameworks exist to regulate and incentivize good corporate governance and transparency. Similarly, country system capacities for environmental and social management system regulation, supervision, and enforcement are critical to driving sustainability in operations. Governments need to establish a clear institutional framework that incentivizes sustainable procurement.

Governments also need to ensure capacities and policies for anti-corruption and good public governance. They should establish enabling institutional contexts to drive sustainability innovation. They need to ensure support to project preparation that incorporates sustainability, project design, and planning to ensure optimal implementation and the commitment and capacities to ensure project feasibility. Governments can also establish national and sectoral frameworks to standardize project agreements. Finally, capacities for data collection, management, and analysis are key to support infrastructure investments, as are ensuring capacities for project design and engineering analyzes for sustainability performance. (See Inter-American Development Bank, 2006a; International Hydropower Association, 2010; Institute for Sustainable Infrastructure and Zofnass Program for Sustainable Infrastructure of the Graduate School of Design Harvard University, 2012; World Bank Group, 2014; Serebrisky, 2014; Organisation for Economic Co-operation and Development et al., 2015; Bhattacharya et al., 2016; Egler and Frazao, 2016; Qureshi, 2016; The New Climate Economy, 2016; Organisation for Economic Co-operation and Development, 2017c; US Department of Transportation: Federal Highway Administration, 2017; EU High Level Expert Group on Sustainable Finance, 2017.)

Using Financing to Drive the Sustainable Infrastructure Transformation

Financing and financial systems are critical to driving the transformation toward sustainable infrastructure (Yuan and Gallagher, 2015; Berensmann et al., 2017; EU High Level Expert Group on Sustainable Finance, 2017). The EU High Level Expert Group on Sustainable Finance (2017) identified three complementary action areas to improve delivery of sustainable infrastructure:

- Ensure that projects adhere to sustainability standards through the adoption of IFC Performance Standards or the incorporation of ESG requirements.
- Provide targeted finance for key subsectors that meet sustainability objectives—for example, toward delivering on SDGs or the Paris Agreement.
- Align financial system institutions to deliver finance that addresses key sustainability risks and provides long-term support for infrastructure.

Investor interest in "green financing"—targeted investments toward climate mitigation, climate resilience/adaptation, and environmental sustainability—is growing, as evidenced by rapid growth in the green bond market. Continued growth will depend on standardizing green finance practices, enhancing transparency and disclosure standards for risks, enhancing markets for green investments, and supporting developing-country sustainable finance roadmaps (Berensmann et al., 2017).

For economic and financial sustainability: Governments and financiers should ensure that projects are supported by explicit plans describing how the project supports productivity and maximizes sustainability co-benefits. All projects should be based on an infrastructure service provision agreement and on concession agreements that incorporate and incentivize sustainability requirements, quantify usage and demand forecasts as part of project viability, and allocate risks to ensure alignment of interests among parties and to optimize risk management. Project sponsors should incorporate monetized analysis of ESG liabilities and analysis of environmental, technological, institutional, supply, and demand risks. Projects should show how they increase access to affordable, quality, and reliable services.

Projects should present analysis of financial structuring and evidence of comprehensive financial due diligence. The due diligence should include evaluating creditworthiness of project participants, modeling operational net revenues against external risks, and evaluating competitive, construction, termination, political, and macroeconomic risks, including as these relate to suppliers, customers, and competitors. (See Inter-American Development Bank, 2006a and 2010; International Hydropower Association, 2010; International Finance Corporation, 2012; Institute for Sustainable Infrastructure and Zofnass Program for Sustainable Infrastructure of the Graduate School of Design Harvard University, 2012; Véron-Okamoto and Sakamoto, 2014; Bhattacharya et al., 2016; Global Infrastructure Basel, 2017; CEEQUAL Ltd, 2017; International Bank for Reconstruction and Development/The World Bank, 2017; Infrastructure Sustainability Council of Australia, 2017; US Department of Transportation: Federal Highway Administration, 2017.)

