Chapter 11: The Business Case for Planning Sustainable Infrastructure

The Zofnass Program for Sustainable Infrastructure at Harvard University
http://research.gsd.harvard.edu/zofnass/
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1._ Background

Investment in infrastructure has traditionally been identified as a driver of growth and development. A central piece in the new 2030 global agenda, sustainable infrastructure helps to meet the targets defined in the Paris Agreement as well as the provision of basic services defined in the Sustainable Development Goals (SDGs).

However, (i) the capital allocated to infrastructure investment is not sufficient to meet the demand and (ii) the quality of the projects that are currently developed (in most cases) do not follow special protocols or procedures to ensure that they are sustainable. According to the New Climate Economy report released in 2014, an investment of $90 trillion in infrastructure is needed until 2030 for the expected growth. A similar number was published by OECD on its Technical note on estimates of infrastructure investment needs in July 2017. In order to put these numbers in perspective, this represents *"more than twice the current stock of global public capital"* (Brookings, 2015).

Many see this gap in global sustainable infrastructure investment as a result of years of insufficient policies, institutional failures and lack of investor familiarity with greener

technologies and projects (McKinsey, 2016). The participation of the private sector in providing the additional capital and expertise to fill the gap will be central to achieve the set targets. Literature shows that over the past decades infrastructure owners chose where to invest based on "*priorities, borrowing capacity and tax-paid revenues [...] hoping that the private sector, and especially so-called impact investors, will step in to fill the investment gap*" (Janowitz, 2014). Nevertheless, in recent years as the need for infrastructure has increased, especially in developing economies, the infrastructure gap has increased.

Regarding the second consideration, "the projects that are currently been built do not align with sustainability principles", it is important to reflect on the "by-default" common assumption that sustainable infrastructure projects "always cost more". According to John Mogge, the Global Environmental Market Executive, CH2M, and member of the Sustainability Industry Advisory Board of the Zofnass Program "*Specifically in the area of capital cost outlays, one immediately assumes that sustainability costs more; it is usually because there is a lack of understanding in the means and methods used to create sustainable solutions and because the project requirement has been defined in normative terms without the benefit of newer and innovative sustainable means and methods*." He added: "*breaking through the first cost barriers of sustainable planning, design and, construction is all about defining the requirements in performance terms. Typical infrastructure engineering requirements are defined in terms of what is required not the performance that is needed. Creating a performance specification allows truly creative planners and designers to innovate to solve bounded problems. This is what unleashes the truly sustainable solutions*."[1]

Given the two main constraints: (i) lack of investment and (ii) lack of enough quality infrastructure, a significant multidisciplinary effort is required from different agents working on infrastructure to achieve the common goal of "more sustainable and resilient infrastructure projects". Such agents are governments, private developers, investors, engineers/designers, consultants, contractors, multilateral development banks, commercial banks, insurers, infrastructure operators, non-profit organizations, and academia.

[1] at the Zofnass Program Workshop in Brooklyn, NY, November 1, 2017.

2._How Owners and Financiers benefit from Sustainable Infrastructure

To understand the business case for planning sustainable infrastructure it is important to quantify the cost and the benefits and communicate those to the project owner and the project financiers. The costs and benefits should be measured in two ways: (a) upfront and (b) during the lifecycle of the project. This quantification will determine the financial viability of available choices for the owner who, as the decision maker, will select the optimal model according to his/her criteria. Although sustainable infrastructure projects can be more efficient and more effective, and therefore leading to increased financial gains, today the financial return on investments in sustainable infrastructure is still imprecise. Sustainable projects avoid impacts, avoid negative externalities and their associated costs but such advantages are rarely quantified and often they are not shared with public officials and taxpayers. Planning sustainable infrastructure should not be just a value imposition. A comprehensive methodology is necessary to establish the value proposition, based on reliable and solid data to illuminate the conditions for increased returns, the cost differentials and the avoided risks.

Within the current effort of the Zofnass Program for decoding the principles of the business case for planning sustainable infrastructure, two main considerations stand up as enablers to drive change (i) the challenges and barriers found to deliver more sustainable infrastructure and (ii) the reasons why planning sustainable infrastructure makes a financially sound business decision according to existing literature.

