SAVi Sustainable Asset Valuation

How Can Indonesia Foster Sustainable Infrastructure Solutions That Deliver Low-Carbon Development and Bring Additional Benefits?

IISD International Institute for Sustainable Development

UKaid from the British people

Ronja Bechauf

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International Institute for Sustainable Development

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Head Office

111 Lombard Avenue,
Suite 325
Winnipeg, Manitoba
Canada R3B 0T4

Tel: +1 (204) 958-7700
Website: www.iisd.org
Twitter: @IISD_news

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Acronyms and Abbreviations

Bappenas	Ministry of National Development Planning
ESG	environmental, social, and governance
GHG	greenhouse gas
IISD	International Institute for Sustainable Development
KPPIP	Committee for Acceleration of Priority Infrastructure Delivery
LCDI	Low Carbon Development Initiative
MIRT	Multi-Year Programme for Infrastructure, Spatial Planning and Transport
OJK	Financial Services Authority
PT SMI	PT Sarana Multi Infrastruktur
PT IIF	Indonesia Infrastructure Finance
PV	photovoltaic
REIPPPP	Renewable Energy Independent Power Producer Procurement Program
SAVi	Sustainable Asset Valuation
SDG	Sustainable Development Goal
UNEP	United Nations Environment Programme

1.0 Introduction: How sustainable infrastructure can contribute to low-carbon and sustainable development

The unsustainable exploitation of natural resources and investments in high-carbon, inefficient energy and transportation systems in Indonesia are resulting in air and water pollution, deforestation, urbanization problems, climate change, biodiversity loss, and the depletion of natural resources (Ministry of National Development Planning, 2019). Indonesia's Ministry of National Development Planning (Bappenas) finds that the current development pathway cannot be maintained and limits the country's growth and ambitions to eradicate poverty. Indonesia's Low Carbon Development Initiative (LCDI), coordinated by Bappenas, makes the case for an ambitious transition to low-carbon, sustainable development and aims to integrate climate action within Indonesia's development agenda.

Sustainable infrastructure forms the basis for Indonesia's transition to an economy that offers opportunities for all while protecting the environment. It requires considerable investments in the coming years and decades to bridge the infrastructure gap of USD 143 billion (Bappenas, 2019; Global Infrastructure Hub, 2020c). The Government of Indonesia is expected to spend about USD 50 billion per year on infrastructure between 2020 and 2024. This represents about 20% of the annual national budget (Ministry of National Development Planning, 2019). To ensure that this will support the transition to a low-carbon economy, the investments must flow to projects that are well aligned with the Sustainable Development Goals (SDGs), the Paris Agreement, and national low-carbon development ambitions.

Sustainable infrastructure is defined as "infrastructure projects that are planned, designed, constructed, operated, and decommissioned in a manner to ensure economic and financial, social, environmental (including climate resilience), and institutional sustainability over the entire life cycle of the project" (Inter-American Development Bank, 2018). It supports the day-to-day functions of our societies and can bring significant co-benefits related to achieving green growth, sustainable development, and reducing climate risks (Ministry of National Development Planning, 2019).

A comprehensive definition of infrastructure includes traditional, "grey," or "built" infrastructure, such as energy networks and roads, as well as natural infrastructures like forests, wetlands, and hybrid forms of nature-based infrastructure, such as green roofs and walls on buildings. Choosing the right infrastructure projects and delivering them in the right way can simultaneously improve electricity access, bring health benefits, and reduce greenhouse gas (GHG) emissions.

1.1 What Does This Mean for Indonesia?

Investing in sustainable infrastructure offers great economic and social benefits for Indonesia, both by generating new opportunities and by reducing unintended costs (see also LCDI, forthcoming).

In addition, investments in sustainable infrastructure are the key to recovery from the impacts of the COVID-19 pandemic. A well-designed recovery strategy that is supported by investments in sustainable infrastructure can help Indonesia achieve its growth and social

development goals while meeting international climate commitments and adapting to climate change (Apanada, 2020; Asian Development Bank, 2020). Infrastructure investments are important elements of recovery strategies: within a time frame of 2–5 years, investments return 150% of economic value when compared to the original capital invested (Global Infrastructure Hub, 2020b).

The current unsustainable development path and the pressing need to recover from the pandemic both call for a paradigm shift in Indonesia. Decision-makers must adapt their priorities and boost sustainable infrastructure investments. It is key for the Indonesian people that infrastructure projects are not only implemented in a sustainable manner but that the sustainable infrastructure projects are the default choice for meeting the country's diverse challenges.

Budgetary constraints also make it imperative for Indonesian decision-makers to choose sustainable infrastructure options. Indeed, not considering the impact of climate change on infrastructure or other environmental, social, and governance (ESG) risks to infrastructure projects risks further deteriorating the budgetary situations, in particular for future generations.

1.2 Early Examples to Illustrate the Opportunities and Benefits of Sustainable Infrastructure

Waste: Waste management is a priority in Indonesia. Municipalities and cities generate around 105,000 tonnes of waste on average per day. This number is expected to increase to 150,000 tonnes per day in 2025 (World Bank, 2019). If waste is not properly collected and managed, it poses serious threats to the environment and human health. Unsustainable solutions, such as unregulated landfills and waste incineration, worsen this issue, while sustainable waste management infrastructure, such as recycling and composting facilities and certain waste-to-energy plants, can offer multiple benefits. These benefits include improved resource efficiency, energy savings, reductions in GHG emissions and poverty, enhanced equity, and the creation of green jobs (Bassi, Pallaske et al., 2020).

Mobility: Sustainable mobility infrastructure is another area that offers opportunities to create a more inclusive society. Lower-income households, women, and ethnic minorities are more reliant on public transit (Global Infrastructure Hub, 2020a). This means that investing in public transportation like bus and railway systems, instead of more exclusive and carbon-intensive roads, can provide vulnerable groups better access to public services and the labour market.

