



Task Force 02

**SUSTAINABLE CLIMATE ACTION AND INCLUSIVE JUST ENERGY TRANSITIONS**

## Knowledge Capacity for Sustainable Infrastructure: a bottom-up approach

Anthony Bartzokas, Professorial Fellow, UNU-MERIT, The Netherlands and Dilek Cetindamar, Professor, UTS (Australia)



---

**TF02**

## Abstract

One of the biggest challenges for development finance practitioners is how to channel the vast pools of global savings to sustainable infrastructure investments. In this paper, we provide an overview of implementation challenges, and we discuss modalities for the development of public and private financing mechanisms for the selection of soft and hard infrastructure projects in the Global South. Our focus is on best practices and bottom-up solutions into government systems and programmes or into private sector offerings. We recommend the introduction of capacity building initiatives for scaling up sustainable infrastructure investment. Enhanced local investment capabilities can lower investment and implementation risks. This bottom-up approach allows investment priorities to be tested, adapted, and co-created at a small scale to evaluate their scale-up potential. Local governments gain a sense of the technical, financial, and economic parameters before entering the investment phase and local actors accumulate knowledge to develop and fine-tune investment projects to local conditions. In this scheme of things, space embedded institutions are enablers of local social and economic development.

**Keywords:** Sustainable Infrastructure, Development Finance, Capacity Building, Bottom up Investment

## Diagnosis of the Issue

Infrastructure is a diverse field that covers transportation infrastructure, such as roads, railways, and bridges; social infrastructure, such as hospitals; and energy and sanitation infrastructure. The rationale for investment in infrastructure includes economic growth and urbanisation; the digitalisation of (smart) cities and infrastructure; increased focus on resilient infrastructure, a move to renewable energy sources; and investment in health infrastructure. However, the quality, quantity, and accessibility of economic infrastructure in Low Income Countries lag considerably behind those in advanced and emerging market economies, with the gap particularly large in the power sector. Firm-level data compiled by the World Bank as part of the Enterprise Surveys confirm the presence of large gaps in access to electricity, water, and transportation infrastructure, and indicate that such gaps are an actual constraint on real economic activity (Gurara et al, 2017).

One of the biggest challenges for global financial markets today is how to channel the vast pools of savings that are now invested in low or (even negative) yield fixed-income assets—as much as \$17 trillion in 2019—to the higher return sustainable, infrastructure investments in emerging markets. Achieving the Sustainable Development Goals (SDGs), the objectives of the Rio Conventions and recovery from the COVID-19 pandemic requires localised approaches and transforming towns and cities into inclusive, resilient, and sustainable growth centres. This is particularly the case in less developed regions but also holds true for urban centres. The lack of productive, service-oriented infrastructure in urban and rural areas is a key obstacle to local development and economic transformation (Dash, et al. 2021). Yet, flows of public and private

development and climate finance reaching local governments remain scarce. Strong domestic capital markets, local fixed-capital formation and expanded local fiscal space are instrumental for the critical transition to higher productivity and green and inclusive local economies (Arezki, et. al, 2017).

Another related infrastructure concern is disasters in the era of climate change. SDG 11 is about Sustainable Cities and Communities, which focuses on making cities and human settlements inclusive, safe, resilient, and sustainable. It directly addresses disaster risk reduction by emphasising the need for resilient infrastructure, disaster preparedness, and effective response to natural and human-made hazards. Natural and human-made disasters are expected to increase, with a major threat to developing countries. For example, the United Nations Environment Programme (UNEP, 2024) has indicated that the cost of adapting to climate change in developing countries could range from \$140 billion to \$300 billion annually by 2030, escalating to \$280-\$500 billion annually by 2050. These figures underscore climate change's significant financial burden on the world's most vulnerable nations. That is why building strong local capacity for infrastructure will help immediate and sustained international cooperation and investment in adaptation and mitigation strategies when disasters hit (United Nations, 2021).

## Recommendations

In August 2021, the G20 countries announced a reported \$3.2 trillion of stimulus funding, amounting to 3.2 percent of their GDP, to infrastructure investment, which would result in the largest push for infrastructure investment in many decades and imply a 45 percent increase in annual infrastructure investment<sup>1</sup>. The G20 countries have been proactively exploring policy options and market-based solutions that could support this expansion. The relative importance of infrastructure in terms of scale and impact is beyond any doubt. The proposed sectoral approach on capital constraints and decentralised investment capacity provides a high-level framework for the implementation of sustainable infrastructure projects in G20 countries and offers useful guidelines for the support of scaling up infrastructure in less developed countries.

