Challenges and Opportunities in Evaluating Sustainable Infrastructure

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Executive Summary

Considering the importance of investments in infrastructure with their high financing costs, opportunity costs and long-term legacy, it is critical to determine which projects among their alternatives provide the best value and, if and how a good project can be made better. The challenge in making the right investment is ever more difficult when attempting to achieve sustainability because sustainability embodies long-run aspirations across sectors, while projects are typically measured relative to direct, short-term impacts that primarily affect a relatively small part of a region or population. Much effort has been undertaken to develop sustainable infrastructure evaluation frameworks by national and international public agencies and non-governmental organizations alike, but they are not always adequately applied to evaluate projects to achieve sustainability goals.

This paper takes a step back from current discussions about sustainable infrastructure and evaluation frameworks to ask whether there is a better way to evaluate projects. We raise questions about current approaches to identify areas for improving strategies in planning, designing and financing infrastructure to more effectively meet sustainability goals. Our interest is to help decision makers efficiently and effectively make the best investment choices. To this end, we lay groundwork for an evaluation framework that extends beyond project-level benefit-cost analyses to account for a broader context and goals. A key part of this framework is the development of a clear and concise set of project outcome indicators that are aligned with a macro-scale concept of sustainability.

The intended audience for this paper includes public planning and implementing agencies, as well as the public and private financing community who are wrestling with the concept of sustainability and the influence that infrastructure investments can have on long-run outcomes. We discuss several important activities that would need to be undertaken to implement an improved sustainable infrastructure evaluation process. Finally, we conclude with a series of next steps, including research and data collection that would be required for implementation.

Introduction

1

Sustainable development, as originally defined in the Brundtland Commission report (WCED, 1987), refers to "development that meets the needs of the present without compromising the ability of future generations to meet their own needs." While various definitions of sustainable development have emerged since to emphasize different dimensions, its fundamental reference to balanced growth in economic opportunity, environmental conservation, and human development is unchanged. Yet, the concept of sustainable development remains merely aspirational without methods for assessing infrastructure investments and policies that aim to achieve balanced, long-run goals. Certainly, the recent work to clearly define measurable Sustainable Development Goals (SDGs) is a positive step. However, additional guidance for evaluating investments is still critically important for several reasons: the ramp-up in sustainable infrastructure financing goals; the high opportunity costs of some investments that preclude others; and the long-term legacy that projects have once in place.

A central challenge in evaluating the contribution of infrastructure to sustainability is that nearly every project involves trade-offs and conflicting outcomes. No project can meet everyone's needs and often, some people benefit at the expense of others. For example, investments that favor industrial growth can compromise nearby communities. And, while economic growth has helped feed growing populations, it has been coupled with higher natural resource extraction and environmental degradation. As well, some impacts are immediate and short-term, and others affect development thereafter. When a well-conceived road, water supply system, or power plant is implemented, families, communities and economies tend to grow around it and establish a new trajectory of growth. Thus, a project can become a stepping stone to sustainability or one that leads to lower quality living standards and environments. These conflicting perspectives on a project underscore the dichotomy that exists between micro- and macro-scale perspectives on sustainability, in which infrastructure projects are primarily designed to address specific short-term needs of some people, whereas sustainability is a multi-dimensional and long-run goal for a larger region.

Currently, investments tend to move forward when economic benefits exceed costs. Of course, it is the present value of benefits and costs which are compared and by definition, a present value favours current needs over future ones because future benefits and costs are discounted. This is not to say that economics is a flawed approach to evaluating project investments; the principles of economic analysis are a reasonable path forward for objectively evaluating projects based on assumptions and data on the choices people make. But, such analyses rarely examine the implications for inequitable growth – a debt we owe to Nicholas Kaldor and John Hicks, whose Kaldor-Hicks criterion emerged from their papers in 1939 as a way of evaluating investments. Under this criterion, a project is justified when benefits exceed costs, because the gains to beneficiaries could be large enough from them to hypothetically compensate those that could be worse off. Of course, such direct compensation was only ever a conceptual premise. It is up to the relevant public agencies to allocate other resources towards investments and programs to meet the needs of those who bear the costs.

Public agencies attempt to minimize projects' negative external impacts on people and the environment by upholding lending safeguards. Generally, safeguards refer to a series of policies and standards for evaluating negative impacts and mitigating them if required. Safeguards though do not generally account for potential spillover effects of a project into other sectors across a region. While good project designs include mitigation measures to minimize negative impacts on people and natural habitats, these measures are often not net improvements, just damage control. Remaining discrepancies and needs are left for future projects to address. But do they? If not, how can evaluations processes anticipate long term needs?

This paper raises these questions to motivate discussion towards improving strategies in planning, designing and financing infrastructure to more effectively meet sustainability goals. Our interest is to help decision makers efficiently and effectively answer two critically important questions related to project investment choices:

- Which project provides the best value? and,
- How can a good project be made better?

where "best" and "better" reflect a balance between short-term needs and long-term economic, social and environmental goals. To this end, we lay groundwork for an evaluation framework that would extend beyond the confines of project-level benefit-cost analyses to consider the broader context and goals of implementing a project in the first place. We discuss the need for and provide examples of clear and concise performance metrics that link projects and sustainability to improve the short- and long-term consideration of investment impacts. Such information could improve consistency in evaluating tradeoffs between projects within a single sector, and projects in other sectors that together can strive to achieve a more balanced development across a region.

The intended audience for this paper includes public planning and implementing agencies, as well as the public and private financing community who are wrestling with the concept of sustainability and how it applies to their role in project development. We recognize that currently, most agencies involved in building and maintaining infrastructure are not typically responsible for accounting for a project's impacts on people and the environment beyond those directly affected. Similarly, but at a wider perspective, planning agencies are not usually organized to take a cross-sector perspective on mobility, energy, water, land development and associated social services. The gap in planning arises then for anticipating long-term, cross-sector impacts.

Recognizing that even though conceptual, institutional and evidential challenges exist in current institutional mandates, sustainable infrastructure evaluations cannot avoid the question of how a project more broadly affects a region's or country's long-term goals. We provide some remarks about improving processes for planning and project design that can support a broader evaluation approach. These processes are primarily aimed at planning processes that would include improved alignment of information and goals at the project implementation level. In addition, our argument for an expanded evaluation framework would improve monitoring and research on development processes. We conclude this paper with a discussion of next steps to formalize the indicators, evaluation methods and data needed to make such a framework operational.

What is Sustainable Infrastructure?

2

Infrastructure, whether it's an urban bypass road, water supply reservoir dam, solar energy field, new hospital or some other structure, is designed within site and budget constraints to satisfy a specific need. The value of infrastructure is derived primarily from its use. Most structures have no intrinsic value but depending on their function, can enable users to save time, lower costs, become healthier or benefit some other way. Many projects are justified when the value of this use is high enough to exceed lifecycle construction and operation costs, including any expenditures to mitigate negative impacts to people, communities, and ecosystems.