An assessment of implementing a public bicycle sharing system in New Delhi, India, shows that investing in such sustainable infrastructure improves the quality of life in the city and brings significant societal benefits. Shifting from air-polluting transportation modes to clean, active transportation reduces health costs and carbon emissions and allows users to save time due to reduced traffic. Sustainable mobility infrastructure also has a positive impact on local economic development, as retail businesses benefit from increased revenues and property values in surrounding areas (Wuennenberg et al., 2020).

Energy: Access to affordable energy is crucial for economic development, but electricity production from fossil fuels like coal has severe impacts on the environment and human

health (Sanchez & Luan, 2018). Research shows that shifting away from fossil fuels and investing in renewable, clean energy can unlock great benefits in Indonesia. This transition could significantly reduce health costs from air pollution, improve access to electricity and living conditions, reduce GHG emissions, and create green jobs and economic growth (International Renewable Energy Agency, 2017; Sanchez & Luan, 2018; Sustainable Energy for All, 2020).

1.3 About This Policy Paper

This paper provides guidance to policy-makers and decision-makers in Indonesia to identify the opportunities and benefits of sustainable infrastructure (Section 2) and to foster investments and leverage finance for sustainable infrastructure projects (Section 3).

An annex to this policy paper provides technical guidance on ESG risks and externalities in national development planning models, specifically the IV2045 system dynamics model developed by Bappenas. The methodology outlined in the technical paper is based on the Sustainable Asset Valuation (SAVi) methodology that helps governments and investors make the investment case for sustainable infrastructure by integrating the risks and externalities of infrastructure projects into cost-benefit analysis and project finance indicators. It explores, measures, and quantifies the opportunities that sustainable infrastructure brings and demonstrates that those opportunities and benefits largely outweigh the costs. Finally, SAVi assists in discussions on leveraging other sources of financing for sustainable infrastructure.

2.0 How to Identify Opportunities for Sustainable Infrastructure Projects

2.1 What Are the Key Challenges Related to Identifying Opportunities for Sustainable Infrastructure Projects?

Developing infrastructure is a complex endeavour due to the inherent characteristics of infrastructure, such as high upfront investments, long-term impacts, many stakeholders, and high risks and spatial impacts (Bhattacharya et al., 2016).

A multitude of planning and assessment tools are available to assist decision-makers, infrastructure planners, and investors. Depending on the infrastructure sector and the life-cycle phase, the Sustainable Infrastructure Tool Navigator (2021) alone presents over 90 different tools. These instruments range from modelling tools, rating systems, guidelines, and benchmarks to impact assessments and project preparation tools. Some of the tools are publicly available and free, while other modelling exercises and ratings are to be conducted by external experts. Most tools have a sectoral focus, for instance, assessing the social or ecological impacts of an infrastructure project, providing guidelines for project development, or analyzing the performance of infrastructure assets.

The International Institute for Sustainable Development (IISD) uses the SAVi methodology to identify, measure, and quantify the value that infrastructure projects bring to society. SAVi is a simulation-based assessment methodology to calculate the costs of climate and ESG risks and externalities of infrastructure projects. The SAVi features are:

1. **Simulation:** SAVi combines the outputs of systems thinking and system dynamics simulation and project finance modelling.
2. **Valuation:**
    a. Cost of Risks: SAVi simulates the value of climate, economic, social, and environmental risks. It then shows how these risks affect the financial performance of infrastructure projects and portfolios across their life cycles. Such risks are overlooked in traditional financial valuations. The system dynamics simulation was built on Vensim; the project finance model was built with Corality Smart.
    b. Cost of Externalities: SAVi identifies and places a euro value on the externalities that arise as a direct consequence of infrastructure projects. (An example of an externality is the impacts on human health caused by carbon dioxide, particulate matter, sulphur dioxide, and nitrogen oxide emissions). SAVi thus helps policy-makers and investors to appreciate the wider, second-order gains and trade-offs of infrastructure investments, which may otherwise not be apparent under a traditional valuation.
    c. Cost of Emerging Risks: SAVi shows how externalities today can transform into direct project risks tomorrow. Such valuations help stakeholders make decisions in favour of sustainable infrastructure.

3. **Customization:** SAVi models can be customized to individual infrastructure projects, portfolios, and policies. SAVi can therefore value the cost of risks and externalities that are directly material to each asset.

Despite these available tools, assessing the benefits of sustainable infrastructure and identifying feasible opportunities for implementation remain challenging (Bassi et al., 2019). One barrier is the limited ability to quantitatively evaluate and compare infrastructure project costs and value a project's contribution to society. This quantification is particularly challenging for sustainable and nature-based infrastructure for which many of the benefits are "intangible" or appear as avoided costs. For example, renewable energy generates avoided health costs or avoided costs of GHG emissions when compared to fossil fuel-intensive energy infrastructure.

A second barrier to identifying sustainable infrastructure opportunities is related to the uncertainty around the financial performance of sustainable and nature-based infrastructure projects. The financial returns of sustainable and nature-based infrastructure projects are contingent on site-specific characteristics and can be difficult to compare with conventional grey infrastructure in a cost-benefit analysis.

A third barrier is the lack of knowledge and technical guidance to appreciate the positive impacts of sustainable infrastructure. When planners, policy-makers, and permitting agencies are unfamiliar with the functionalities, risks, and benefits of such projects, they tend to prioritize conventional grey infrastructure solutions, whose immediate performance appears more certain.

Finally, identifying opportunities for sustainable infrastructure is also hampered by high transaction costs. Project preparation takes time and resources. It also requires considerable coordination across multiple stakeholders, such as landowners, jurisdictions, and beneficiaries, which can be time consuming and expensive. The fact that many green infrastructure projects are often smaller scale than grey infrastructure further contributes to this roadblock.