For environmental sustainability, including climate resilience: Projects to be financed should include life-cycle carbon assessment and a management plan for net reduction of greenhouse gas emissions. Projects should assess climate change and disaster risks systematically. They should include a durability, flexibility, and recovery plan. Projects should include management plans for air pollution, for adverse impacts on human health and the environment, for adverse impacts from pollution and contamination, for accident prevention, and for environmental management—including pre-existing liabilities, soils, water resources, materials use, energy use, waste, and hazardous materials. (See Inter-American Development Bank, 2006a and 2007; Institute for Sustainable Infrastructure and Zofnass Program for Sustainable Infrastructure of the Graduate School of Design Harvard University, 2012; International Finance Corporation, 2012; Véron-Okamoto and Sakamoto, 2014; Bhattacharya et al., 2016; Infrastructure Sustainability Council of Australia, 2017; US Department of Transportation: Federal Highway Administration, 2017; International Bank for Reconstruction and Development/The World Bank, 2017; International Finance Corporation, 2017.)

For social sustainability: Infrastructure projects should include a comprehensive social impact management plan and document how benefits and compensations will be shared with project-affected communities and how they would be delivered, how grievances and social liabilities are managed, and how stakeholders will be engaged. Projects should include final local community agreements based on free, prior, and informed consent. They should avoid resettlement and displacement or include a resettlement and displacement management plan. They should include management plans to ensure preservation or enhancement of public amenities, maintain urban connectivity, and avoid mobility disruptions.

Projects should ensure that services are fully accessible to disabled and disadvantaged users. They should include plans to manage impacts on community health and safety and to ensure compliance with healthy working conditions and occupational health and safety standards, adherence to human rights agreements, and gender inclusion. Projects should include agreements with local communities that protect community access to food, land, and water resources and that manage tangible and non-tangible cultural heritage and any potential impacts and risks to indigenous and traditional peoples from project activities. (See Inter-American Development Bank, 2006a, 2007 and 2010; Institute for Sustainable Infrastructure and Zofnass Program for Sustainable Infrastructure of the Graduate School of Design Harvard

University, 2012; International Finance Corporation, 2012; Véron-Okamoto and Sakamoto, 2014; Bhattacharya et al., 2016; Infrastructure Sustainability Council of Australia, 2017; US Department of Transportation: Federal Highway Administration, 2017; International Bank for Reconstruction and Development/The World Bank, 2017; International Finance Corporation, 2017.)

For institutional sustainability: Projects should have all relevant parliamentary, sectoral, environmental, social, and planning approvals and permits allowing development and construction works to commence. Risks emanating from potential changes in laws and regulations should be assessed and managed. Similarly, risks associated with project and organizational structure with a focus on governance systems (executive and board) should be assessed and managed. Projects should have completed environmental and social assessments and management plans along with demonstrated human and financial resources to execute plans. They should establish and implement a comprehensive sustainable procurement program and should include commitments to anti-bribery and measures that promote integrity and increase transparency, including grievance redress mechanisms.

Projects should have mechanisms driving organizational collaboration, teamwork, knowledge sharing, and internal capacity building as well as improving local capacities and broadening understanding of the importance of sustainability. They should demonstrate integrated project delivery approaches and a comprehensive project procurement and technology management plan. Project contracts and subcontracts must be aligned with sustainability performance requirements through specific clauses and requirements. Projects should document the establishment of data collection and management systems and should demonstrate reporting and disclosure transparency and accountability on organizational and project sustainability. (See Inter-American Development Bank 2006a, 2007, 2010, Institute for Sustainable Infrastructure and Zofnass Program for Sustainable Infrastructure of the Graduate School of Design Harvard University 2012, International Finance Corporation 2012, Véron-Okamoto and Sakamoto 2014, Infrastructure Sustainability Council of Australia 2017, International Bank for Reconstruction and Development/The World Bank 2017)