The impact of infrastructure development however extends well beyond the value gained by users. Physically, a project's footprint alone replaces productive land, can force relocation of people, and disrupt ecosystems. Wider impacts can occur if infrastructure changes competitiveness of local economies, future land uses, or human health. These extended spillover impacts though differ by project type. Consider some examples:

- **Freight Transportation:** Expanding the scale or efficiency of transportation systems for freight lowers costs of moving goods and can in turn enable producing industries to grow, increasing wages and jobs in the short-term. At the same time, the same infrastructure can enable importing industries to lower costs, which increases local competition and can in turn shift employment and wages in different directions. All the while, increased transportation leads to more negative environmental externalities that have long term impacts on people and habitats near the road.

- **Personal Mobility:** Highway capacity expansion projects can save small amounts of travel time for millions of users and are often favored over relatively more expensive transit projects that, in contrast, can significantly improve journey quality but for smaller numbers of people. These project alternatives have very different impacts on land use and resources: highway projects enable drivers to travel from farther distances in the same amount of time, spurring land development further from cities. Transit projects more effectively concentrate resource use and development, and in turn, improve quality of life. Also, because beneficiaries of transit projects, as compared to highway projects, tend to have lower incomes, they can help to support a more equitable development trajectory.

- **Water supply:** Increased access to clean water improves human health and industrial production. But diverting or storing water from rivers and lakes can cause negative environmental consequences, require relocation of communities, and harm other users downstream. In addition, over-pumping of water from aquifers increases the costs of water access for nearby well owners while causing pollutant emissions from energy consumption in pumping. Downstream, water users can also be affected by reduced water supplies and lower water quality.

- **Energy generation:** New sources of energy can reduce costs for manufacturing and transportation which in turn increases economic competitiveness. Non-renewable energy sources tend to be lower cost alternatives, but their associated pollution leads to negative environmental consequences that can ultimately impact short-term human health and productivity, as well as long-term health care costs. Carbon-based fuels lead to higher risks of severe climate change-induced impacts that can cause wide-spread, long-term impacts to human health, environment, and economies.

- **Public infrastructure in education and health facilities:** Health and education projects are critical long-term investments to maintaining a healthy society with the skills and productivity to compete in the workforce. In turn, individuals and communities gain from increased opportunities for higher wages and can stimulate development of local innovations and technology. However, it is often the case that better funded and connected facilities are located in the parts of a community or country that already have relatively higher standards of living, which can lead to a further distortion in opportunities.

As these examples illustrate, no single project can meet all needs. Negative outcomes are often mixed with positive ones, and impacts extend well into the future. In developing countries, infrastructure for meeting current needs have often been implemented to the detriment of society and future generation. The sustainability of infrastructure, in economics terms, depends on whether the marginal social benefit exceeds the marginal social cost, and by extension, whether the well-being of future generations are included in the benefits conceived by current generations. The question that remains is how to understand if a project's short- and long-term impacts relate to broader regional goals.

The concept of sustainable infrastructure broadens the perspective and goals of projects to incorporate interests beyond a project's primary purpose. Sustainable infrastructure can be defined as infrastructure that is designed to enable a community or country to achieve a more sustainable form of economic development. Infrastructure in a physical or practical sense is not sustainable per se. Far from it in fact: infrastructure deteriorates as it is used and exposed to natural elements. Over its life cycle, owners can spend more time and money maintaining its infrastructure assets than they do in initial planning and construction. While on-going infrastructure maintenance is necessary to generate sustained long-term infrastructure value, sustainability outcomes from infrastructure depend on what is built, where, and when.

For infrastructure to be sustainable, planning and design choices should aim to meet short-term needs while anticipating long-term implications (including unintended consequences), because once built, a project becomes integral to a community and economy. Sustainable infrastructure evaluations must reconcile benefits and costs for a single project with recognition that future projects may be necessary to mitigate known negative aspects or unintended consequences. Such evaluations should consider cross-sector impacts of a project and its place within a range of investments that are necessary to achieve sustainable development, as broadly defined by a local community. Accordingly, sustainable infrastructure evaluations should not focus solely on one project but take a portfolio perspective on the cross-sector project options available to address needs in the short- and long-term. Such an evaluation would cover projects that target different objectives, beneficiaries and locations, and which can be formulated into a suite of investments that aim to balance needs over time.

Infrastructure evaluation with respect to sustainability goals requires a set of quantitative indicators of project impact that can help make choices among trade-offs. Such a framework of indicators is no small feat because of the desire to account for short- and long-term dimensions across balance goals. Moreover, the accuracy of quantitative measures of some project impacts, especially those involving dynamic changes, can be highly uncertain even when estimated with sophisticated modeling. Instead, sustainable infrastructure evaluation can be improved with a clear and concise set of key project indicators that are aligned with sustainability perspectives at the micro (project) and macro (community and economy) scales. With a more limited, but representative, set of project indicators, project evaluations can focus on key outcomes and more readily address unknowns. Short- and long-term indicators of a project then can serve as a vehicle for common planning, evaluation, and monitoring and ultimately, a coordinated vision at the project and planning levels. In the discussion that follows, a review of different sets of sustainable infrastructure indicators are discussed to highlight potential directions for developing better indicators for sustainable infrastructure.

Existing Sustainable Infrastructure Evaluation Approaches

3

The sustainability dimensions in infrastructure projects have been assessed through various guidelines and sets of indicators. But, whether these frameworks are derived from a sustainability concept based on "five capitals"[1] or a "triple bottom line"[2], they are more similar than not. The main question is whether such indicators, when applied at a project scale, effectively guide the selection and design. The section that follows provides an overview of some of the sustainability assessment approaches but is hardly an exhaustive review. Instead, we concentrate on several leading frameworks, at national and international scales, to identify strengths and weaknesses. Our principal aim is to provide context for the next section in which we discuss a proposed set of sustainability evaluation principles that build upon existing approaches to better account for a broader scope of impacts and integrating planning and project level considerations.

3.1 UN Sustainable Development Goals (SDG)

The UN General Assembly formally established a set of 17 SDGs in 2015 to guide development planning and investment through 2030. The SDGs, which represent an update on the Millennium Development Goals, aim to emphasize the quality of economic growth, with respect to impacts on the environment, the economy and society as a common global goal. SDGs cover a broad set of themes that include: funding/global partnerships; infrastructure; human, community and economic development; built environment and resource use. The SDG framework aims to re-focus development strategies across many sectors and locations, and address persistent causes of poverty and risks from climate change.

In an attempt to make the SDG framework more tangible, a series of targets and measurable indicators are established for each SDG to help guide investments. In addition, because some SDGs have overlapping themes or goals, associated indicators are cross-linked to better recognize potential co-benefits of achieving a goal. Altogether, across all 17 SDGs and related targets, over 250 indicators are classified with respect to the feasibility for tracking purposes, especially related to data availability (see excerpt of SDG 9 - Build resilient infrastructure in Table 1)[3].