2.2 What Are Possible Approaches to Overcoming These Challenges and Identifying Opportunities for Sustainable Infrastructure Projects?

The United Nations Environment Programme (UNEP) established 10 international good practice principles for sustainable infrastructure to support government policy-makers and decision-makers in creating an enabling environment for sustainable infrastructure (UNEP, 2021b). These principles for sustainable infrastructure illustrate how sustainability can be integrated throughout the entire infrastructure life cycle, especially in the early planning phases. The principles are meant to foster integrated, systems-level approaches that help governments achieve the SDGs and meet infrastructure needs with solutions that are more resource efficient, cost effective, resilient, and have fewer risks than "business-as-usual" approaches.

BOX 1. UNEP'S INTERNATIONAL GOOD PRACTICE PRINCIPLES FOR SUSTAINABLE INFRASTRUCTURE

The 10 guiding principles:

> "1. **Strategic planning** to ensure the alignment of infrastructure policies and decisions with global sustainable development agendas and to strengthen the enabling environment.
>
> 2. **Responsive, resilient, and flexible service provisions** to meet actual infrastructure needs, allow for changes and uncertainties over time, and promote synergies between infrastructure projects and systems.
>
> 3. **Comprehensive life-cycle assessment of sustainability**, including the cumulative impacts of multiple infrastructure systems on ecosystems and communities over their entire lifespans, to avoid "locking in" infrastructure projects and systems with various adverse effects.
>
> 4. **Avoiding environmental impacts** of infrastructure systems and investing in natural infrastructure to make use of nature's ability to provide essential, cost-effective infrastructure services and provide multiple co-benefits for people and the planet.
>
> 5. **Resource efficiency and circularity** to minimize infrastructure's natural resource footprint, reduce emissions, waste and other pollutants, and increase the efficiency and affordability of services.
>
> 6. **Equity, inclusiveness, and empowerment** through a balance between social and economic infrastructure investments to protect human rights and promote well-being, particularly of more vulnerable or marginalized groups.
>
> 7. **Enhancing economic benefits** through employment generation and support for the local economy.
>
> 8. **Fiscal sustainability and innovative financing** to close the infrastructure investment gap within the context of increasingly constrained public budgets.
>
> 9. **Transparent, inclusive, and participatory decision making** that includes stakeholder analysis, ongoing public participation, and grievance mechanisms for all stakeholders.
>
> 10. **Evidence-based decision-making** that includes regular monitoring of infrastructure performance and impacts based on key performance indicators and the promotion of data sharing with all stakeholders" (UNEP, 2021b, p. 13).

2.2.1 STRENGTHEN STRATEGIC INFRASTRUCTURE PLANNING

As mentioned in the first good practice principle for sustainable infrastructure (Box 1), strategic planning is crucial for developing sustainable infrastructure systems (International Transport Forum, 2017; United Nations Environment Programme, 2021b). When infrastructure investments are planned in an integrated, strategic way, they can address multiple societal needs at the same time and save valuable resources. Identifying such opportunities

requires cross-sectoral thinking that also looks beyond pre-defined spatial boundaries and jurisdictions. A national sustainable infrastructure strategy that is created in collaboration with relevant stakeholders can provide a valuable framework for the direction of infrastructure developments in a country. Having a common vision of moving toward sustainable development can align separate short- and medium-term projects with a long-term path and can orient planners, political decision-makers, and investors. In addition, a common vision can facilitate better coordination and collaboration across different planning departments and levels of government and administration.

Recognizing the need to facilitate important infrastructure projects, the Government of Indonesia created the Committee for Acceleration of Priority Infrastructure Delivery (KPPIP) a few years ago. The KPPIP selects National Strategic Projects that are urgently needed for economic development (Committee for Acceleration of Priority Infrastructure Delivery, 2021). The resulting list currently includes about 250 projects, primarily grey, carbon-intensive projects like roads, dams, industrial zones, and ports. There is considerable room for improvement in aligning the National Strategic Projects with national ambitions, for instance, in relation to low-carbon development, poverty eradication, and the protection of natural resources.

2.2.2 INVEST IN EARLY PLANNING STAGES

To successfully develop infrastructure that meets the highest sustainability standards and brings additional benefits to society and the environment, sustainability criteria need to be incorporated early in the planning process. During the conceptual phases, significant choices and changes can be made for the right kind of infrastructure, while later interventions have a limited capacity to address sustainability issues and often only serve to remedy unintended negative impacts.

As governments are the main buyers of infrastructure, they have a significant influence on the sustainability of the projects through the public procurement process and the regulatory framework. Governments can, for instance, set requirements on the social and environmental performance of bidding companies and prioritize projects that foster sustainable development in procurement decisions (Perera et al., 2016).

During the planning phase of infrastructure projects, a broad, integrated approach that is open for different solutions can be crucial to credibly consider sustainable projects (Arts et al., 2014; Heeres et al., 2012; Ministry of Infrastructure and Water Management, 2018; UNEP, 2020). Through a broad approach, planning authorities would not solely decide on grey, sectoral infrastructure solutions but would work with other stakeholders in identifying a set of alternatives that could also solve the issues. These alternatives may also create additional benefits for society. For example, a water authority would not immediately decide to build a water purification plant to address water quality issues but might also consider restoring wetlands that filter and purify water while providing flood protection and recreation benefits to the local community (Bassi et al., 2019). To do that, the water authority will have to invite other experts and agencies into the consultation and planning process.

Investing time and resources into the early planning stages of infrastructure can help to create better infrastructure and save money in the longer term.