Economists have long puzzled over why so little capital from advanced countries, with saturated capital markets and limited investment opportunities, is flowing to emerging market countries, with high growth potential and abundant investment opportunities. The economic characteristics of infrastructure make it special. Infrastructure exhibits externalities that benefit the economy but may not necessarily benefit private investors. Secondly, infrastructure can be a natural monopoly and subject to regulation that comes with political risk. Thirdly, the cash flow profile is back-loaded, risks are front-loaded,

---

<sup>1</sup> Global Infrastructure Hub. 2021. “With USD 3.2 trillion in investments announced, G20 governments are leveraging infrastructure’s transformative potential to achieve greater social, environmental, and economic outcomes.” Published 4 November. Assessed 1 March 2024. <https://www.gihub.org/knowledge-hub/>

and the investment is illiquid. This means that while infrastructure investment might be profitable for the economy, private returns are not always sufficient without public support.

Common reasons cited are emerging market countries' greater instability and inadequate property rights protections for investors, including the possibility of capital controls during financial crises (Acharya, Parlatore, and Sundaresan, 2022). But another important reason is the lack of development in capital markets in emerging market economies. Stock and bond markets are small in relative terms, and most emerging market economies have financial sectors that are dominated by banks.

Furthermore, only a handful of banks have a global presence. And because such banks cater mostly to the needs of multinational corporations, they are not set up to channel savings from assets owners in wealthy countries to long-term investments in emerging markets, especially since the financial crisis and the imposition of tighter prudential regulations that have the effect of penalising investments with a long payback period.

Given limited public financing in most of countries, the introduction of innovative measures to attract private sector capital will be crucial to overcoming the infrastructure financing shortfall (Avellan et al., 2024). Attracting institutional investors such as insurance companies and pensions, which are characterised by long-term investment horizons of 10-20 years, will be particularly important to large-scale infrastructure development. Similarly, it will be important to address financial systems propensity to invest in short- to medium-term projects consistent with the structure of their assets and liabilities. In short, there is a major institutional gap in the global financial architecture that prevents the efficient allocation of capital around the world (Basílio, 2014).

An additional benefit of a bottom-up perspective comes from its role in enhancing the advantages of Public-Private Partnerships (PPPs), a mechanism used to leverage the strengths and resources of both the public and private sectors (Koh, 2018). PPPs enable the mobilisation of private sector capital for public infrastructure projects, which bridges the infrastructure funding gap without immediately straining public finances and sharing the risks associated with infrastructure development between the public and private sectors. In other words, PPPs can make projects more viable and attractive to private investors. The bottom-up perspective could improve PPPs by underlying the role of local expertise in managing and executing infrastructure projects efficiently, leading to cost savings, shorter project timelines, and higher-quality outcomes (Kouassi, Smith, and Cuervo, 2023). Simply put, PPPs strengthen the soft infrastructure by facilitating the transfer of knowledge and skills to the public sector and local workforce as well as enhancing local capabilities in infrastructure development and maintenance.

Therefore, the case of soft infrastructure, such as education systems, needs further consideration. Unlike hard infrastructure, which includes physical assets like roads, bridges, and railways, soft infrastructure encompasses the services, institutions, and frameworks necessary for a country's sustainable and equitable operation. This is because soft infrastructure, the intangible components of the infrastructure ecosystem, supports the efficient functioning of a society and economy by improving labour, capital, and total factor productivity. Thus, developing countries should build institutional strength around establishing and managing PPPs by introducing better project preparation, procurement practices, and regulatory frameworks, which are elements of key soft infrastructures (United Nations, 2021).

Further, technological challenges induced by digital technologies are underlying the importance of soft infrastructure. Levels of digital infrastructure in developing countries vary greatly, with large gaps persisting especially in Low-Income Countries, which are characterised by low levels of Internet penetration, low digital usage, large gaps in coverage between urban and rural areas, and high affordability barriers, especially for mobile Internet (Cetindamar and Burdon, 2024). The COVID-19 crisis underscores the critical nature of digital connectivity and digital services in supporting resilience and business continuity while the mobile revolution in Asia and Africa has demonstrated how communication technology can bring efficiency gains and essential services to people without requiring large infrastructure investment as in the age of fixed-line telephony (Strusani and Hounbonon, 2022). Immediate actions may include the provision of working capital or equity investment, especially for independent operators, in broadband sectors in the most challenging emerging markets. Such actions could help soften the shocks and preserve the competitiveness of the digital sector. Financing support could enhance market competitiveness as operators in need will be those that are ensuring market contestability. Medium- to long-term plans could seek to strengthen resilience and inclusiveness of the digital infrastructure sector by supporting investment in redundant digital infrastructure and enabling expansion of Cloud services providers and broadband operators in hard-to-reach areas. More public-private partnership (PPP) projects could require financing because of increased government interventions in the digital sector. However, these financing projects cannot automatically deliver the expected benefits if users of these technologies cannot have the capabilities to enact the opportunities offered by digital technologies.