Infrastructure is clearly recognized in the SDG framework as an important means to achieving human, community, and economic goals. Infrastructure is explicitly or implicitly referenced in several SDGs such as:

- SDG 3: Good Health and Well-being – Hospitals and clinics;
- SDG 4: Quality Education - Schools;
- SDG 6: Clean Water and Sanitation – Water and Wastewater treatment facilities;
- SDG 7: Affordable and Clean Energy – Power plants and distribution systems; and,
- SDG 9: Industry, Innovation and Infrastructure – Transportation, business and other infrastructure.

1 https://www.forumforthefuture.org/project/five-capitals/overview

2 https://en.wikipedia.org/wiki/Triple_bottom_line

3 UN (2016). Tier Classification for Global SDG Indicators. September 2016. http://unstats.un.org/sdgs/iaeg-sdgs/

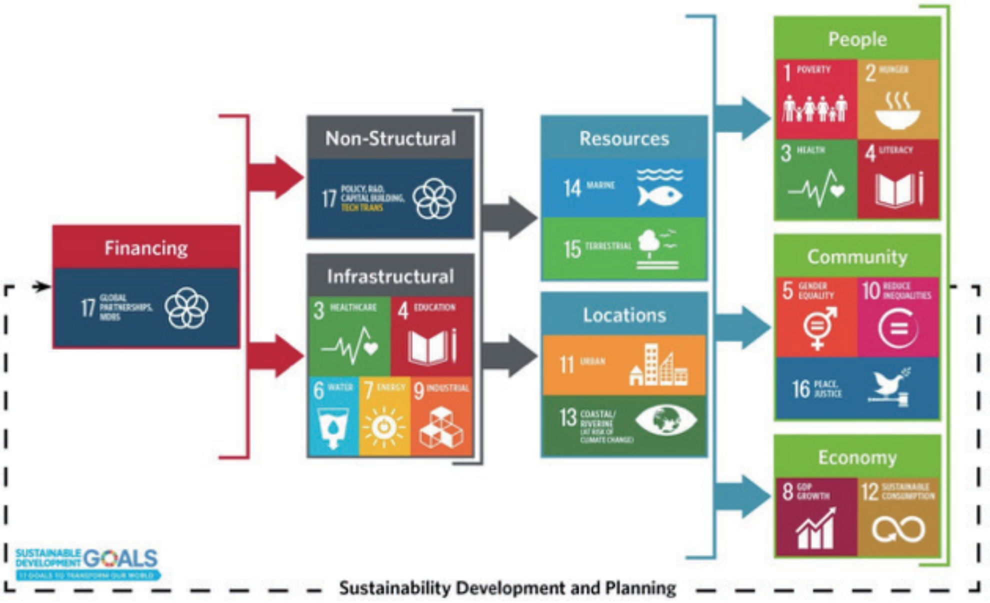
To emphasize this connection, the entire set of SDGs can be rearranged graphically to highlight the role that infrastructure plays in development (Figure 1). On the left side, financing (SDG 17) is presented as a core driver of sustainable development opportunities. Financing leads to investments in varying types of infrastructure (e.g. energy, water, industrial, education, and health), which alongside capacity building and policy reform (also SDG 17), spur development in important and at-risk locations (SDG 11, SDG 13). Ideally, development occurs without over-exploitation of aquatic (SDG 14) and terrestrial resource (SDG 15). Remaining SDGs represent development goals for meeting the needs of people (SDGs 1-4), communities (SDGs 5, 10, 16) and the economy (SDGs 8, 12).

While infrastructure is an important driver and measure for achieving SDGs, infrastructure indicators are not suitable for project evaluations. For instance, an indicator in SDG 4 (Education) includes "Proportion of schools with access to: electricity, computers [and other amenities]". This indicator can measure the status of all schools in a region, but cannot assess the degree to which access to amenities should be prioritized in a single school. Similarly, for SDG 7 (Energy), the indicator "Proportion of population with access to electricity" measures the number of people who gain from energy, but not as a result of a single project. SDG indicators can support planning-level discussions and identify needs across a portfolio of projects. But, they are not directly applicable for project-level design decisions and budget challenges of specific infrastructure (e.g. school capacity, volumes of water produced, numbers of people with increased energy, etc.). Thus, the SDG framework frames the importance of making sensible infrastructure investments but, the indicators are more effective in tracking long-term progress towards sustainability, not in evaluating tradeoffs among investments in the same or different sectors.

Table 1 SDG Indicator Development List for SDG 9 (Excerpt)

SDG 9: Build resilient infrastructure, promote inclusive and sustainable industrialization and foster innovation	
Target	**Indicator**
9.1 Develop quality, reliable, sustainable and resilient infrastructure, including regional and trans-border infrastructure, to support economic development and human well-being, with a focus on affordable and equitable access for all	9.1.1 Proportion of the rural population who live within 2 km of an all-season road
	9.1.2 Passenger and freight volumes, by mode of transport
9.2 Promote inclusive and sustainable industrialization and, by 2030, significantly raise industry's share of employment and gross domestic product, in line with national circumstances, and double its share in least developed countries	9.2.1 Manufacturing value added as a proportion of GDP and per capita
	9.2.2 Manufacturing employment as a proportion of total employment
9.3 Increase the access of small-scale industrial and other enterprises, in particular in developing countries, to financial services, including affordable credit, and their integration into value chains and markets	9.3.1 Proportion of small-scale industries in total industry value added
	9.3.2 Proportion of small-scale industries with a loan or line of credit
9.4 By 2030, upgrade infrastructure and retrofit industries to make them sustainable, with increased resource-use efficiency and greater adoption of clean and environmentally sound technologies and industrial processes, with all countries taking action in accordance with their respective capabilities	9.4.1 CO_2 emission per unit of value added

Figure 1: Organization of SDGs as an Investment and Development Trajectory



Source: Authors

3.2 Development Bank Safeguard Instruments

“Safeguards” cover a range of project evaluation processes that have been developed by development banks to account for negative impacts and unintended consequences of infrastructure investments. In contrast to SDGs, safeguards are focused on project impacts. While safeguards of different lending institutions vary in their focus and procedures, most cover similar types of project impact categories that relate to sustainability dimensions of development. Table 2 lists several categories of indicators on the left side (e.g. involuntary resettlement, pollution prevention, etc.), and different development banks that may include these indicators across the top. The table indicates whether such indicators are included in a development bank’s safeguard system.