2.2.3 MAKE INFORMED INFRASTRUCTURE DECISIONS BASED ON COMPREHENSIVE PROJECT VALUATIONS

Conventional infrastructure decisions are usually based on traditional valuations that focus on the economic and sectoral performance of projects. Such valuations, however, overlook the full costs of the diverse economic and ESG risks that infrastructure projects face these days. For instance, climate change impacts like changing precipitation patterns have a strong influence on infrastructure like roads and wastewater treatment (Bassi et al., 2020), but such risks are usually not included in traditional valuations. In addition, these valuations also do not value the diverse positive and negative externalities that result from infrastructure development, like job creation, human health, and the provision of ecosystem services. Many conventional infrastructure projects are no longer financially viable or desirable from a societal point of view when valuations include these risks and externalities.

The limitations of traditional approaches in assessing the value of infrastructure represent a key barrier for more sustainable infrastructure. IISD developed the SAVi methodology to respond to this barrier. SAVi combines system dynamics and project finance modelling to capture the full costs of projects' economic and ESG risks and models how these risks affect the financial performance of infrastructure projects across their life cycles (IISD, 2021). For instance, SAVi can analyze how the imposition of a carbon tax might create unexpected costs for an infrastructure project or how changed wind speeds influence the performance of a wind energy park. In addition, it estimates the dollar value of relevant externalities, such as the health costs of air pollution.

Policy-makers, decision-makers, and investors can use SAVi to make investment decisions that are not only based on a comprehensive valuation of risks but also consider how infrastructure investments will contribute to addressing climate change, fulfilling national development priorities, and achieving the SDGs.

BOX 2. SAVI: ASSESSING THE ECONOMIC VALUE OF RESTORING TWO WETLANDS IN SARDINIA, ITALY

Description of the model

The SAVi model was used to calculate the economic and societal value generated by the S'Ena Arrubia and Corru S'Ittiri–Marceddì–San Giovanni wetlands in the Gulf of Oristano in Sardinia, Italy. Both wetlands are protected due to the presence of numerous plant and animal species and provide essential ecosystem services, such as:

- Water filtration and supply
- Flood control
- Nitrogen removal
- Carbon sequestration
- Material provision
- Wildlife habitat
- Tourism and recreation.

By providing these ecosystem services, the wetlands contribute to the local economy by enabling agriculture, tourism, fisheries, and aquaculture. However, the ecosystems are exposed to a range of human and climatic threats that increasingly degrade the wetlands and limit their ability to provide ecosystem services. The threats include, among others, intensive agriculture, livestock, and aquaculture activities, salination, and long droughts.

SAVi was used to model a range of values of the two wetlands: the dollar value of the ecosystem services provided by the wetlands, the dollar value of the labour income generated in connection to the wetlands, and the capital and operating costs of built infrastructure that would provide the same level of services.

The SAVi assessment also explored how more sustainable agriculture can protect the wetlands and thus make sure that they continue to provide ecosystem services to the local communities. In this scenario, the livestock manure generated in the area would be used to produce biogas, pellets, and compost. While the current practice of directly fertilizing the land with manure leads to damagingly high nitrogen loadings in the wetlands, the alternative approach provides benefits to the environment and the farmers. The waste-to-energy solution and production of compost offer a potential revenue stream, while the compost reduces the farmers' dependence on chemical fertilizers.

Results of the assessment

The wetlands will generate ecosystem services worth EUR 306 million between 2020 and 2060 without any restoration or protective activities taking place. However, avoiding continued degradation can generate additional value of EUR 171 million over this period. The assessment also indicated that reusing part of the livestock manure could provide a net benefit of more than EUR 200 million over 40 years.

When compared to the cost of wetland maintenance or the cost of built infrastructure solutions, the wetlands produce substantial economic and societal benefits at an attractive cost, making their conservation a worthwhile investment for local businesses, municipalities, and taxpayers. The results across the two scenarios also show how important the wetlands are for the local economy, as they support considerable labour income and tax revenues that are threatened if the wetland quality continues to deteriorate.

Source: Bassi, Uzsoki et al., 2020

2.2.4 TAKE AN INCLUSIVE, PARTICIPATORY APPROACH AND WORK WITH ALL STAKEHOLDERS

Successfully developing sustainable infrastructure requires meaningful stakeholder participation during the whole planning process (see principle 6 in Box 1). Such an inclusive approach is important for several reasons. First, the involvement of local communities and other stakeholders in the early planning stages helps to gain a better understanding of local needs and preferences, which helps to create projects that are well aligned with national ambitions as well as local demands for services. The inclusion of local communities is crucial to garnering perspectives from more vulnerable, marginalized, or disadvantaged groups.

Second, including local knowledge in the planning process can create better infrastructure. For example, residents' experiences with floods and natural habitats might lead to a project design that is better adapted to climate risks while reducing negative impacts on biodiversity.

Third, transparent decision-making processes that take multiple views into account and accessible grievance mechanisms can increase the legitimacy of infrastructure decisions. They also avoid costly conflicts and delays afterwards.

Finally, good stakeholder analysis and participation can also help to develop appropriate governance frameworks as well as suitable ownership and financing structures. Identifying all stakeholders affected by the diffuse benefits of such projects can pave the way for broad coalitions and financial contributions.

2.3 How Do Other Countries Successfully Identify Sustainable Infrastructure Opportunities?

2.3.1 SUSTAINABLE INFRASTRUCTURE RATING IN MALAYSIA

In Malaysia, the Construction Industry Development Board (CIDB), an agency under the Ministry of Works, developed the Sustainable INFRASTAR rating tool to assess the sustainability measures in infrastructure projects. It is applicable to a wide range of infrastructure types, such as roads, railways, water and electricity facilities, and waste treatment. The tool assesses and scores the following components of a project (CIDB Malaysia, 2020):

- Land-use planning and management
- Resource management
- Energy and water management
- Biodiversity and other ecosystem services
- Social and cultural protection
- Stakeholder coordination.

Sustainable INFRASTAR aims to ensure the consideration of sustainability criteria in the crucial early planning phases of projects and to improve social and environmental infrastructure performance. Even though the use of the tool is not a legal requirement, the opportunity to be awarded a "star rating" is an incentive for developers to strive for high levels of sustainability and gain public recognition (CIDB Malaysia, 2020).