3._Challenges and Main Barriers for Sustainability Investment

Challenges arise in the process of credibly linking and forecasting the relation between specific infrastructure investments and performance outcomes. To proceed with sustainable infrastructure investment, like in any investment, the resources must be available and positive paybacks are expected. A challenge, commonly presented in the available literature, is the establishment of the right method to evaluate financial returns resulting from sustainability and identify key performance indicators against which a project's sustainable performance can be measured.

Efforts to quantify business benefits after integrating sustainability and to demonstrate an increase in revenues and profits has led to developing various frameworks and company-specific measurement models. However, approaches are not consistent. In

the case of the study of Ballow's et al. (2004) the proposed framework identifies and lists tangible and intangible assets, but is limited to only quantifying the traditional accounting assets. According to Stapledon (2012) *"traditional accounting assets explain only about one quarter of market value"* and some intangible assets typically overlooked by managers, are actually valued by the market. Willard (2012) makes a statement about profit increase and presents a tool for calculating profits. However, the assumptions have raised skepticism regarding their validity and thus cannot be considered an established method or evidence. An important issue is that sustainability initiatives have additional intangible benefits that may offer additional value (and profits) to a business, which often are not included in business case assessments. According to Lubin et al. (2010) "*Recognizing that if they can't measure it, they can't manage it, companies are developing better means of gauging corporate-sustainability-related costs and benefits and of benchmarking performance.*" The authors express certainty that this process will be eventually streamlined: "*Once firms have a solid base of analytical data, they will be positioned to develop distinctive sustainability strategies. Many aspects of strategy development will remain internal, but companies will increasingly adopt open-source approaches."*

Another challenge to consider is the search of a model that adequately integrates sustainability with the investor's risk profile, as well as to factor the overemphasis on short-term results (profits & losses) and on front end costs instead of lifecycle costs. *"Large up-front costs with returns flowing only much later, and constraints on long-term financing, make the funding of infrastructure particularly challenging"* (Brookings Institute, 2016).

The McKinsey Center for Business and Environment (2014) also points out five major barriers of private-sector investment in sustainable infrastructure.

- The lack of transparent and "bankable" pipelines,
- High development and transaction costs,
- Lack of viable funding models,
- Inadequate risk-adjusted returns, and
- Unfavorable and uncertain regulations and policies.

The Brookings Institute reaffirms public policy as barrier to investment, as it sets the regulatory and institutional framework that influences the actions of private investors and consumers. The government has the responsibility to create and maintain a framework of conditions that can offer maximum stability and create the right incentives. Regulations may constrain the operation of infrastructure projects and may have a negative effect on

profitability. On the other hand, regulatory certainty and an appropriate mix of policy tools can play a key role in promoting sustainable infrastructure investments.

The literature refers also to challenges related to the lack of a common language for sustainability within individual infrastructure industry sectors, as well as the conflicting agendas of infrastructure stakeholders and short-term confrontational contractual relationships (financiers, developers, consultants, contractors, owners, and operators), (Stapledon, 2012). In addition, studies confirm that investment on sustainable infrastructure projects is a field with extremely high potential but with a mixed risk scenario. The risks can be asset-specific, related to all the phases of the project (design, construction, operation) or asset-class related, such as interest rates fluctuations or political factors.

4._Why Planning Sustainable Infrastructure makes a Financially Sound Business Decision

4.1_ Corporate Performance

Corporate performance is often times linked to competitiveness, operation efficiency, good leadership or risk perception among others. A common observation is that although theoretical and empirical research often points to a positive relation between corporate sustainability and company competitiveness, a consistent approach to document this link it is missing in the current literature (Weber, 2008). As a result and in order to identify the potential financial benefits that a sound sustainability strategy could have at the corporate level, here are listed some of the most common benefits that the current existing literature highlights.