Table 2: Comparison of Safeguard Approaches of Development Banks

Indicator Category	WB	IFC	EBRD	EIB	IADB	AsDB	AfDB[a]	MFI-WGE[b]
Environmental and Social Assessment (ESA)	Yes	Yes	Yes	Yes	Yes	Yes	Yes	
Involuntary resettlement	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Pollution Prevention	Yes	Yes	Yes	Yes	Yes	(in ESA)	Yes	Yes
Biodiversity	Yes[c]	Yes	Yes	Yes	Yes	(in ESA)	Yes	Yes[d]
Community Impacts	No	Yes	Yes	Yes	No	(in ESA)	(in ESA)	Yes
Labour Conditions	No	Yes	Yes	Yes	No	(in ESA)	Yes	Yes
Indigenous Peoples	Yes	Yes	Yes	Yes	Yes	(in ESA)	(in ESA)	Yes
Cultural Heritage	Yes	Yes	Yes	Yes	Yes	Yes	(in ESA)	No[e]
Environmental Flows	Yes[f]	No	No	No	No	No	(in Biod)	Yes

Notes: (a) As proposed in the ISS; (b) As contained in the Common Framework for Environmental and Social Assessment; (c) World Bank has safeguards on natural habitats and forests; (d) Split into pollution and toxic and hazardous substances; (e) Proposes safeguard on vulnerable groups, which includes indigenous peoples; (f) Safeguard is on water resource management.

Abbreviations: World Bank (WB), International Finance Corporation (IFC), European Bank of Reconstruction and Development (EBRD), European Investment Bank (EIB), Inter-American Development Bank (IADB), Asian Development Bank (AsDB), and African Development Bank (AfDB).

Sources: African Development Bank Group’s Integrated Safeguards System: Safeguards and sustainability series, Volume 1-Issue 1 (Dec. 2013).

The process of applying safeguards to assess projects differs by organization. One effective approach is implemented by the Development Bank of Southern Africa (DBSA), which requires safeguard evaluations for different types of projects based on a risk classification (see Table 3). High risk projects include those that are likely to cause significant, irreversible adverse environmental impact (e.g. dams). In such instances, DBSA requires an ex-ante environmental impact assessment to be completed on the proposed project regardless of the regulation and legislation of the borrower country. In contrast, projects with medium risks (e.g. water supply projects) are likely to cause lower environmental impacts which are likely to be reversible. As a result, DBSA relies on EIA legislation of the borrower country to conduct a safeguard review. Other, low-risk projects (e.g. hospitals) are those that do not present any significant risk to the social or bio-physical environmental.

Table 3: List of sample projects under different risk categories

Type of Project	High Risk	Medium Risk	Low Risk
Water, Wastewater	• Large dams and reservoirs • Water transfer schemes • Large scale wastewater treatment plants	• Water supply projects • Medium, small waste water treatments projects • Water purification plans • Public reservoir	
Energy	• Major oil and gas developments • Thermal and hydropower developments	• Renewable energy projects, Electrical transmission projects	
Trans-portation	• Roads, railways, airfields and associated infrastructure • Manufacturing, transportation and use of hazardous materials		• Internal reticulation at existing urban developments
Commu-nications		• Telecommunication projects	
Industry	• Textile industry, • Tourism (hotel and resort development)	• General manufacturing	
Social	• Projects affecting tribal or indigenous populations		• Health services • Institutional development and capacity building
Operational Assistance			• Advisory assignments • Technical assistance, excluding studies

Source: DBSA (2008) Environmental Appraisal Procedure.

In another example, the African Development Bank (AfDB) safeguards system contains Operational Safeguards (OSs) that combine updated safeguard policies with a revised Environmental and Social Assessment Procedures (ESAPs) and Integrated Environmental and Social Impact Assessments (IESIA).[4] The main objective of this safeguard system is to "mainstream sound and environmental and social management practices into all Bank operations to ensure that they are sustainable and that the public and private sector clients are supported in meeting the requirements" (AfDB, 2013). The Bank is dedicated to supporting social and environmental development by making funds available to individuals and countries in a way that will be sustainable while protecting vulnerable groups (Ibid). According to AfDB (2013), safeguards are clear requirements that the Bank's clients need to meet during preparation and implementation of projects and these safeguards fall under the section of Operational Safeguards. These criteria or policies however apply after the financial support has been approved and do not act as conditions for acquiring Bank funding.

Certainly weaknesses exist in the de jure and de facto implementation of safeguards evaluations of projects. The most effective application of safeguards is ex-ante, that is, when opportunities exist during project planning and design phase to choose the best project, or at least make a project better. This weakness is directly applicable to safeguard evaluation guidelines that lower the "up front" requirements on say environmental and social assessments prior to project approval (an ex-ante process), and instead consider these impacts in a post-disbursement monitoring and evaluation (an ex-post process). Concerns about these practices have certainly arisen (see Box 1).

4 Guidance notes (AfDB, 2013).

Box 1: Some flaws identified in the World Bank's safeguards include (Fired, 2015):

Environmental sustainability

- Substantially weak existing protections for biodiversity and forest-dependent peoples, including a reversal of existing requirements on the destruction of critical habitat, protected areas and nature reserves

Social sustainability (Ex-ante)

- Weak protection for those forcibly displaced by Bank-funded operations
- Making safeguards for indigenous people optional
- Reducing access by affected communities to the Bank's Inspection Panel; reducing the ability of the Inspection Panel to function
- Eliminating the right of communities to obtain information on and provide their assessment of projects likely to affect lives and livelihoods prior to project appraisal

Economic sustainability

- Reducing safeguards for opaque financial intermediaries, including those domiciled offshore in secrecy jurisdictions such as the British Virgin Islands
- Introducing narrow labor standards, excluding third party contractors, collective bargaining and freedom of association

Apart from stated guidelines, the process of applying safeguard evaluations is sometimes not implemented properly – a de facto weakness. For example, the Asian Development Bank's Independent Evaluation Department (IED) found that post-disbursement monitoring and supervision of projects and investments have traditionally been very weak. In addition, because the World Bank has relied in some cases on borrower country's environmental sustainability framework, negative consequences have arisen for communities affected by projects in Africa and Asia (AfDB, 2013). The IED has also identified significant gaps in the ADB's own post-disbursement project implementation and supervision along similar concerns. The reliance on borrower country frameworks, most of which are geared towards pushing high economic growth with less regard for social and environmental impacts, creates challenges in planning and designing projects for sustainable infrastructure.

A more effective approach would involve enforcing compliance with sustainability standards, if these standards were attached as criteria for funding rather than being left to the borrower country to implement. Agreement by leading multilateral banks on a set of "best practice" sustainability standards and assessment criteria would create effective models for new or emerging Banks like the BRICS banks and the Asian Infrastructure Investment Bank (AIIB). Ultimately, even with weaknesses in the de jure and de factor implementation of safeguards, these evaluation systems are primarily concerned with mitigating impacts of projects. Accordingly, the safeguard systems are not necessarily the most effective vehicle to address the two key questions facing sustainable infrastructure choices: how to choose the best project and how to make a good project better.

3.3 Sustainable Infrastructure Rating Systems

A third approach to evaluating infrastructure projects for meeting sustainability goals involves a rating system. Today, many sustainability-oriented rating systems exist for infrastructure; some are applicable across sectors (e.g. EnvisionTM and SuRe®) and others are sector-specific (e.g. BE2ST-In-Highways™ and Greenroads™)[5]. Each of these systems aims to supplement existing infrastructure analyses to reorient design decisions towards broader goals. They aim to fill a gap in existing environmental impact assessments which largely help identify what not to do. As such, rating systems attempt to create incentives to extend beyond cost and impact minimizing options.