2.3.2 INTEGRATED INFRASTRUCTURE PLANNING IN THE NETHERLANDS

The Dutch Multi-Year Programme for Infrastructure, Spatial Planning and Transport (MIRT) is an integrated infrastructure investment program that has been developed to ensure coherence and synergies between different policy fields, such as transportation, urban planning, and environmental protection (Klakegg et al., 2016; Ministry of Infrastructure and Water Management, 2018). MIRT includes a set of mandatory rules and procedures for large infrastructure projects. To qualify for state funding, projects need to run through all three MIRT phases (exploration, plan elaboration, and realization) and four gateway reviews and decisions (initial, preference, planning, and realization) (Ministry of Infrastructure and Water Management, 2018). In the Netherlands, MIRT serves as a framework for different parties, such as different levels of government and private actors, to collaboratively develop infrastructure and work toward sustainable development ambitions.

One special feature of the MIRT program is the priority placed on integrated planning and a broad, problem-oriented approach. Instead of quickly deciding on a sectoral solution, in the first phase of MIRT, stakeholders explore possible sustainable solutions and opportunities to align their interests (Ministry of Infrastructure and Water Management, 2018). For example, the national executive agency for infrastructure would not simply decide to expand its roads if there are congestion issues; instead, it works together with the affected provinces, municipalities, and businesses in identifying innovative solutions that fit the local ambitions. Congestion on the motorway, for example, could be eased by building attractive cycling routes and setting up a mobility management scheme, which would then reduce commutes by car and positively influence citizens' health.

In the coming years, even more priority will be given to the sustainability of Dutch infrastructure projects. The national government launched a strategy that stipulates that, by 2030, all infrastructure projects of the national executive agency for infrastructure must be climate neutral and have a circular approach to procurement (Government of the Netherlands, 2020).

2.3.3 STRATEGIC INFRASTRUCTURE PLANNING AND SCENARIO MODELLING IN SAINT LUCIA

The Caribbean island state of Saint Lucia has recognized the need for integrated, long-term infrastructure planning. It has introduced new tools and institutions to develop infrastructure aligned with national sustainable development ambitions. Sustainability considerations are included very early in the planning process; a scenario analysis helps to address uncertainty about future developments; and decision-makers have clear evidence on the performance and impacts of infrastructure projects.

In partnership with the United Nations Office for Project Services and the University of Oxford-led Infrastructure Transitions Research Consortium, the Government of Saint Lucia developed a National Infrastructure Assessment that provides decision-makers with a step-by-step framework to prioritize and achieve long-term development goals. The National Infrastructure Assessment aims to ensure that the country's social, economic, and environmental needs are met in a wide range of future scenarios and is based on the National Infrastructure Systems Model (Adshead et al., 2020; UNEP, 2021a).

The assessment estimates Saint Lucia's current and future infrastructure needs based on scenarios that consider different developments related to its population, economy, land use, and climate. It also gives specific recommendations for how these needs can be met. For instance, the National Infrastructure Assessment estimates how the increasing visitor numbers due to the expansion of Saint Lucia's airport and cruise port influences energy and water needs as well as wastewater and solid waste. It proposes cross-sectoral solutions to deal with these changing infrastructure needs, such as using a waste-to-energy scheme to sustainably address rising solid waste volumes and increasing energy needs (Adshead et al., 2020; UNEP, 2021a).

The Government of Saint Lucia created the National Integrated Planning and Programme Unit as part of the Department of Finance to coordinate and implement the cross-sectoral solutions (Adshead et al., 2020). The Planning and Programme Unit also helps to break up departmental silos and find integrated infrastructure solutions.

3.0 How to Foster Investments in Sustainable Infrastructure

3.1 What Are the Key Challenges Related to Increasing Investments in Sustainable Infrastructure?

Indonesia's *Low Carbon Development* report underlines that the Government of Indonesia does not have the financial resources for a low-carbon transition, even with ongoing support from bilateral and multilateral development organizations (Bappenas, 2019). Therefore, private capital—as well as domestic, foreign, and blended finance—will be required to successfully transition to a low-carbon economy.

The main challenges to leveraging more investment for sustainable infrastructure include a lack of project pipelines and viable funding models, high (perceived and real) transaction costs and risks, and a lack of coordination between infrastructure and budget planning.

These challenges are further exacerbated by public budget constraints caused by the COVID-19 pandemic. Indonesia is struggling with high case loads and death tolls from the pandemic. After spending about USD 50 billion on relief measures in 2020, the government is expected to implement stimulus measures of a similar size this year to support its struggling economy. To make sure that Indonesia's recovery from the pandemic supports low-carbon development instead of high-carbon, environmentally damaging practices, public spending like the Economic National Recovery Fund needs to be targeted to green measures and closely monitored.

Governments around the world are spending unprecedented amounts on stimulus measures, such as President Biden's USD 2 trillion American Jobs Plan and the European EUR 750 billion NextGenerationEU package. Although many countries have rhetorically committed to a green recovery from the pandemic, current investments are barely aligned with environmental goals. Only 17% of recovery spending (or 2% of total COVID-19-related spending) announced by governments is allocated to green recovery measures like renewable energy and sustainable mobility (Organisation for Economic Co-operation and Development, 2021).

To urge more decision-makers to choose a green recovery pathway, several organizations are tracking government stimulus spending; examples include the Energy Policy Tracker (2021) initiated by IISD and partners, Carbon Brief's tracker of emissions cut through green recovery plans (Carbon Brief, 2020), and Vivid Economics Greenness of Stimulus Index (Vivid Economics & Finance for Biodiversity Initiative, 2021).