Delivering the 2030 Agenda for Sustainable Development

The framework explicitly and directly supports progress toward over 70% of the 169 SDG targets. This includes all the targets under Goals 6 (ensure availability and sustainable management of water and sanitation for all), 7 (ensure access to affordable, reliable, sustainable, and modern energy for all), 9 (build resilient infrastructure, promote inclusive and sustainable industrialization, and foster innovation), 11 (make cities and human settlements inclusive, safe, resilient, and sustainable), and 13 (take urgent action to combat climate change and its impacts). Some SDG targets are outside of the sectoral scope of sustainable infrastructure; similar frameworks for sustainable cities, sustainable islands, and sustainable landscapes would ensure complete coverage of all SDG targets.

4. The Role of IDB and Partners

This document provides an initial framework definition of sustainable infrastructure for project preparation and design along with criteria that could be considered upstream and in the financing stage to support delivery of sustainable infrastructure. Within the IDB Group (IDBG), we began through using ENVISION to evaluate private sector operations (INFRA 360), developing an initial definition in 2014 (Watkins, 2014), lessons learned from case studies (Boltz et al., 2016; Calixter et al., 2016; Perivier et al, 2016; Picón et al., 2016), and an evaluation of the contribution of safeguards to sustainability (Georgoulias, Arrasate, and Georgoulias, 2016). The definition also draws on the body of work by sustainability assessment tool providers and on environmental and social standards. The framework has benefited from initial discussions with sectors and disciplines within the IDBG, Harvard University, and the Brookings Institution. This document is a first step to establishing a vision and approach to what we want to achieve through delivering sustainable infrastructure.

Sustainability in infrastructure operations within the IDBG is delivered both through proactive actions within infrastructure divisions and through the application of environmental and social standards. The focus for operational Divisions is to ensure economic, financial, and institutional sustainability in operations. In addition, the Transport Division reports annually on portfolio-level sustainability performance through application of STARS. The Division has also worked extensively on road safety, climate resilience, and gender inclusion. The Water and Sanitation Division works on climate resilience, watershed management, and green infrastructure. The Energy Division delivers renewable energy solutions and energy efficiency and through this has analyzed and supported change in the institutional contexts for delivering sustainable infrastructure.

The Infrastructure Department has begun pilot activities to advance sustainable infrastructure with the Ministry of Transport in Paraguay, the Ministry of Public Works in Chile, and the Ministry of Public Works and Mendoza Municipality in Argentina. In addition, the Department is evaluating the use of the Sustainable Infrastructure Foundation online platform SOURCE to provide accessible information for infrastructure projects—potentially leading to a standardized approach to documenting quality and sustainability. The IDB Environmental and Social Safeguards Unit has continued to improve interpretation and application of environmental and social standards in operations, supported the application of the Hydropower Sustainability Assessment Protocol, and worked with the Climate Change Division to address disaster and climate risks in operations. Gender and climate change issues are actively mainstreamed throughout the IDBG. These efforts should be evaluated, expanded, and standardized as a basis for establishing effective cross-sectoral approaches to ensuring sustainability in operations across the Bank and with our clients.

During 2017, the IDBG established a cross-sectoral Sustainable Infrastructure Working Group that at both the management level and the technical level creates the context for ongoing dialogue and action. The management group will play an increasingly key role in guiding the actions within the Bank to enhance sustainability in operations. The technical working group will examine existing tools (ENVISION, STARS, and SOURCE) considering the definition and will adapt and expand the application of these tools across infrastructure operations. The technical group will continue to support piloting within the Divisions of the use of sustainability assessment approaches with country clients. This support will include new and innovative financial instruments such as the NDC Pipeline Accelerator and the UK Infrastructure Fund, designed to support sustainability across the project cycle. The knowledge work on sustainable infrastructure will focus on providing a better understanding of the effectiveness of upstream and financing actions in delivering sustainable infrastructure.