Most rating systems entail a credit scoring framework that establishes standards of excellence about just what is sustainability, or at least, what are more sustainable investments. Planning and design decisions that generate higher points from combinations of credits are then recognized by having achieved a certain status (e.g. bronze, silver, gold or platinum). Ultimately, when a rating system is broadly recognized in the market or among peers, the status of a project as being among the best can drive an owner to make investments as steps to sustainability.

The Institute for Sustainable Infrastructure (ISI) developed the Envision rating system in collaboration with the Zofnass Program for Sustainable Infrastructure at the Graduate School of Design, Harvard University, to promote the integration of sustainability goals into infrastructure planning and design. Envision is a comprehensive sustainability rating system that aims to establish best practices for public infrastructure and throughout the implementation process. Envision is composed of five categories of impact (i.e. Quality of Life, Leadership, Resource Allocation, Natural World, and Climate and Risk) and 60 different sustainability criteria across these categories. Together these criteria, called "credits", address a wide range of environmental, social, and economic impacts from project design, construction, and operation. Project characteristics are "scored" against these credits to determine a number of points that the project can achieve against some specified measure of performance.

Envision and similar rating systems provide a highly structured approach to project evaluation for meeting sustainability goals. They aim to be comprehensive measures of a project's achievement of sustainability goals. However, weaknesses also exist in Envision and similar rating systems that can compromise their legitimacy and use. For example, because points per criteria are usually subjectively based they do not necessarily align with evidence of how the public values impacts. Problems can also arise if the credit and point systems are overly cumbersome and data intensive. Finally, rating systems usually require designs to be finalized, and in some cases require the project to be in operation, for the evaluation to be possible. Accordingly, rating systems have the potential to provide value in decisions at planning stages, but they are primarily geared towards evaluating projects within completed designs and they do not necessarily account for long-term impacts across sectors.

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5 A fairly comprehensive list of rating systems is located here: http://fidic.org/node/5943

Principles of a Project Evaluation Framework for Sustainability

4

Each of the sustainability frameworks discussed here has strengths and weaknesses for guiding project planning and design. The frameworks represent different elements of a sound approach, but not in one format. For example, the SDGs encompass a well-conceived set of indicators and cross-indicator linkages that could be a sound starting point for regional, multi-sector assessments. But, the indicators are not formulated for project evaluations and many project-specific indicators are not included (e.g. indicators of economic and financial feasibility, and direct impacts to people and the environment). Also, the large number of indicators (over 250), makes it challenging to operationalize project-specific assessments. Safeguards, by contrast, are more project-focused and many safeguard assessments are implemented in an ex-ante process as part of a financing assessment. However, these evaluation approaches tend to be more focused on mitigating impacts instead of creating value by addressing social inequities, improving resource use efficiencies, or fostering conditions for long-term prosperity. Safeguards, however, are not implemented at a higher planning level where decisions are made concerning which project to implement. Finally, the Envision rating system is a useful framework for evaluation but the sheer number of indicators and complex process of project evaluation can preclude its use in ex-ante evaluation. Envision is still in its first version and hopefully future refinements will enable elements of it to be more scalable and focused for multi-sector investment considerations.

To begin to address this gap in assessing sustainability in projects, we propose a series of principles for project evaluation that aim to improve consideration of both short-term project impacts and long-term goals. Considering all of the work conducted in the SDGs, safeguards, Envision, and other sustainable indicator sets, another list of indicators is not entirely useful. Instead, this approach proposes several evaluation principles that can lead to identifying indicators of sustainability that are better integrated between project planning and design stages, help justify the value of sustainability, and generate evidence for learning about development over time. These principles include:

- **Minimum set of indicators:** A limited set of measureable indicators should be developed that represent key tenets of sustainability goals at project- and planning-levels and can be monitored over time. A relatively small set of key indicators can enable more focused decisions on goals and tradeoffs.

- **Measurable definition of sustainability:** Sustainability should be defined in tangible measures across economic, environmental and social impacts that can be linked to project outcomes. A macro-scale perspective on outcomes should enable comparisons across project in different sectors and ultimately provide justification for infrastructure investment to achieve sustainability goals.

- **Short- and long-term project impact indicators:** The contribution of projects to sustainability must include indicators that capture the design solutions to meet needs of current users, and the potential impacts on people and communities, resources and the economy over the long-run.

- **Sound evaluation processes and analytical methods:** Even with a reasonable set of indicators, evaluation methods must be implemented ex-ante, at project planning stages, and based on best practices. These methods can draw from economics, decision theory and risk evaluation and include approaches to evaluate a single project and multiple projects within a portfolio of options.

The next two sections discuss these principles and the development of a conceptual framework for bridging the dichotomy between macro and micro perspectives on sustainability and infrastructure to improve planning and design considerations.

4.1 Defining Sustainability Goals for Assessing Infrastructure

Sustainability is often considered as a triple bottom line (TBL), that is, a combination of economic, environmental and social outcomes. The notion of a TBL arose from a desire to understand social and environmental outcomes of infrastructure alongside the potential for generating economic value. Defining sustainability relative to infrastructure outcomes begins with simplifying the concept as a combination of macro-scale TBL measures. Macro-scale TBL measures capture overarching and long-term goals of a community, region or nation but are not readily linked to specific project outcomes. The purpose of establishing macro-scale TBL measures is to help justify sustainability-oriented planning and to provide a structure for defining project-level that actually link to sustainability goals.

Proposed indicators for sustainability planning at a macro-scale cover each TBL dimension. They include:

- **Economic:** The most widely recognized indicator of economic activity is the **gross domestic product (GDP),** which captures the value created at all stages of production within an economy and represents an overall measure of welfare. GDP is measurable at the national and sub-national scales in many countries around the world. Linkages between infrastructure and GDP have been studied for decades but recent methodological advances and data reliability has helped to clarify the connection. In just one example, the World Bank (2016) summarizes its research on balanced growth in countries with a range of economic conditions. They found that at a national scale, a 10 percent increase in infrastructure spending can stimulate a 1 percent rate of economic growth. Moreover, improved infrastructure quality can lead to even greater rates of growth. The connections between infrastructure development and GDP cover a wide range of outcomes that include the actual construction spending, as an economic stimulus, as well as the use of infrastructure to increase transportation efficiencies, improve health care, increase educational attainment, and increase energy reliability. In addition, some research findings indicate that infrastructure spending can reduce income inequality in wealth.[6]

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6 World Bank (2016): http://web.worldbank.org/WBSITE/EXTERNAL/TOPICS/EXTINFRA/0,,contentMDK:23154473-pagePK:64168445-piPK:64168309-theSitePK:8430730,00.html

- **Environmental:** Natural capital accounting efforts have developed methods to monetize changes in environmental resources supply and quality to be comparable with GDP. The **"Green Gross Domestic Product (green GDP)"** represents a net change in GDP relative to the loss of resources. Decades of research has explored approaches to monetize the value of changes in biodiversity, habitat, climate and other resources. By accounting for consumption and degradation of natural resources, the Green GDP provides a more complete accounting of the existing value of a country's or community's wealth. With respect to infrastructure, methods and data are available to estimate the direct change in value for many types of resources, such as water quantity and quality, air quality, greenhouse gas emissions, and other resources. It is harder to analyze analytically the long-term implications of infrastructure development that leads to changes in land uses (e.g. urban sprawl) and follow-on effects on resource use, but these potential outcomes are important to characterize nonetheless.