3.1.1 LACK OF SUSTAINABLE PROJECT PIPELINES

Private institutional investors, such as private equity and pension funds, could fill up to half of the global infrastructure gap, but they can only play their part in boosting sustainable infrastructure if they can identify bankable projects (Bielenberg et al., 2016). In practice, identifying sustainable projects is very challenging, as only a few countries develop sustainable infrastructure pipelines and communicate them in a transparent way. National project priority lists, such as Indonesia's National Strategic Projects, often include a limited number of projects that are compatible with low-carbon, sustainable development pathways.

As another example, Indonesia's National Medium Term Development Plan (RPJMN) 2020–2024 lists 42 key projects for 2021, of which only nine are in line with low-carbon development ambitions (see LCDI, forthcoming).

International platforms and initiatives such as the Global Infrastructure Hub[1] and the UN SDG Investor Platform[2] can support countries and investors with knowledge on sustainable project pipelines.

3.1.2 LACK OF VIABLE FUNDING MODELS

In addition to the widespread uncertainty about upcoming infrastructure investment opportunities, many projects are not "bankable." They do not deliver adequately high risk-adjusted returns to attract investors, or else costs and risks appear to be allocated inappropriately (Bielenberg et al., 2016). This uncertainty is based on valuation methods that fail to capture the positive returns from a lower total cost of ownership perspective. Creating viable funding models is made even more complex when the advantages of a sustainable project, such as reduced energy bills, generate diffuse benefits and may not adequately compensate the initial investor who might face higher upfront costs (Bielenberg et al., 2016).

Investors are hesitant to invest in infrastructure projects with uncertain or intangible revenue streams, for instance, when users are unwilling or unable to pay for services or when the project does not produce conventional revenue streams (Bhattacharya et al., 2016; Bielenberg et al., 2016). This uncertainty restricts the bankability of projects and viable funding models.

In Indonesia, for example, the upscaling of renewable energy is hampered by a lack of bankable projects. Faced with governance issues such as inconsistent policies, bureaucracy, and a lack of institutional capacity, as well as low electricity purchase prices and regulated low end-consumer tariffs, investors fail to identify bankable projects.

3.1.3 HIGH (PERCEIVED AND REAL) TRANSACTION COSTS

A third challenge to attracting investment for sustainable infrastructure is the potentially higher transaction costs for such projects (Bassi et al., 2019; Bielenberg et al., 2016; Perera et al., 2016). In general, investors are less familiar with sustainable infrastructure and can find it difficult to consider the specific characteristics, such as climate resilience, in their valuations. The lack of a proven track record of the performance of sustainable infrastructure also makes the project analyses more challenging. As these projects tend to also be smaller scale, the transaction costs can appear to be disproportionally high.

In addition, inefficient permit and procurement processes contribute to high transaction and development costs and thereby discourage private investments. It can therefore be problematic when the procedures and standards are not only different from country to country but also on the regional and local levels within a country. Investments in sustainable infrastructure can be severely hampered when there is little collaboration between public agencies and when procedures and ambitions are not aligned between federal, provincial, and local policy-makers (Perera et al., 2016).

[1] Global Infrastructure Hub: https://www.gihub.org/

[2] SDG Investor Platform: https://sdginvestorplatform.undp.org/

3.2 What Are Possible Approaches to Overcome These Challenges and Increase Investments in Sustainable Infrastructure?

3.2.1 CREATE A PIPELINE OF SUSTAINABLE INFRASTRUCTURE PROJECTS

As mentioned before, Indonesia's KPPIP created a list of more than 200 projects, of which a limited number aligned with low-carbon, sustainable development. The National Strategic Projects need to be re-evaluated based on sustainability criteria. UNEP's good practice principles for sustainable infrastructure (see Section 2.2) can offer valuable guidance. In addition, new infrastructure projects need to be selected based on transparent, mandatory sustainability criteria. For instance, projects should be aligned with national GHG emission targets, avoid negative impacts on ecosystems, and meet the needs of vulnerable communities.

3.2.2 CREATE OR IMPROVE PROJECT PREPARATION FACILITIES

One promising approach to foster investment in sustainable infrastructure is to improve the preparation of infrastructure projects to create a pipeline of viable, sustainable projects. Governments and development banks are well advised to scale up their investments in project preparation facilities and technical assistance, as this can greatly improve the bankability of projects and reduce transaction costs for investors (Bhattacharya et al., 2016; Bielenberg et al., 2016). An example can be found in Section 3.3.

Project preparation facilities can carry out feasibility studies, coordinate actors and procedures, and facilitate financial transactions. They can also support governments in prioritizing infrastructure projects and bundling them in a transparent pipeline. They can help unpack the legal framework and provide investors with information, further reducing transaction costs and making investments in sustainable infrastructure more attractive.

To create viable, sustainable infrastructure projects and attract investments, the Government of Indonesia could consider setting up a project preparation facility. Alternatively, an existing institution like the state-owned multi-infrastructure facility (PT SMI) or Indonesia Infrastructure Finance (PT IIF) could be strengthened to act as a project preparation facility. There are also numerous international project preparation facilities that foster sustainable infrastructure projects and could be useful for Indonesia (Nassiry et al., 2018).

BOX 3. PROJECT PREPARATION FACILITIES AND SUSTAINABLE INFRASTRUCTURE PROJECTS

A project preparation facility can support investment in sustainable infrastructure projects by:

- Acting as a focal point for all relevant stakeholders in the planning stages of infrastructure projects and fostering collaboration between multilateral development banks, national development banks, government ministries and agencies, local communities, and investors.
- Reducing transaction costs for governments and investors by preparing an infrastructure pipeline.
- Checking alignment of infrastructure projects with sustainable development plans.
- Performing integrated assessments, including looking at ESG risks and the externalities/impacts of infrastructure projects.