Beyond the IDBG, development of the definition and its application to address sustainability challenges requires engagement of those who work directly with sustainable infrastructure in the region. These stakeholders include government planners, government regulators, national development banks, project advisors, policy makers, private sector investors, construction and operations firms, think tanks and tool providers, academia, civil society, public and private donors, and operational specialists in financial institutions. The IDBG, Brookings Institution, Harvard University, and the Public-Private Infrastructure Advisory Facility will work with these stakeholders to further develop and finalize the framework across the project cycle before the Global Infrastructure Forum meeting in Bali in October 2018. The IDBG will continue to work particularly with client governments, civil society partners, and private sector investors to better understand and embrace the imperative of sustainable infrastructure and to accelerate the development and standardization of frameworks and tools.

Despite the high-level commitment to the Paris Agreement and the SDGs made by governments and MDBs, and despite the efforts under way to leverage private sector finance, there is still a lack of engagement by stakeholders. This document serves as an additional call to action. Mercer and Inter-American Development Bank (2017) recommended that the Bank help to convene all the stakeholders, align MDBs and other partners, and encourage collaboration across all stakeholders. The Paris Agreement and the 2030 Agenda for Sustainable Development provide a long-term signal to investors to allocate capital to infrastructure that is consistent with low-carbon and climate-resilient development. But the signal only illuminates the path. This framework for sustainable infrastructure can hopefully help develop the vehicle to drive progress along that path.

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Appendix 1: Project Design and Preparation Criteria Descriptions

CRITERION	DESCRIPTION
	1. Economic and Financial Sustainability
1.1. Project design for optimal development growth	Infrastructure projects should be planned, designed, and operated to address specific bottlenecks, promote inclusive and sustainable growth, and boost productivity. Sustainable infrastructure should seek to maximize co-benefits, create quality employment opportunities particularly for local communities, and identify, assess, and minimize negative spillovers, especially for disadvantaged and vulnerable groups—thus supporting social equity and inclusion.
1.2. Economic and social return over project life cycle	Infrastructure projects should apply cost-benefit analysis techniques that adequately evaluate all externalities (positive and negative) to ensure holistic cost-effectiveness and the highest possible social return.
1.3. Increase of local investment	Infrastructure projects should, where possible, use innovative financial structures that address sustainability risks to increase investments locally and mobilize local sources of finance, such as pension and insurance funds.
1.4. Service access and affordability	Infrastructure projects should broaden access to infrastructure services, especially for disadvantaged and vulnerable groups—thus supporting social equality and inclusion.
1.5. Service efficiency, quality, and reliability	Infrastructure projects should broaden access to high-quality, efficient, and reliable infrastructure services.
1.6. Infrastructure asset maintenance and optimal use	Infrastructure projects should include adequate design and operation standards and action plans to ensure optimal asset utilization and service provision and to discourage overuse and abnormal deterioration.
1.7. Positive net present asset value	Infrastructure projects should be financially structured such that the present value of cash inflows is greater than the present value of cash outflows—both discounted at the weighted average cost of capital. Infrastructure project financial assessments should be conducted in accord with international good practices and evaluated by independent entities.
1.8. Adequate risk-adjusted rate of return	Infrastructure projects—in addition to a net positive economic return—should generate an adequate risk-adjusted rate of return by identifying and assessing relevant project risks to attract commercial investment.
1.9. Clarity on revenue streams	Infrastructure projects should provide clarity on the ultimate source of revenue that would cover operating costs, to mitigate risks and ensure financial viability.
1.10. Operating profitability	Infrastructure projects should be financially structured such that revenues cover running costs and operations turn out profits, before deduction of taxes, interest, amortization, and depreciation of capital investments (and remuneration of capital).
1.11. Asset profitability	Infrastructure projects should be financially structured such that asset profitably (return on assets; return on equity) is sufficient to attract private capital.