- **Social:** Many indicators of human well-being have been developed to characterize social conditions related to sustainability and most have been included in the SDGs. One of the most recognized frameworks is the Human Development Index (HDI) – a composite statistic of life expectancy, education, and income per capita. While indices such as HDI attempt to provide comprehensive assessments of social conditions, the measurement criteria in the index cannot be readily linked analytically with infrastructure investments. Sustainable infrastructure can however be directly evaluated with respect to its impact on people at different ends of the income scale. Accordingly, a single overarching social indicator is the **gini coefficient** – a measure of income inequality that can be measured at multiple geographical scales. Evidence on the importance of the gini coefficient in economic development has been recently revealed in research that has correlated it with many social indicators that are reflected in sustainability goals (e.g. education, life expectancy, etc.).[7] In addition, higher levels of income equality have been shown to be correlated with stable political conditions, better quality public services, and higher GDP. To the effect that inequality takes a multi-dimensional flavor in the developing country space, the gini coefficient is only a partial indicator of social sustainability. However to the extent that it indirectly captures the existing conditions and influences aspirations of people, especially for lower income persons, it is an effective TBL indicator. Moreover, linkages between broad measures of inequality and an infrastructure project are usually possible by analyzing the socio-economic and demographic characteristics of users.

This combination of macro-scale TBL indicators provides a clear and defensible foundation for recognizing the value of sustainability-oriented infrastructure planning at community, regional, or national scales. These indicators capture the potential increase in value of trade and productivity (GDP), the net value of resource use (green GDP), and inequality (gini coefficient). As macro-scale indicators, they generally relate to most types of infrastructure improvements in a variety of ways and provide a sound basis for communicating the justification of sustainability-oriented infrastructure project selection, especially with respect to accounting for people's needs beyond the primary project purpose.

4.2 Measuring Project Outcomes in Sustainability Terms

At the project level, planning and design of infrastructure focuses on the extent to which a project investment meets needs of users. Depending on the project, engineering design goals (e.g. driving time savings, acre feet of water, or kilowatt hours) become the fundamental indicators of project performance. Data on indicators are measured, modelled and ultimately used to guide design development. Then, in comparison to capital budget constraints and a structure's lifecycle costs, choices are made over alternatives that provide the best value.

Sustainable infrastructure evaluations though require considerations beyond the project footprint and user value. Indicators for meeting TBL goals depend on the type of infrastructure (e.g. a transportation mode, water, energy, etc.). Existing TBL project evaluation frameworks already include indicators that reflect direct effects, which arise in the short-run. Missing however are measures that can serve as leading indications of future development trajectories and potential for cross-sector spillover effects that occur over a long-run. These

7 IMF (2015). "Causes and Consequences of Income Inequality: A Global Perspective". https://www.imf.org/external/pubs/ft/sdn/2015/sdn1513.pdf

long-run leading indicators highlight differences between existing conditions at a project site (e.g. reservoir, transport corridor, etc.), and the region surrounding the site (e.g. county, municipality, or state) where planning is implemented. Depending on the context, long-run leading indicators can be measured in a variety of ways (e.g. cardinal units, ordinal rankings, percentage of goal achievement, ratios of project outcome to regional need, etc.) but should capture the direction and magnitude of potential project impact.

Table 4 lists types of indicators that correspond with TBL impacts of different types of projects and include short-run (SR) and long-run (LR) dimensions. These project-level indicators are organized around the macro-scale indicators of sustainability discussed above, as captured by:

- **Economic indicators,** that reflect GDP goals by capturing changes in short-term productivity, as well as opportunities and threats to long-term growth and the payback of a loan;
- **Environmental indicators,** that account for impacts to human and environmental health in the short-term and recognize a project's long-term contribution to climate change and regional ecosystem services; and,
- **Social indicators,** which represent goals for lowering a gini coefficient, capture a project's benefits for people of lower income strata or reductions in externalities from long-term economic and environmental changes.

The project types and associated indicators of Table 4 represent a list of illustrative project impact. For example, consider indicators of freight transportation improvements in the short run. A key driver of value for freight movement is time savings since this can lower costs directly for existing freight volumes, and also divert additional freight volumes to that mode that has become more efficient. If the time savings are achieved with a capacity expansion, there could be direct environmental impacts on the local habitats, migratory patterns, or stormwater runoff and water quality. Social impacts also can be captured relative to these emissions and freight volumes by observing demographic and the number of low-income households (HH) affected by proximity to the corridors. Since goods movement entails negative impacts on property values and health, the changes in the volumes of freight in specific highway or rail corridors could lead to lower or higher impacts to persons at different ends of the income spectrum. For example, under certain conditions, reduced truck use on highways could reduce the negative pressure on prices of properties that are adjacent to these roads.

A long-run perspective on investments for freight movement assesses whether wider economic, environmental or social conditions could change. Indicators of economic change from freight flow improvements could be observed in the competitiveness of local industries. If industries within the vicinity of the freight infrastructure project are more export- than import-oriented, then the project could help the region generate higher returns and income. As listed below, an indicator of the potential long-term changes is an export-to-import value ratio, which in turn can relate to an improved regional GDP. Where industry is transformed by improved freight flows, a corresponding improvement in low-wage jobs could arise, which would in turn improve incomes for low skilled persons – and potentially improve the gini coefficient. Long-term environmental conditions would be measurable through changes in pollutant emissions on human health (e.g. respiratory illness) and climate change risk (e.g. extreme weather) – impacts that can be documented in natural resource accounting methods.

Table 4: Examples of Short- and Long-run Sustainable Infrastructure Indicators

Sector	Economic / Financial (GDP)	Social (Gini Coefficient)	Environmental (Green GDP)
Freight Transportation	**SR: Productivity:** Travel time savings **LR: Competitiveness:** Local export / import ratio	**SR: Corridor location:** # of low-income HH affected **LR: Employment:** Change in manufacturing jobs	**SR: Air Quality:** Air pollutant emissions **LR: Climate change:** GHG emissions
Passenger Transportation	**SR: Productivity:** Travel time savings **LR: Land use change:** Neighbourhood densities	**SR: Mobility:** Cost saving per low-income HH **LR: Neighbourhood change:** Property value appreciation	**SR: Air Quality:** Air pollutant emissions **LR: Climate change:** GHG emissions
Water Supply Improvement	**SR: Productivity:** Water cost savings **LR: Growth potential:** Supply shortage risks	**SR: Access to water:** Reduced risk of contamination **LR: Watershed impacts:** Reduced water downstream	**SR: Environmental Health:** Streamflow volume reduction **LR: Ecosystem health:** Change in species population
Wastewater Processing Improvement	**SR: Productivity:** Treatment cost savings **LR: Growth potential:** Downstream impacts	**SR: Discharge water quality:** Reduced risk of exposure **LR: Watershed impacts:** Improved access to clean water	**SR: Environmental health:** Discharge water quality **LR: Ecosystem health:** Change in species population
Energy Generation / Distribution	**SR: Productivity:** Energy cost savings **LR: Growth potential:** Industrial development	**SR: Access to energy:** kWhs per low-income HH **LR: Employment:** Change in manufacturing jobs	**SR: Natural resource:** Volume of raw material **LR: Global Health:** Air pollutant, GHG Emissions
Public Facilities (Schools)	**SR: Productivity:** Basic Literacy **LR: Growth potential:** Graduation rate	**SR: School enrolment:** Access for low income HH **LR: Job creation:** Employment growth rates	**SR: Improved education:** Enrolment levels in science **LR: Stewardship ethic:** Family education level