3.2.3 IMPROVE THE POLICY ENVIRONMENT FOR INVESTMENTS IN SUSTAINABLE INFRASTRUCTURE

Improving the policy environment is crucial to channelling investments toward sustainable infrastructure. This improvement may include reducing policy risks and the costs of doing business by adapting regulations and tax policies, setting clear standards for infrastructure projects, and providing reliable long-term directions (Bhattacharya et al., 2016). An enabling institutional and regulatory framework for sustainable infrastructure is paramount (Bhattacharya et al., 2016; Bielenberg et al., 2016). Governments are also advised to improve the transparency of planning processes, provide standardized documents, and promote investors' confidence in policies and their implementation. For example, transparent sustainability criteria could be included in requests for proposals and made more explicit in project evaluations.

Authorities in Indonesia can also foster low-carbon, sustainable infrastructure by moving toward sustainable public procurement. Using their buying power in the infrastructure market, governments send a clear signal to businesses and investors that infrastructure must become sustainable. This signal can encourage the market to innovate and invest in its capacity to design, build, and operate sustainable infrastructure (Bielenberg et al., 2016; Perera et al., 2016).

3.2.4 RECONCILE INFRASTRUCTURE AND BUDGET PLANNING

The mismatch between infrastructure planning and the budgetary process in Indonesia hinders investment in sustainable infrastructure. Bappenas prepares infrastructure plans based on programs, which can be cross-institutional and multi-year. The Ministry of Finance prepares the Macroeconomic Framework and the Principles of Fiscal Policy (KEM-PPKF) and the state budget (APBN) on a yearly basis.

To create the basis for sustainable infrastructure development, efforts to synchronize these processes between both entities need to be intensified. In addition, the budget system

should be adapted to facilitate funding for cross-sectoral programs instead of providing funding per department or agency. Moreover, the Macroeconomic Framework and the Principles of Fiscal Policy and the government work plan (RKP) should pay specific attention to low-carbon, sustainable development to make sure that public funding is well targeted to reach these ambitions.

Several ministries in Indonesia are already using the e-planning tool KRISNA for their plans and budgets (Kementerian PPN/Bappenas, 2017). Expanding the use of KRISNA to more departments, ministries, and agencies can contribute to better coordination of government activities.

3.2.5 REFORM PROJECT FINANCE MODELS

Another approach to attracting financing for sustainable infrastructure would be to reform the project finance models used to assess the performance of possible investments. It is crucial to acknowledge that many carbon-intensive grey infrastructure projects only appear viable because ESG risks and negative externalities are left aside in project valuations. However, these risks and costs are real and must be integrated into the valuations.

To show the financial and societal attractiveness of sustainable projects, the project finance models need to incorporate the full range of ESG risks associated with infrastructure development and consider the multiple positive and negative externalities of projects.

BOX 4. SAVI: HOW AN IMPROVED PROJECT FINANCE MODEL SUPPORTS NATURE-BASED INFRASTRUCTURE IN BELGIUM

Applying the SAVi tool to the implementation of agroforestry in the municipality of Welkenraedt, Belgium, can help to illustrate the role of project finance models for sustainable infrastructure. Agroforestry is nature-based infrastructure that aims to maintain and restore soil productivity, combat erosion, maintain high water quality, and strengthen climate resilience.

In the case of the Welkenraedt, planting and maintaining the trees and hedges for the agroforestry scheme costs about EUR 600,000. The net benefits of the project are estimated at EUR 3.9 million over a 20-year lifetime, largely due to additional revenue streams related to tourism and agriculture activities, carbon sequestration, nitrogen removal, and other ecosystem services. The SAVi assessment also shows that under climate impacts like rising temperatures, agroforestry projects are even more economically attractive.

The SAVi project finance model treats the project's externalities as revenues to demonstrate the investment worthiness of nature-based infrastructure. Such a calculation of the net present value and internal rate of return helps decision-makers to take a more holistic approach when assessing whether a project would deliver value for money to society over its life cycle.

If only the revenues from fodder and milk production are considered, the agroforestry project hardly appears to be a worthy investment: the net present value is negative while the internal rate of return is 1.22%. However, when all additional revenues and externalities of the agroforestry project are considered, the internal rate of return increases to 27.85% and the net present value to EUR 1,430,000. These attractive results from the project finance model show that agroforestry in Welkenraedt is a worthwhile use of public resources that can generate considerable returns for local stakeholders as well as for society.

Source: Bassi et al., 2021

3.2.6 MOBILIZE INNOVATIVE FINANCE

In 2018, Indonesia issued its first green sukuk[3] (Republic of Indonesia, 2020). Building on this experience, several other finance solutions could be considered to attract funds for green projects, such as resilience and catastrophe bonds, environmental impact bonds, blended finance, and innovative insurance solutions.

Even though Indonesia's Financial Services Authority (OJK) issued a Roadmap for Sustainable Finance (OJK Otoritas Jasa Keuangan, 2014, 2020), sustainability considerations in the sector remain limited. To further development within the sector, the criteria and supervision for sustainability reporting should be improved, and the government should consider investing in the regulatory supervision of OJK over the banking, capital market, and financial service industry sectors.

BOX 5. THE ROLE OF NATIONAL DEVELOPMENT BANKS IN SUSTAINABLE INFRASTRUCTURE

Apart from such financing mechanisms, decision-makers in Indonesia could also consider creating a national development bank to support the country's sustainable development. Experience in many other countries shows that, provided they have a clear mandate and are well-governed, national development banks can increase sustainable infrastructure financing, foster structural transformations, and promote environmental sustainability (Griffith-Jones & Ocampo, 2018). The Development Bank of Southern Africa, for example, focuses on development finance solutions, especially for sustainable infrastructure and human capacity development (Development Bank of Southern Africa, 2021). The bank, which is owned by the Government of South Africa, also offers project preparation support to create bankable infrastructure projects and hosts the national Infrastructure Fund.