## Scenario of Outcomes

A variety of mechanisms are being used to stimulate sustainable private participation in infrastructure. Most of these efforts involve some form of “blended finance,” the use of concessional or near-concessional funding to reduce private sector risks associated with infrastructure projects, thereby catalysing more private sector investment, especially via PPPs. But the large amounts of subsidy funding needed to make many of the PPPs in developing countries commercially viable raises questions about how much subsidy support for private investment is optimal, and how that optimality is determined (Gardner and Henry, 2023).

What are the implications, in terms of costs and risks, of using large amounts of subsidy money to attract private sponsors, operators, and investors to infrastructure projects? Should such projects be structured as PPPs, or traditional public sector projects, owned and managed by the public sector? What kinds of hybrid project structures are possible? And how cost effective will this use of blended finance be in attracting private sector support for the achievement of targets like the SDGs?

The first step in the process is the preparation of bankable, investment-ready projects that are suitable for financing. This is essential for success, as poorly prepared projects will likely fail to secure investment, face significant delays and increased costs as issues are addressed and may ultimately be scrapped. Even if financing is secured, unless structured correctly it may be financially unsustainable and could leave the municipality (and its citizens) holding significant debts it may struggle to fund. A well-prepared and bankable project, on the other hand, will be much more likely to secure affordable financing and move rapidly into procurement and implementation. It will also build

confidence amongst financiers in the municipality, increasing the likelihood they will invest in other projects and helping to close the infrastructure gap (Pegon, 2022).

The amount of work required in creating a bankable project can often be quite substantial in practice, as many municipalities lack the internal technical expertise to develop project ideas beyond an early-stage concept and may not be able to undertake the necessary feasibility studies, project structuring reviews and approvals needed before it is ready for investment (Stuart and Gallagher, 2018). Specialised technical expertise is often required from external organisations, such as consultancies and engineering firms, which can be very expensive. Alternatively, cities can recruit and/or train staff with the necessary expertise, but this can be equally expensive and there may not be enough projects to justify their cost.

As a result, the associated costs tend to be between 5–12% of the total investment needs of an infrastructure project, running into millions (or tens of millions) of dollars depending upon its scale and complexity. Where cities have funds available, these costs are usually be considered a justifiable expense, to later be recovered partly or fully through the project once financing has been secured. Unfortunately, the majority of cities and municipalities rarely have the funds available to pay for this support directly (Clarke Annez, Huet, and Peterson, 2008).

Our preferred approach is to focus on capacity building that could enable bottom-up approach where development finance practitioners could scale up sustainable infrastructure investment with the active involvement of local partners. The global public goods literature suggests a participatory governance to be carried out at the lowest possible level at which they can effectively and efficiently be dealt with (Kaul, 2019). Thus, capacity building initiatives are catalytic in blending both financial engineering



insights and financial capabilities with allocation and management of capital considerations. An innovation economics perspective will add value to assessment matrices, benchmarks for market participants and future project structuring that could enrich the creative cooperation with local actors. The collaboration of experts from local, national, and international levels results in enhanced opportunities for learning, flexibility and periodical adjustment in light of shared information. In addition, enhanced local management capabilities can lower investment and implementation risks for bottom of the pyramid applications (Bartzokas, 2022).

A bottom-up perspective for space-based policy initiatives adds value at three key levels.

First, better understanding of local credit and risk capital conditions. Generic awareness and a template for the assessment of gaps facilitates the interface and information sharing between financial intermediaries and firms.

Second, streamlining the selection of financial instruments for local development with market-based criteria or objective oriented priorities. This process leverages existing experience in financial institutions and has a strong capacity building element with improvements of financial reporting, more options for risk mitigation and the introduction of new funding instruments (for example, social bonds).