Competitiveness

The Boston Consulting Group (BCG) in collaboration with the Sloan School of Management at MIT published in 2016 the report “Investing For a Sustainable Future: Investors Care More About Sustainability than Many Executives Believe”. This report describes the findings of an 7 years ongoing research, where surveys asks 3.057 managers (among other profile professionals) matters related to corporate sustainability. It is remarkable to highlight than even though most participants believe that sustainability is important (90%), a bit more than half have created a sustainability strategy (60%), and just 25% have a “positive business case for sustainability”. Other interesting takeaways is the lack of internal collaborations among members of the same company. While 80% of the board members that took part in this study believes that their company is involved in

sustainable investment just 73% of the middle managers and 62% of lower level employees think the same. A general comment found is that current methods to track the project sustainability impacts are incomplete with imprecise data that cannot support the decision-making process for companies.

Other authors like Lubin et al. (2010) provides numerous examples of companies that have emerged as leaders within the shifting sustainability landscape developing and executing sustainability strategies. These allows companies to gain competitive advantage by providing more innovative green services and capitalize in a new and differentiated business models with strategic execution.To this regard the author state *"pioneering companies in sustainability often start by focusing on risk and cost reduction and over time develop strategies for increasing value creation, ultimately including intangibles such as brand and culture."*

Strong Leadership

Sustainability requires an integrated, multidisciplinary approach calling for coordination among professionals from different disciplines or departments to achieve a common target. Leadership and strategic management enable companies to transition from siloed to integrated approaches. As a result sustainability is a synonym for committed and good leadership, given that it is required to balance not only economic performance, but also strong social and environmental commitments. This will not just integrate the efforts at the company level, but will also bring together other stakeholders such as communities, customers, suppliers and clients. "*Corporate transformation for sustainability is a leadership task. […]New, integral thinking is crucial. […]Sustainability thinking must penetrate the entire corporate value chain"* (Leisinger, 2015).

Lack of familiarity with sustainability indicators

Existing literature highlights the "lack of understanding" or "unknown nature", of what sustainability means for decision-makers, managers or other agents involved in the infrastructure project lifecycle. As a result the integration of sustainable practices on a project could be perceived as a "risk", an "imposition", that might incur costs and delays and damage to a project. This is contradictory to the "*abundant evidence that corporate social responsibility and sustainability are valuable to business and drivers of market value."* (Stapledon, 2012). However, companies or other institutions with a deeper understanding of sustainability, or the different procedures to integrate sustainability practices at the

corporate level benefit from an early adoption. In these cases sustainability, it is understood as a tool to reduce risk and open possibilities to explore different market niches.

"A key competitive advantage provided by sustainability is that it extends risk management beyond compliance activities outside the typical infrastructure considerations of time, cost and quality. This allows systematic, early identification and addressing of risks in the operating environment" (IFC, SustainAbility, Ethos Institute, 2002).

Leisinger (2015) refers to the integrity that sustainable practices provide to a company as "*smart risk management",* explaining that *"acting against global societal interests results in reputational damage, law cases, penalties and more regulation*."

Efficiency- related cost savings at the corporate level

Sustainability provides the framework to achieve efficiency at the corporate level.

As identified in the paper "Making the Business Case for Environmental Sustainability, *Leading sustainable change: an organizational perspective" written by Henderson, R., and published by the Harvard Business School, "It has been proven that increasing operational efficiency can minimize the cost of the project reducing the cost of resources*". Eccles et al. (2012) also provides examples of firms reporting significant internal savings from individual and systematic efforts of energy and water reduction across their portfolio; e.g. as much as $150 million of returns per year.

Weber (2008) registers corporate social responsibility (CSR) induced cost decreases: *"triggered by CSR-specific collaborations with e.g. NGOs that provide knowledge or contacts to critical stakeholders such as public authorities reducing the costs for product or market development" or "from tax concessions or reductions of certain duties granted by governments to promote e.g. environmentally friendly technologies"*.

4.2_ External Market Forces

Higher sensitivity of investors to sustainability issues, external market forces as well as public and governmental concern about climate change, industrial pollution, food safety, natural resource depletion, etc, can facilitate access to capital. As highlighted by a report published by the International Finance Corporation, and Ethos Institute "*is not an end in itself. It matters because it enhances the ability to attract capital — both human and financial — to mitigate risk and to build a company's license to operate*". There is no question that Sustainability has emerged as a megatrend, and as such presents

inescapable strategic imperatives for corporate leaders. "*Managers can no longer afford to ignore sustainability as a central factor in their companies' long-term competitiveness"* (Lubin et al. 2010). *"In five years, there will be no access to international markets for companies that do not show respect for the environment. It is becoming fundamental to international trade." (Rafael Wong, executive vice president of Reybancorp in Ecuador)* (IFC, SustainAbility, Ethos Institute, 2002).