Indonesia has state-owned enterprises to support infrastructure investments, for example, PT Sarana Multi Infrastruktur (PT SMI) and PT IIF. These facilities are already involved in the

[3] A sukuk is a Shariah-compliant financial instrument backed by specific assets.

preparation, financing, and implementation of sustainable projects, but decision-makers should consider adapting their mandate to such projects only to avoid investments in carbon-intensive projects with negative effects on society and the environment.

PT SMI is the accredited agency for the Green Climate Fund. The Green Climate Fund can support PT SMI under various financing mechanisms to provide and leverage financing for sustainable infrastructure.

3.3 How Do Other Countries Overcome These Challenges and Boost Investments in Sustainable Infrastructure?

3.3.1 USING PROJECT PREPARATION FACILITIES TO CREATE BANKABLE SUSTAINABLE PROJECTS

The previous section identified improved project preparation as a valuable approach for fostering investments in sustainable infrastructure. An example of such a project preparation facility is InfraCo Asia, a commercially managed infrastructure development company funded by donors such as the governments of the United Kingdom, Switzerland, and Australia.

InfraCo Asia aims to create viable infrastructure investment opportunities that balance the interests of host governments, local communities, and domestic and international private sector investors. More specifically, InfraCo Asia de-risks early-stage infrastructure projects where the private sector is initially unable or unwilling to invest. For this purpose, the facility provides project development and financing expertise and takes an equity stake in high-risk projects (InfraCo Asia, 2018). To qualify for support from InfraCo Asia, all projects need to provide social and economic benefits, reduce poverty, and comply with environmental best practices.

So far, the facility has mobilized more than USD 370 million in private sector capital, based on about USD 30 million in investments from InfraCo Asia. For example, it has helped to develop two wind power projects in Pakistan, where electricity shortages are a heavy burden for the economy and households. Together with local partners, InfraCo developed two 50 MW wind parks, providing valuable expertise in the early stages of the projects as well as capital to complete the development of the projects and secure debt financing from international and local lenders (InfraCo Asia, n.d.). The two projects improved electricity access for approximately 700,000 people, decreased carbon emissions, and reduced national dependence on fuel imports, as well as the country's power capacity deficit.

3.3.2 UNLOCKING COMMERCIAL INVESTMENTS IN SOLAR PHOTOVOLTAIC PROJECTS BY CREATING AN ENABLING POLICY FRAMEWORK AND PUBLIC SUPPORT

Many countries are using public support to de-risk large-scale solar photovoltaic (PV) developments and make them attractive for private investments. World Bank research finds that creating and maintaining a transparent and coherent policy and regulatory framework is important for countries to successfully increase commercial investments in solar PV (Makang et al., 2019). In addition, it underlines the role of providing direct and indirect financing, improving long-term planning and technical and operational capacities, investing in enabling infrastructure such as power transmission systems, and providing government-sponsored guarantees if necessary.

In South Africa, the Renewable Energy Independent Power Producer Procurement Program (REIPPPP) forms the foundation for commercial investments in solar PV (Makang et al., 2019). Between 2010 and 2018, the program successfully mobilized more than USD 8 billion in capital and procured 45 solar PV and concentrated solar power projects. Even before the REIPPPP, South Africa had an attractive business environment and an enabling legal framework for private investments in the energy market. In this favourable context, the government provided financial support to back the offtake obligations of the national power utility Eskom and carried out a well-designed, competitive procurement process. This reduced transaction costs and risks for investors and attracted experienced international developers to South Africa's solar market.

The REIPPPP is managed by a newly created Independent Power Producer Office, comprising experts from the National Treasury and the Department of Energy as well as domestic and international advisers. The Independent Power Producer Office engages with prospective investors and develops transaction documents that balance the government's objectives and the expectations of commercial investors. By organizing an efficient bidding process and providing high-quality, streamlined contracts, the REIPPPP leads to bankable solar projects and helps to boost commercial investments.

4.0 Conclusion: A way forward

Policy-makers in Indonesia must embrace the paramount importance of sustainable infrastructure investments for reaching national development goals and ambitions for low-carbon development. Undertaking integrated assessments can help identify and shed light on the benefits and opportunities of sustainable infrastructure projects and provide transparency on the real cost of unsustainable options. Practically, sustainable infrastructure reduces costs, increases benefits, and avoids a costly lock-in into a carbon-intensive infrastructure future.

To take advantage of these opportunities and mobilize the necessary investments in sustainable infrastructure, decision-makers in Indonesia can improve project preparation facilities and capacities. This improvement can help to create a pipeline of sustainable and bankable projects that is in sync with the low-carbon development strategy and sustainable development ambitions. Furthermore, the national infrastructure and budget planning processes should be reconciled.

Considering Indonesia's significant GHG emissions and emission-related health costs, renewable energy is one priority sector for infrastructure development in the country. In addition, increased focus on nature-based solutions is recommended to support Indonesia's rich biodiversity. Sustainable waste and water management facilities and practices can be another focus area for sustainable infrastructure investments.

Properly analyzing the risks and benefits of infrastructure projects forms the basis for good investment decisions. Projects need to be assessed in a systemic, integrated way that analyzes ESG and climate risks, measures avoided costs and added benefits, and identifies appropriate risk management strategies. Such a systemic analysis can help decision-makers across different levels and sectors to identify worthwhile infrastructure projects and prepare them for private or blended financing. The IV2045 model developed by Bappenas can serve as an excellent starting point by providing the systems view required for estimating the benefits of sustainable infrastructure. Targeted additions to this model would allow the creation of an integrated cost-benefit analysis for key infrastructure assets. Crucially, a strengthened IV2045 would also open the door to bringing sustainable infrastructure to decision-makers that are already using this model and including more stakeholders and expertise in the discussion.

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Head Office

111 Lombard Avenue, Suite 325
Winnipeg, Manitoba
Canada R3B 0T4

Tel: +1 (204) 958-7700
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