1.12. Debt and fiscal sustainability	Infrastructure projects should ensure that service provision costs are covered through carefully designed user fee schemes and, when determined non-viable, should incorporate transparent, predictable, and well-targeted availability payments.
1.13. Liquidity ratios	Infrastructure projects should be financially structured such that the investment can pay off both its current liabilities as they become due as well as its long-term liabilities as they become current, at any given time.
1.14. Solvency ratios	Infrastructure projects should ensure adequate cash flows to be able to make payments and pay off long-term obligations to creditors, bondholders, and banks across the life of the asset. Infrastructure project financial assessments should transparently indicate solvency ratios, in accord with international good practices.
1.15. Efficient risk allocation	Infrastructure projects should be structured such that project-related risks (technical, social, environmental, political) are allocated to the party most able to control the likelihood of the risk occurring and best able to control the impact of the risk on the project outcome, by assessing and anticipating a risk well and responding to it.
1.16. Commercial and regulator incentives for sustainability	Infrastructure projects should be designed and implemented to align with and use commercial and regulatory incentives for incorporating sustainability during construction and operations, such as using energy-efficient equipment or materials with lower embodied energy and water content or priority dispatch in grids for renewable energy.
2. Environmental Sustainability, including Climate Resilience	
2.1. Project design for low GHG emissions	Infrastructure projects should result in the net reduction of GHG emissions during construction, operations, and decommissioning, thus contributing to the realization of the 2015 Paris Agreement GHG reduction commitments. Project developer should calculate the anticipated amount of GHG emissions through a life-cycle carbon assessment and implement clearly defined action plans to reduce or minimize them.
2.2. Understanding of climate risks and project resilient design	Infrastructure projects should be designed to be resilient to climate change and contribute to enhancing adaptation. Project developer should systematically assess and manage climate change risks through a climate impact assessment and adaptation plan. Infrastructure projects should ensure that they do not introduce risks that jeopardize climate change resiliency, such as increasing flooding risks in the case of water reservoir projects.
2.3. Project design and systems optimization for disaster risk management	Infrastructure projects should systematically assess and manage potential disaster risks that may affect the project and stakeholders such as workers and potentially affected local communities, following national disaster management frameworks. In addition to specifying mitigation and adaptation measures to address disaster risks, infrastructure projects should include sound disaster risk monitoring and management as well as recovery plans indicating the actions to be taken in the case of natural disasters.
2.4. Durability, flexibility, and recovery of design elements	Infrastructure projects should be designed to be durable and flexible, allowing easy reconfiguration, deconstruction, and recycling of project components to extend project useful life and improve resiliency.

and technological systems	
2.5. Project design and systems optimization to minimize air pollutant emissions	Project developer should monitor air quality and air emissions and should minimize adverse impacts from pollution from project activities during construction, operations, and decommissioning. Infrastructure projects should include comprehensive air pollutant emissions management plans that define actions to be taken to avoid air emissions, as well as to minimize emissions in case regulatory thresholds are exceeded.
2.6. Project design and systems optimization to minimize water contamination	Project developer should assess, evaluate, and manage adverse impacts on human health and the environment from excess use of water or water pollution resulting from project activities or storm water runoff.
2.7. Project design and systems optimization to minimize soil and other pollution	Infrastructure projects should assess, evaluate, and manage adverse impacts from pollution and contamination on land, ocean, seas, water courses, and in the air, including noise and vibration, light, dust, visual effects, and particulate matter among other anthropogenic effects. Infrastructure projects should avoid risks of soil pollution—or other kinds of pollution, such as of seabeds—due to spills, use of chemicals, or bad practices. Remediation procedures and cleanup programs should be put in place in case the land being developed was previously contaminated.
2.8. Environmental assessment of project impacts	Infrastructure projects should include a comprehensive environmental impact assessment that identifies, assesses, and proposes actions for mitigation of all relevant environmental impacts. Relevant public authorities should approve the environmental impact assessment. Infrastructure projects should avoid negative impacts on biodiversity and assess and manage any unavoidable impacts to ensure maintenance of biodiversity functions and ecosystem services, seeking net positive gain.
2.9. Project design for maximum ecological connectivity	Infrastructure projects should assess and avoid negative impacts on habitats, wildlife corridors, and sediment transport and should include clearly-defined action plans to manage unavoidable impacts, to ensure maintenance of ecological connectivity.
2.10. Preserve natural areas, areas with high ecological values, and farmlands	Project developer should avoid greenfield development where possible and favor development on previously developed greyfield sites and brownfield sites. Infrastructure projects should avoid impacts on farmland and, where possible, restore previously degraded farmland to productive state.
2.11. Project design and technology to minimize invasive species	Project developer should use locally appropriate and noninvasive species to avoid the introduction of invasive species and ensure that invasive species would be properly managed and/or eliminated during construction, operations, and decommissioning.
2.12. Project design and technology to optimize soils management	Infrastructure projects should avoid disturbance of soils and, where not possible, restore disturbed topsoil and subsoil during construction, operations, and decommissioning. Infrastructure projects should also aim to restore soils disturbed during previous development.