Value generation and reputation increase

It is relevant to identify that most of the information available regarding the "Business Case for sustainable infrastructure" highlights value creation for customers, shareholders, and other stakeholders as one of the top benefits of the integration of sustainable practices at the business level. This value creation can refer to various aspects from more competitive advantage, reputational or image improvement to higher level of engagement at the workplace. However, literature points out the need for adapting a different approach for measuring shareholder value, encompassing both operational and investment perspectives, in order to quantify this value creation benefit (Stapledon, 2012).

"A McKinsey survey of 1560 CFOs, investment professionals, and finance executives found they agreed, by a large margin, that improved corporate reputation and image is the most important way sustainability programs create value" (Jenkinson, 2010). The link with the infrastructure sector is implicit in the value creation merit of sustainability and more explicit in some cases:*"[…]embedding a culture of sustainability throughout the infrastructure delivery and management process will not only achieve public good outcomes, but will add bottom line value to your project, your organisation, and to society"* (Stapledon, 2012).

4.3_Regulations: Policy as Enabler of Change

Public policy pays mayor roles in not just incenticing investment, but also to provide the right incentives and business environment to mobilize finance. Having the adequate policy frameworks in place at the early phase of the project is central to incentivise a sustainable outcome in the long-term change. Infrastructure projects require careful planning, sound governance and well articulated structures and processes for project prioritization and selection, preparation and procurement including effective frameworks to incentivize robust public-private partnerships (Bhattacharya, 2018). According to an study recently published by McKinsey in 2016, a business environment, defined by *distorting subsidies, unreliable counterparties, and flawed procurement processes "can raise the cost*

of private finance to the point where infrastructure projects are no longer economically viable", as a result strong political frameworks should be in place in order to incentivise good behaviour. Brookings Institution (2016) states that public policy, at both national and international levels, has a crucial role to play in scaling up sustainable infrastructure development. *"There is a range of policy, institutional, and market failures that undermine the adequacy, efficiency, affordability, and sustainability of infrastructure. These failures raise costs and lower returns, increase risks, limit institutional capabilities, and drive a wedge between social and private costs and returns"* (Brookings Institution, 2016).

In many cases regulation barriers, or outdated regulations requirements increase a contractor's design and regulatory costs, which delays construction and can increase a contractor's financing costs. To surpass these barriers reforms are required e.g. tax and expenditure reforms, better use of balance sheets, new innovative ways, such as carbon pricing and improved property taxation, to leverage more private finance and lower its cost, risk mitigation and the promotion of infrastructure as an asset class.

4.4_Portfolio/System-level Finance vs. Project-level Finance

Systemic Approach

The existing literature cite the benefits of the systemic approach in infrastructure financing as opposite to the project by project traditional approach. Conventional notion of infrastructure value is about delivering a specific, discrete service at the lowest upfront capital cost. This has resulted in projects isolation from an inclusive view of their place and impact within the wider infrastructure system. The opposite of this approach is growingly merited in literature: *"There is considerable value to society in raising the standard of integrative, systemic design and planning"* (Janowitz, 2014). This could apply to either a series of linked projects of the same type, or complementary investments of different types made in a specific areas. E.g. master-planning for large-scale urban extensions exemplifies the latter case. *"A new settlement requires multiple types of infrastructure – roads, public transport networks, telecommunications, electricity supplies, water supply, sewerage, schools, health services, community facilities, etc. If any one of these infrastructures is lacking, the entire project may be rendered infeasible or lose significant value, but each investment project can only be evaluated in the context of all others also taking place"* (Grimes, 2010).