The intention of Table 4 is to stimulate a discussion for establishing comparative indicators for projects, especially those that could have major long-term consequences. Different indicators should be developed potentially for specific projects, but represented in as few indicators as possible that represent short- and long-run indicators across the TBL. A smaller set of indicators is more likely to reveal gaps in development that need more information and possibly greater emphasis in following rounds of investments.

Project indicators such as these would be developed to define outcomes that can be evaluated from a regional sustainability planning effort. No one project can meet all needs but where the outcomes of one project create additional demand from other types of infrastructure, it can lead to better use of resources. For example, projects that aim to accelerate growth in industries that are major employers or more energy efficient should be supported, but probably not all of them. Instead, the impacts of projects across major infrastructure sectors should be jointly considered – especially those projects that can lead to long-term changes landscapes (e.g. transportation) or resource use (e.g. energy and water). A multi-sector portfolio approach for evaluating projects would highlight how individual projects meet specific needs and potentially contribute to a consistent vision of sustainability. Selected indicators across project types provide the backbone of a framework for this approach to planning. They also provide a more tangible basis for communicating results.

Principles of Sustainable Infrastructure Evaluation Process

5

The process of incorporating the principles of sustainability evaluation discussed above may also require new institutional mechanisms to improve coordination and communication between planning and implementation organizations. This section outlines considerations for institutional processes that would support efforts to operationalize the kind of long-run, cross-sector infrastructure evaluation proposed here. The actual forums in which these practices can take place are varied and country-specific. Certainly, some combination of a country's national and regional planning units, with support from development banks, would be important elements. Representation in such forums should be sufficiently broad to enable consideration of multi-sector baseline needs, establish an evaluation framework of indicators, and periodically track the progress of projects that are implemented to address these needs.

However such a forum could materialize, the principal goal is to develop a framework for creating data that facilitates decision-making across project options in different sectors, to meet short- and long-run needs, at regional and national scales, and recognizing budget constraints and financing opportunities. Key elements include the following:

- **Baseline Assessment:** Current efforts in national and international agencies to establish baseline data on conditions across economic, social and environmental dimensions are critical ingredients to effective decision-making about project investments. These baseline data can provide insight on the status and needs of people, businesses, and natural resources at local, regional, and national levels. For project level planning and reporting, baseline data should be sufficient to reflect sustainability goals at a regional level – that is, at a scale that is commensurate with understanding a project's impact on regional goals. Analysis of these data should aim to determine interconnections between project outcomes and macro-scale indicators. The analysis should also seek to highlight gaps in understanding and areas of uncertainty.

  To this send, the SDG framework is an important reference point because it has identified a multi-dimensional set of varied goals, targets and indicators, and their inter-relationships. Also, because of its connection to global benchmarks, use of this framework enables a country to contribute to needs-identification and reporting at international levels, and with an international standard of legitimacy. In light of the principles discussed above however, only a selected few decision-critical indicators should be selected for analysis and tracking, as discussed in other elements of this process below.

- **Sustainable Infrastructure Evaluation Framework:** As sustainable infrastructure evaluation framework builds from baseline data at local, regional and national scales to determine a set of performance indicators that are project-specific. The example developed in Table 4 is a high-level illustration of project indicators and more details would be required to establish a standardized approach. Since the purpose of these indicators is to enhance communication and coordination between agencies, common metrics will permit comparisons across regions and sectors. Standards for defining indicators should specify different characteristics including: units of measure (e.g. total cost savings, kWh per person, etc.), time period (e.g. annual, lifecycle, etc.) and impacts to different socio-economic groups (e.g. annual ridership of people below the poverty line, gallons of water per day per person in first income quintile group, etc.). Whatever indicators are identified, they should be established in a consistent structure that enables projects to be compared to each other and for results to rolled-up to a regional planning level.

- **Methods for Comparing Project Alternatives:** Infrastructure project evaluation involves a process of assessing indicators relative to meeting goals so that projects can be prioritized for implementation. Quantifiable goals include performance metrics (e.g. average travel time savings), cost-effectiveness (e.g. volumes of water per lifecycle cost), or a benefit-cost analysis metric (e.g. total present value of benefits minus costs are greater than zero). Evaluation methods vary depending on their type and purpose but are fundamentally all ex-ante analyses to help inform the process of project selection or improve design.

  An evaluation approach for considering short- and long-term indicators of sustainability across sectors requires methods beyond economics-based BCA methods because not all impacts are measurable, let alone monetizable. A promising alternative entails a Least Cost Planning (LCP) approach in which projects are evaluated relative to goals and is flexible in terms of whether principles).[8] LCP results determine which projects are most cost-effective, with effectiveness determined by a combination of economic benefits and MCA scores. For sustainable infrastructure, a project's short- and long-run performance across all TBL criteria can be examined separately as well as collapsed into a composite score and compared against lifecycle costs.

Best practices in developing a method suitable for a country and data include:

- Consistent and comprehensive assessment of options
- Limited, independent numbers of Indicators
- Measure impacts from a reasonable definition of current conditions
- Evaluate indicators with quantitative and evidence-based measures
- Assess impacts over time and apply discounting to present value terms
- Account for uncertainty
- Produce results on total TBL values and distribution of impacts among stakeholders

Ultimately, the purpose of the evaluation framework is to empower decision makers with the evidence and rationale for making sound choices. In that regard, the framework should be country-specific to enable the importance of long-run impacts to be locally established. These data and evaluation frameworks can also enable decision makers to assess public and private financing capacity and leverage where possible best mix of project, especially where projects reflect connection of financial payback, GDP growth and short-and long-run implementation risks.