Third, proactive adjustment to capital reallocation driven by top-down policy initiatives. For example, the assessment of project cycles in the framework of building back better initiatives feeds in better policy sequencing supported by local/regional coordination platforms.

This bottom-up approach allows investment priorities to be tested, adapted, and co-created at a small scale to evaluate their scale-up potential. Local governments gain a sense of the technical, financial, and economic parameters before entering the investment phase and local actors accumulate knowledge to develop and fine-tune investment projects to local conditions. In this scheme of things, space embedded institutions are enablers rather than regulators of local social and economic development.

## References

- Acharya, Viral V., Cecilia Parlatore, and Suresh Sundaresan. 2022. *Financing Infrastructure in the Shadow of Expropriation*. NBER Working Paper Series no. 30131. Boston: NBER.
- Arezki, Rabah, Patrick Bolton, Sanjay Peters, Frederic Samama and Joseph Stiglitz. 2017. “From global savings glut to financing infrastructure.” *Economic Policy* 32, (April): 221–261.
- Avellan, Leopoldo, Arturo J. Galindo, Giulia Lotti, and Juan Pablo Rodríguez. 2024. “Bridging the gap: Mobilization of Multilateral Development Banks in Infrastructure.” *World Development* 176: 1-24.
- Bartzokas, Anthony. 2022. *Finance and Innovation: From Joseph Alois Schumpeter to Rhino Bonds*. UNU-MERIT Policy Brief no.1. Maastricht: MERIT.
- Basílio. Maria S. 2014. “The Determinants of Multilateral Development Banks’ Participation in Infrastructure Projects.” *Journal of Infrastructure Development* 6, (2): 83–110.
- Cetindamar, Dilek, and Steven Burdon. 2024 (Forthcoming). “Digital Leadership and Policy Making: Lessons from Indonesia, Malaysia, South Korea.” In *Digital Leadership: Concepts and Cases*, edited by J. Mark Munos, Chapter 4. Cheltenham, UK: Edward Elgar Publishing.
- Clarke Annez, Patricia, Gwénaelle Huet, and George E Peterson. 2008. *Lessons for the Urban Century: Decentralized Infrastructure Finance in the World Bank*. Directions in Development; Infrastructure Series. Washington, DC: World Bank.

Dash, Priyadarshi, Paulo Esteves, Rob Floyd, Arthur Minsat, Aloysius Uche Ordu and Cobus van Staden. 2021. *G20 Support for Improved Infrastructure Project Cycles in Africa*. G20 Policy Brief, 2021.

Gardner, Camille, and Peter Blair Henry. 2023. “The Global Infrastructure Gap: Potential, Perils, and a Framework for Distinction.” *Journal of Economic Literature* 61, (4): 1318–1358.

Gurara, Daniel, Vladimir Klyuev, Nkunde Mwase, Andrea Presbitero, Xin Cindy Xu, and Geoffrey Bannister. 2017. *Trends and Challenges in Infrastructure Investment in Low-Income Developing Countries*. IMF Working Paper 233.

Kaul, Inge. 2019. “Conceptualizing Global Public Policy: A Global Public Good Perspective.” In (eds), *The Oxford Handbook of Global Policy and Transnational Administration*, edited by Diane Stone and Kim Moloney, 257–273. Oxford: UK: Oxford Handbooks.

Koh, Jae Myong. 2018. *Green Infrastructure Financing: Institutional Investors, PPPs and Bankable Projects*. London: Palgrave, Macmillan.

Kouassi, Noé K., Heidi Jane M. Smith, and Rocío Huerta Cuervo. 2023. “Insights on Co-Creation in Mexico: Challenges to its Application of Public-Private Partnerships.” *International Review of Public Administration* 28, (2): 242–254.

Pegon, Matthieu. 2022. *Mobilizing Beyond Leverage: Exploring the Catalytic Impact of Blended Finance*. Washington, DC: IDB Invest.

Studart, Rogerio, and Kevin Gallagher. 2018. “Guaranteeing Sustainable Infrastructure.” *International Economics* 155, (October): 84–91.

Strusani, Davide, and Georges V. Hounghonon. 2020. *What COVID-19 Means for Digital Infrastructure in Emerging Markets*. Washington, DC: IFC Note 83.

UNEP. 2024. *Annual Report 2023: Keeping the Promise*. New York: United Nations Environment Program.

United Nations. 2021. *Managing Infrastructure Assets for Sustainable Development: A Handbook for Local and National Governments*. New York: United Nations.



# Let's **rethink** the world