2.13. Efficient use of water resources	Infrastructure projects should monitor and promote the sustainable use of water resources, including maximizing water reuse or efficiency and minimizing use of critical water resources or consumption of potable water during the life cycle of the project. Infrastructure projects should utilize storm water, greywater, or recycled water to cover project water needs.
2.14. Material use and recycling	Infrastructure project should monitor and promote the efficient use of materials, including materials with a recycled content and materials with lower energy and water content, and should incentivize the integration of recycling practices during the life cycle of the project. Evaluation of embodied water and embodied energy should be considered when selecting the optimal materials for the project. The use of local materials should be incentivized when possible.
2.15. Project design to minimize energy consumption and maximize use of renewables	Infrastructure projects should monitor energy use and promote energy efficiency and the use of renewable energy to minimize energy consumption, thus avoiding the use of more-polluting non-renewable energy sources and the generation of GHG emissions. Infrastructure projects should aim to reduce annual project energy needs following applicable industry norms.
2.16. Waste management and recycling	Project developer should implement a waste management plan to monitor and minimize wastes through recycling and, where possible, avoid generation of hazardous wastes. A waste management hierarchy should be established that considers prevention, reduction, reuse, recovery, recycling, removal, and final disposal of wastes.
2.17. Hazardous materials	Infrastructure projects should avoid the use of chemicals and, where possible and necessary, apply integrated pest management approaches and monitoring during the life cycle of the project to avoid the use of pesticides, fertilizers, and herbicides.
3. Social Sustainability	
3.1. Social impact assessment of project	Infrastructure projects should assess and ensure that negative social impacts are avoided or minimized. Infrastructure projects should include a comprehensive social impact assessment that identifies, assesses, and proposes actions for mitigation of all relevant social impacts. Relevant public authorities should approve the social impact assessment.
3.2. Social sustainability and development plan	Infrastructure projects should be planned, designed, executed, and operated for maximum benefit inclusion for disadvantaged groups including, but not limited to, women and the poor, thus improving social cohesion. A social sustainability and development plan should specify social sustainability and development initiatives to help local communities develop sustainably.
3.3. Stakeholder engagement process	Infrastructure projects should identify and effectively engage with stakeholders throughout the project cycle to ensure public support. Stakeholder engagement should be pursued through a clearly-defined stakeholder engagement plan that includes provisions for soliciting stakeholder feedback and grievances.
3.4. Community consultation and participation	Potentially affected communities should be effectively consulted on project developments and engaged during the project development process through official public consultations and targeted initiatives to