- **Project Impact Monitoring:** Sustainable infrastructure performance indicators and evaluation methods are intended to improve decision making at the project planning and design levels. These decisions are made ex-ante, that is, before the project is implemented. This evaluation stage is critical for reaching sustainability goals because the process can identify which project provides a better balance between short- and long-term goals and, ideally in concert with other projects that have complementary goals or impacts. But this is not the only stage of evaluation that is important. Ex-post evaluations that occur during or after implementation can help to realign a project to intended goals as well as provide important lessons learned for new projects. This section discusses how the framework proposed above work within existing ex-ante and ex post evaluation processes. The link between different phases of evaluation depends on two scenarios, whether (a) it is an entirely new infrastructure development project, or (b) a new phase of an already existing infrastructure project in progress. In the case of an entirely new infrastructure project the role of an ex-ante evaluation and how it links to the other phases of the evolution process differs from its role in an on-going project.

8 HDR has worked on least cost planning initiatives as part of its Sustainability Value Analysis (SVA) program. SVA originated in collaboration with Columbia University and the Clinton Global Initiative nearly 10 years ago to address a need for robust TBL methods. SVA includes suite of methods that are all economics-based approaches to project evaluation and applies peer-reviewed evidence to account for and communicate financial, social and environmental outcomes in both monetary and non-monetary terms, while recognizing uncertainty in inputs and conclusions.

- A New Infrastructure development project: In new infrastructure development projects ex-ante evaluation should be done very early in the process in order to inform a project design and an implementation plan that is inclusive of the needs of all stakeholders and actors in society. Ex-ante evaluation in this case helps to define objectives, ensure that these objectives can be met, instruments used are cost-effective and that a reliable later evaluation will be possible.[9] The European Union Budget Division (2001) outlines a clear outline by which this can be done. Whether ex-ante evaluations help to ensure sustainable infrastructure development depends on the extent to which such evaluation ensures that the development needs of the present generations can be met without compromising the well-being of future generations or the ability of future generations to meet their own needs. The timing of other evaluations, such mid-term reviews, final and ex-post evaluations have to be clearly stipulated along the project cycle at the outset of project as part of the project design and implementation plan.

- New phase of an on-going project: In the case of a new phase for an on-going project the sequencing of the different phases of evaluation differ from that of an entirely new project. The ex-ante evaluation of the new project phase relies on the mid-term review as well as the final and ex-post evaluation report of the just ended implementation phase of the on-going project. The mid-term review report is best placed to highlight challenges of the first years of implementation and the relevance and effectiveness of chosen strategies and delivery instruments. The final and ex-post report of implementation phase would further highlight implementation bottle necks, objectives that could not be met and why, and what the mitigating measures should be going forward, especially implications for future project design and implementation framework. Also of relevance to an ex-ante evaluation of a new phase for an on-going project are the new and emerging societal, economic and environmental needs of the target population or community. This is because the implementation of previous phases of a project in itself creates new challenges for the target community that need to incorporated into the ex-ante evaluation of the new/subsequent implementation phase and provided for in future project design and implementation framework.

- Establishing monitoring programs to improve ex-ante evaluations: It is very clear that a significant gap exists in terms of ex-ante sustainability requirements as conditions for acquiring funding for infrastructure development among multilateral financial institutions. This is not in sync with objectives of the Sustainable Development Goals and raises concern especially for developing countries in Africa and Asia where the quest for high economic growth has been at the expense of society and the environment. Beside projects categorized as having a high risk profile by the DBSA, the safeguard systems of most multilateral financial institutions are ex-post in nature and are not required as conditions for funding. Hence the social and environmental cost of infrastructure development can only be ascertained after project implementation, by which time the damage would already have been done. Thus, a gap exists for ex-ante sustainability requirement and indicators to be researched, identified and defined, to serve as conditions for funding for infrastructure development by multilateral financial institutions if real sustainability of infrastructure development; environmental, social and economic is to be achieved.

9 European Union (2001). Ex-ante evaluation. A practical guide for preparing proposals for expenditure programmes, European Union Budget Division.

Next Steps

6

This paper has proposed a series of principles for improving links between the core characteristics of sustainability and key performance measures of infrastructure in an effort to make better choices – not only on how to build something but which projects to build. This effort represents only an initial step to formalizing this framework and developing case studies for assessment. Key research and evaluation efforts include:

- Building on the risk profiles of projects (Table 3) to further characterize projects that can have long-term sustainability implications and that require additional consideration of infrastructure planning.

- Building on the illustrative set of indicators (Table 4) above to refine indicators based on key characteristics of different types of projects. These indicators should be measurable at the project level and enable clear comparisons between projects.

- Developing appropriate indicators for each phase of the evaluation process, being ex-ante, mid-term, final and ex-post evaluations, clearly distinguishing between new projects and new phases of ongoing projects.

- Ensuring that ex-ante evaluation indicators serve as pre-conditions for disbursement of development finance where possible, to ensure that development is inclusive and not to the detriment of society, the economy or environment.

- Establishing guidelines for evaluation methods, whether economic, MCA or a hybrid approach is adopted. These guidelines should cover the best use of data, ways of handling uncertainty, and characterizing results to support ex-ante project planning and design decisions.

- Designing a database to permit the formation of current and historical data on the selected indicators at different regional and national scales. This database would enable better tracking of infrastructure impacts across all three categories of indicators and help identify gaps that should be addressed in subsequent rounds of investment.

- Formulating adaptive management strategies to continually evaluate infrastructure investments in order to reveal short- and long-term tradeoffs, as well as tradeoffs between growth, environmental conservation and protection and community well-being.

EMSD is a network of change agents and decision makers from think tanks, multinational corporations, and the financial sector. Our members jointly develop and implement solutions for sustainable economic development in emerging economies through consultation, dialogue, and research. We bring these solutions into national and international fora, contributing to the global sustainability transition and the protection of global public goods.

EMSD comprises three dialogue platforms and networks, fostering knowledge exchange and creation between diverse actors from emerging and industrialised economies. The Economic Policy Forum (EPF), the Emerging Market Multinationals (EMM) Network for Sustainability and the Emerging Markets Dialogue Financial Sector (EMDF) seek to contribute to innovative economic policy making, sustainable business development, and financial stability/green finance. Commissioned by the German Federal Ministry for Economic Cooperation and Development (BMZ), the Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH facilitates and supports these three platforms in a coordinating and secretarial role.

EPF is a growing global network of the world's leading political economy think tanks from emerging and industrial economies. Its strategy and policy papers are produced for governments and national policy-makers to inform national and international policy processes. Its goal is to better inform domestic and global economic policies with evidence-based policy recommendations. In this vein, EPF has been contributing to the BRICS Academic Forum, the official track-II coordinators of the annual BRICS summit and has fed its policy proposals and research findings into the COP21 and Munich Security Conference. EPF has been supporting the T20 process since the Turkish G20 Presidency, both in terms of process advisory and through various contributions to a number of task forces.

HDR Inc. is an architectural, engineering, and consulting firm based in Omaha, Nebraska, United States. HDR has worked on projects in all 50 U.S. states and in 60 countries, including notable projects such as the Hoover Dam Bypass, Fort Belvoir Community Hospital, and The Roslin Institute building. The firm employs nearly 10,000 professionals representing hundreds of disciplines in the architecture, energy, federal, water resources, environmental, mining, private land development, resource management, transportation, and water markets.

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