A coordinated approach to infrastructure investment, the network effects or complementarities with other infrastructure investments, according to Grimes (2010) is a

potential source of increasing returns to scale. "*A suite of complementary investments can produce greater returns than the sum of returns to each individual investment*". He also underlines the potential that lies in a sequence of interrelated projects that the initial steps have information value about the benefits of further stages in the development. This is the case of new information that becomes available after the completion of earlier projects in the sequence, which according to the author may act against disinvestment decisions and opportunities of benefits lost.

Full spectrum overview

An example of this full spectrum overview is the RE.invest program. An initiative financed by the Rockefeller Foundation aiming to address the key gaps in American federal and state policies to encourage infrastructure investment and to reshape the predevelopment process for resilient infrastructure. The RE.invest program report, based on specific case studies, states that "*design and financing are fundamentally parallel and complementary activities*" and explores the ways so that *"up-front design-thinking can identify specific and pragmatic value-capture opportunities*." *"Starting with design decisions that create savings can help align incentives to maximize resilience benefits over time and open up pragmatic pathways to implementation."* A recommendation the program directs to project designers and implementers is to "*Design based on cash flows, not only costs*", which can be of use for the BC research.

Several specific cases of resilience planning propose that it is key to *"Focus on systems finance, not project finance".* Large-scale resilience projects can generate multiple benefits and have the potential to bring more funding and financing to infrastructure. This approach can respond to investors' preference to large-scale problems and captures multiple cross-sector revenue streams through shared problem solving. As an example, the RE.invest program aimed to: "*(1) catalyze large-scale systems solutions, (2) build pragmatic public-private partnerships, and (3) monetize and capture multiple benefits and revenue streams created by resilient infrastructure projects"* via a collaborative approach among engineering & design, legal & policy and finance assigned core teams. This allowed to attract large-scale private investors for comprehensive city-wide resilient infrastructure development. Eight US cities participating in this program, identifying common problems, and defining six innovative, investable and implementable resilient solutions that were mixed-and-matched to each city's specific needs (RE.invest, 2015).

4.5_Because of Broader Societal Benefits and Societal Demand

Earth has limited resources and we should protect them as much as possible as we improve quality of life and economic prosperity. Infrastructure is among the human activities that mostly influence earth's resources and planning should increase the output to resources ratio and furthermore should utilize renewable resources with minimal impact on climate to the extent possible. Thus, by planning sustainable infrastructure we protect the natural world and we limit climate change. Sustainable infrastructure is inherently resilient, otherwise it is not sustainable. Being resilient, reduces the risk of future failure with the benefits of (a) continuous usage and (b) not requiring new resources for replacement.

Long-term monetary benefits linked to sustainable planning as described above, directly benefit society in multiple ways, always centered on reducing the load on the earth. The public knows that, especially younger people, and have started to actively demand sustainability. In developed countries such demand is so explicit that communities can alter or even stop infrastructure projects which are not sufficiently sustainable.

5._ Measuring Cost-Benefit

Research has provided significant contributions towards sustainability-related tools and best practices, allowing sustainability to be integrated even further across business operations. "*In order for infrastructure businesses to embrace sustainability, the initiatives they adopt must be seen to be valuable within the context of usual industry practice.*" A common trend of existing accounting practices is that "*what cannot be empirically measured is typically viewed as unimportant or even non-existent to business performance." To overcome this trend, management should start using non-traditional cash flow methods"* (Stapledon, 2012). Complex project evaluations involving multiple objectives and multiple stakeholder groups, such as related to infrastructure, have to aim at satisfying simultaneously private economic goals, broader social objectives and environmental targets.

The analysis of the state-of-the art conducted by this research team includes the identification of analytical tools and methods of measuring the cost of integrating sustainability. The "sustainable return-on-investment" tools and *"the emergence of synchronized holistic 'triple bottom line"* provide a basis to assess risk, cost-benefit and investment parameters of various alternatives and thus support the decision-making

process, defending choices. *"Such analysis […] highlights a host of other ways in which these sustainability-oriented projects have added or could add genuine value to their stakeholders"* (Janowitz, 2014), thus recognizing superior outcomes and establishing new benchmarks. This type of input for the Business Case is important given that sustainable outcomes more often than not, cost less depending on how one measures the cost.