	avoid conflicts and ensure community support. In the case of high-impact projects that affect the natural resources and territory of local communities, project developers should obtain the free, prior, and informed consent of the community. Community consultation efforts should be continuous and include provisions for soliciting community feedback and grievances during operations and decommissioning.
3.5. Project design for fair benefit sharing and compensation to project-affected communities	Infrastructure projects should be designed to provide fair and adequate benefits beyond one-time compensation to project-affected communities, as specified through a clearly-defined community social development plan, implemented in consultation with affected communities.
3.6. Project design to minimize impacts of resettlement and economic displacement	Infrastructure projects should be designed and implemented to avoid or minimize the need for resettlement or economic displacement of people because of the project, ensuring that where displacement does occur, people are treated equitably. Alternative project designs that minimize resettlement and displacement should be evaluated. Resettlement and displacement should be managed through sound and clearly-defined displacement management plans.
3.7. Provision of public amenities within project's area of influence	Project developer should ensure the preservation, or enhancement, of critical public amenities, including public spaces or recreational spaces to improve quality of life and help local communities develop sustainably. Where possible, infrastructure projects should aim to restore existing degraded public space or consider initiatives that expand public access to private space.
3.8. Project design to maximize community mobility and connectivity	Infrastructure projects should enhance connectivity, prevent urban sprawl, and avoid mobility disruption. When possible, the project should improve walkability and encourage the use of public transport and other alternative non-motorized forms of transportation.
3.9. Universally accessible project design and technologies	Infrastructure project should ensure that infrastructure services are fully accessible to disabled and disadvantaged users. Infrastructure projects should be designed and implemented following universal accessibility norms and regulations and include provisions to ask for feedback from disabled and disadvantaged users during construction and operations.
3.10. Community health, safety, and security, and crime prevention	Project developer should assess, evaluate, and manage project impacts on community health and safety, including exacerbation of existing climate or natural disaster risks. Project developer should ensure that project activities do not increase security risks for local populations during construction and operations.
3.11. Occupational health and safety and labor standards throughout the project	Project developer should promote healthy working conditions and adherence to occupational health and safety standards. Core labor standards should be respected, and workers protected through fair treatment, nondiscrimination, and equal opportunity, avoiding under any circumstances forced and child labor.
3.12. Project design that preserves the rights of	Infrastructure project should comply with human rights agreements, preventing and mitigating adverse impacts over the life cycle of the infrastructure assets. Such prevention should address vulnerabilities

vulnerable groups	or any kind of discrimination against vulnerable groups—indigenous peoples, women, and children.
3.13. Gender-inclusive project design	Project developer should prevent, or mitigate against, adverse impacts due to gender resulting from project activities. Infrastructure projects should provide equal opportunities to both women and men and include initiatives to promote women's economic empowerment beyond the provision of temporary jobs as specified through a clearly defined social development plan.
3.14. Project design that does not limit communities' access to resources	Infrastructure projects should be designed and implemented to not jeopardize community access to food, land, and water resources. Infrastructure projects should ensure that the resource needs of local communities are considered while calculating resources required for project activities during construction, operations, maintenance, and decommissioning.
3.15. Cultural resources and heritage	Infrastructure projects should assess, evaluate, and preserve tangible and non-tangible cultural heritage that may be affected by project activities.
3.16. Indigenous and traditional peoples	Project developer should, in consultation with potentially affected indigenous and traditional peoples, assess, evaluate, and manage any potential impacts and risks from project activities.
4. Institutional Sustainability	
4.1. Project contribution to national and international commitments for sustainable development	Infrastructure projects should evaluate the extent to which the development is aligned with national and global commitments and obligations. These may includeratified multilateral environmental agreements including the 2015 Paris Agreement, Sustainable Development Goals, and robust sector strategies or national climate change actions pursuant to the Paris Agreement.
4.2. Project alignment with national and sectoral infrastructure plans	Infrastructure projects, as designed, should be optimal and effective solutions to meet demonstrated development needs identified through national and sectoral development and infrastructure plans. Infrastructure projects should transparently indicate the contribution(s) to national and sectoral infrastructure plans, such as expanding access to potable water services.
4.3. Land use and urban planning integration	Infrastructure projects should be shown to be integrated with existing and planned infrastructure and land use across different jurisdictional scales. Infrastructure projects should pursue synergies with adjacent infrastructure systems or facilities to improve efficiencies and reduce waste and costs.
4.4. Project alignment with economic, territorial, and urban strategies	Infrastructure projects should be shown to be in alignment with national and regional economic, territorial, and urban strategies, ensuring that infrastructure assets are effective solutions for achieving national goals to promote economic empowerment and inclusive, sustainable territorial and urban development.
4.5. Project alignment with natural, environment, and social strategies	Infrastructure projects should be shown to be in alignment with natural, environment, and social strategies, ensuring that projects are aligned with environmental restoration or enhancement efforts, as well as social strategies to enhance community quality of life and reduce poverty and inequality.