The literature provides an insight to the available tools and the factors they propose to be considered. Additionally, efforts are made to respond to the question if these tools that have emerged through the prism of economic analysis rather than sustainability, are effective in assessing the wider sustainability costs and benefits of infrastructure projects – with long life spans and significant impacts across institutional boundaries.

A key tool in the assessment of project options and selection of a delivery strategy is Cost Benefit Analysis (CBA). "*A literature review reveals the limitations of CBA alone to effectively evaluate economic, environmental and social externalities or impacts that apply over a long time frame, and that are ultimately irreversible"* (Reidy et al. 2014). According to Grimes's analysis (2010) it is especially useful for making comparisons between alternative specifications that are designed to produce similar benefits. He concentrates on circumstances that may render a standard CBA inappropriate, to highlight the critical role of parameter assumptions and the range of issues to be taken into account. Through use of specific examples of how the choice of the appropriate discount rate, the use of option values and network complementarities can materially alter the perceived worth of an individual project and alter the ranking of alternative projects. He explains how the reasoning that lies behind the parameters can significantly alter the outcomes (Grimes, 2010).

Life Cycle Cost Analysis, for example, is a tool based on simple engineering economics, suitable for infrastructure owners who are also operators. "*In Traditional contracting methods where operation is not included the Life-cycle costing principles are not relevant"* (Stapledon, 2012).

Another more sophisticated tool Multiple Objective Determination Analysis (MODA), or Multi-criteria Analysis (MCA), takes one back to what are the objectives of the investment and how each one will be measured, so it could prove more suitable for other applications. MODAs use dashboards with algorithmic formulas that weight and interrelate the objectives to allow for holistic understanding. It is the preferred approach for problems

with conflicting objectives. It uses both qualitative and quantitative parameters, and enables assessment of non-monetized values (Tudela et al. 2006).

Cross-comparisons of the available tools point out the shortcomings of individual tools and suggest that a combination, for example, of Cost Benefit Analysis and Multi-Criteria Analysis could lead to improved guidelines for Business Case development (Reidy et al. 2014). In general, there is an emerging trend across researchers to propose and promote hybrid methodologies for the evaluation of projects rather than one specific method to respond to the shortcomings. Consistency in the evaluation of benefits is critical to avoid underestimation or overestimation. An example of hybrid evaluation tools is the so called Triple Bottom Line Valuation or TBL-CBA, a study that accounts for a sustainable project's total value and not only financial feasibility at the point of procurement. Autocase®, created in 2012 by Impact Infrastructure, is an example of such tool with the additional value of streamlining the complex analysis process of a TBL-CBA. According to their website, Autocase® through a cloud-based automated technology "*synthesizes hundreds of industry- and government- recognized research studies to provide smart default values"* and after combining these values with basic project-specific data input, it computes and reports the project's full range of costs and benefits.

Another example of total value assessment tool is the Sustainable Asset Valuation (SAVi) Tool by the International Institute for Sustainable Development (IISD). It is a simulation tool, customized for four sectors/asset categories: (a) energy, (b) buildings, (c) roads and (d) water infrastructure, to inform decision-making for governments and investors. SAVi through a System Dynamics Methodology integrates and processes data in a non-linear fashion and generates a conventional cost-benefit analysis with the added value of the quantification of broader co-benefits, avoided costs and project risks. According to IISD, SAVi is a tool capable of "demonstrating the business case for sustainable infrastructure and how improved sustainability performance can affect future cash flows and contribute to more attractive financial returns." The tool's outcome is sustainable project finance modeling presented through reports and illustration of results under various customized scenarios.

Finally, it is worth mentioning that the use of evaluation tools is not only important when weighing conventional vs. sustainable options, but also important for choosing the degree of sustainable performance: *"there is evidence of diminishing returns for higher performance beyond a certain point"* (Stapledon, 2012).

6._Strategies to reduce Direct Costs

Based on the existing literature, several factors are highlighted as having a significant impact on the direct cost of the project. Factors that affect direct cost can be both external to an infrastructure project, e.g. regulations, as well as internal to its development process, and are divided in the following:

- A robust project management approach involves the development of a business case to guide investment decision-making and selection of the most cost-effective project option.
- Early integration of financing: Design and financing are fundamentally parallel and complementary activities.