4.6. Establishment of corporate governance structures	Infrastructure projects should comply with national corporate governance regulations, ensuring appropriate corporate governance, including separation of policy and executive roles, effective participation of stakeholders, and clearly defined organizational sustainability roles. This is intended to ensure that the infrastructure asset is well planned, designed, executed, and monitored over the project life cycle.
4.7. Environmental management systems	Infrastructure projects should ensure development of environmental management plans that address the environmental impacts identified through the environmental impact assessment and their implementation during construction, operations, and decommissioning. The resources—human and economic capital—to achieve this target should be identified.
4.8. Social management systems and grievance redress mechanisms for external stakeholders and for workers, including contractors	Infrastructure projects should ensure development of social management plans that address the social impacts identified through the social impact assessment and their implementation during construction, operations, and decommissioning. The resources—human and economic capital—to achieve this target should be identified. Infrastructure projects should provide project-affected parties with accessible and inclusive access to raise issues and grievances for these to be managed.
4.9. Project design and systems selection in alignment with certified providers	Infrastructure projects should establish open and transparent procurement processes for the efficient and sustainable procurement of materials for construction, operations, and maintenance. Infrastructure projects should use certified suppliers that implement sustainability practices in the context of a public sustainable procurement certification scheme.
4.10. Anti-corruption and transparency framework	Infrastructure projects should develop and implement an anti-bribery management system for the project throughout the life cycle and other measures that promote integrity and increase transparency in the infrastructure development process.
4.11. Project design and systems for engineering and technological feasibility	Infrastructure projects should ensure the feasibility of project design, engineering, and technological systems, as transparently evaluated by independent entities.
4.12. Project organization to ensure accountability, collaboration, and innovation	Infrastructure projects should establish mechanisms for organizational collaboration, teamwork, knowledge sharing, and internal capacity building including sufficient engineering knowledge and skills for efficient design, preparation, construction, operation, and maintenance of infrastructure assets.
4.13. Project design and planning to ensure optimal implementation	Infrastructure projects should ensure that institutional, organizational, and individual capabilities for infrastructure planning and design are enough to ensure sufficient management of technical, project management, contractual, financial, environmental, social, governance, and climate change–related aspects and risks.

4.14. Project information monitoring, and sustainability tracking	Infrastructure projects should establish a sustainability management system with a clearly defined strategy, policy, targets, metrics, monitoring, evaluation, and independent verification, appropriate to the nature and scale of the project and commensurate with the level of social and environmental risks and impacts.
4.15. Project design and systems to promote institutional capacity building	Infrastructure projects should include opportunities to improve institutional capacity to plan and implement sustainable projects and manage environmental and social impacts effectively.
4.16. Local capacities and awareness	Infrastructure projects should include opportunities to improve local capacities and broaden understanding of the importance of sustainable use of infrastructure assets and of properly evaluating sustainability risks and impacts in the context of a comprehensive socioeconomic analysis.
4.17. Project design and engineering studies for sustainability performance	Infrastructure projects should establish mechanisms to build and maintain capacities for design, engineering, and technological innovation that can lead to exceeding sustainability requirements.