  "Starting with design decisions that create savings can help align incentives to maximize resilience benefits over time and open up pragmatic pathways to implementation" (Re.invest, 2015). Therefore early integration of financing in the project development process will determine the final cost.

- Financing structure-specific costs: Having to create unique financing structures for each project and jurisdiction, increases transaction time and costs. For sustainable-infrastructure projects, transaction and development costs may be even higher because limited data on financial and risk performance makes deal evaluation more complicated (McKinsey, 2016).
- The procurement process is key to enabling responding companies to bid projects featuring sustainability as a core guiding principle. Perhaps the most important part of this is how the client defines the project team selection criteria that will determine financial proposals[2].
- Project delivery mechanisms: *"Meeting the demand for infrastructure using sustainable and resilient solutions requires new approaches to realign incentives and design new delivery mechanisms at the right scales to systematically aggregate, monetize, and capture benefits that are usually left off project balance sheets entirely or simply described as "co-benefits" (Re.invest, 2015)*
- Project objectives and performance-based criteria setting: How not setting the typical infrastructure engineering requirements (defined in terms of what is required) but rather

[2] Feedback from Robert Beinstein

setting the performance that is needed, can redefine projects' development. Creating a performance specification allows truly creative planners and designers to innovate to solve bounded problems. This is what unleashes the true sustainable solutions.

- Innovative technology- specific costs: Incorporating new technologies, can introduce delays and increase costs related to finding the right products at the right price, convincing lenders and insurance providers of their value of etc.; however, can reduce operating costs.

- Time horizon for delivering financial results: cost-benefit evaluation of a project depends on the time horizon in scope, lifecycle costs versus upfront costs, long-term vs. short-term focus etc.

"Seeking to honor sustainability principles provide an incentive to design towards full lifecycle project value. An over-emphasis on front-end cost does not incentivize operational efficiency, longevity or resilience, all of which contributes to greater overall resource, energy and cost efficiency" (Janowitz, 2014).

The studies reaffirm that current tendency, or rather pressure, focuses on delivering short-term financial results rather than long-term, resulting to a misalignment of the timelines of the budget and the project. *"Infrastructure sustainability will invariably involve trade-offs. These may include operational versus capital costs, short-term versus long-term planning, and the frequent need for individual pieces of infrastructure to function as an integrated part of a system. The challenge for business is to maintain profitability and continuously build value for shareholders while best balancing the economic, environmental and social needs of, and impacts on, its other key stakeholders"* (Stapledon, 2012).

The above citation apart from commenting on the time horizon of an investment, also refers to the system versus. project approach: system management can prove to be more cost-effective than individual project management. Reference to the cost-effectiveness of the systemic approach is a recurrent theme, inherent to resilient and green infrastructure projects, that has been further explained previously in this review.

7._Future Opportunities

The infrastructure sector is dynamic and evolves rapidly with risks and opportunities. ASCE's 2017 Infrastructure report presents the prioritization of investments as an opportunity pathway. More specifically, it proposes as main guidelines:

- *the life cycle planning and cost analysis for high cost projects that receive public funding,*
- *the creation of incentives to invest in maintenance,*
- *the streamline of projects' permitting process across infrastructure sectors and*
- *the identification of a pipeline of infrastructure projects attractive to private sector investment and public-private partnerships.*

These guidelines can be enhanced, initially to include sustainable infrastructure and subsequently to refer to sustainable infrastructure, as the sole option. The Brookings Institute, 2016, is clear: *"Policy frameworks and financing mechanisms for public-private partnerships (PPPs) must improve in order to increase investment in sustainable infrastructure. PPPs are considered to be increasingly important investment modality"*.

The next step for the Zofnass Program research is to conduct field research to collect data on the costs and benefits on sustainable projects, focusing on identifiable sustainability features and the funding of such projects. Innovative financing, which makes sustainable infrastructure pay for itself, is an opportunity. Mobilizing concessional resources, catalyzing private sector investments and maximizing the use of market-based mechanisms (carbon, insurance markets) can create the right access and incentives for financing and investment sustainable infrastructure.

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