



A practical toolkit embedding infrastructure asset Management into the Planning and Budgeting Processes of Local Governments

Authors: Qianzhi Cheng, JongKyu Chung, Yuwei Xie, Yeqi Niu, Junzhe Yu

Faculty Advisor: Isabelle Delalex

Research Context and Objectives

This research report has been carried out as part of an academic consultancy project for The Financing for Sustainable Development Office in the United Nations Department of Economic and Social Affairs (UNDESA) with the objective to inform their multi-stakeholder dialogues on government's strategies to mobilize sustained resources for infrastructure asset-related expenditures over the entire asset's lifecycle and in line with the intended asset-related service delivery and financial performance goals.

This report builds on an ongoing UNDESA initiative to develop materials highlighting national and local governments' good practices aimed to foster the resilience, sustainability and accessibility of existing and planned infrastructure investments.

To undertake the research, the team adopted a detailed literature review of publicly available data including sector specific studies, company specific research and experts' interviews on infrastructure asset management financing (IAM). The report explores topics on infrastructure finance, asset lifecycle management, the role of local governments and budget cycles while highlighting good practices to incorporate resources needed for the lifecycle management of sub-national assets designed to strengthen capacity of sub-national governments and municipalities deploying sustainable provisions of dependable services. This analytical paper will complement the guidance provided in "Managing infrastructure assets for sustainable development - A handbook for local and national governments". Under the working definition of IAM: "Optimal funding and pricing strategy for public asset managers to mobilize sustained funding of all infrastructure asset related expenditures over its entire lifecycle and in line with all desired asset-related service delivery and financial performance goals", the following explores the benefits of IAM Finance, with a focus on:

- a. Subnational sources of finance and how governments acquire them
- b. Challenges and suggestions associated with the process of disposal of an asset
- c. Long-term objectives and how to achieve them
- d. Constraints and solutions throughout the infrastructure life cycle
- e. Tools to strengthen and support IAM finance

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I. Subnational sources of finance

To finance their infrastructure management, subnational governments (SNGs) rely on two major sources: **own-source revenues and external financing.**

A. Own-source revenues

Own-source revenues include property, sales, and other taxes; charges and fees; and transfers from federal and state governments to subnational governments. Own-source financing is a flexible way to secure infrastructure funding and operational control. However, in many countries, particularly developing ones, the share of own source revenues is less than 10 percent of the total local governments' budgets. With limited fiscal revenues available, own-source financing is rarely a sufficient source of revenues for the government to finance large scale infrastructure projects. In most cases own-source revenues are applied to fund operational/maintenance expenditures.

1. **Suggestions:** Many countries finance sustainable "green" infrastructure by levying specific taxes, tariffs, energy and environmental taxes to discourage environmentally unsustainable assets management. However, developing countries are only able to raise a small share of taxes¹. A key part of funding infrastructure might be through the creation of community development and renewable energy tax incentives, as well as creating new tax-based tools to create incentives to fund sub-national assets. To that end, the cost-benefits of deploying low-income infrastructure tax credits, rehabilitation/preservation/maintenance tax credit for qualified infrastructure producing public goods, renewable energy investment tax credit and production tax credit should be considered. Similarly, the use of own-source financing to finance local infrastructure could qualify municipalities to be exempt from state and federal taxes on revenues generated by these assets.

¹ Besley, Timothy, and Torsten Persson. 2014. "Why Do Developing Countries Tax So Little?" *Journal of Economic Perspectives*, 28 (4): 99-120

2. Case study: Palmas solar program in Brazil

Located in the northern region of Brazil, the city of Palmas was founded in 1989 and is home to approximately 300,000 residents. Given the limitations of hydroelectric power, and the need to ensure quality of life and economic opportunities for its growing population while protecting the environment, the city adopted a development strategy including solar power capacity building starting with the Palmas Solar Project in 2015.

The program aims to encourage private electricity consumers to produce their own solar energy. To that end, the city offers a tax incentive for legal entities or qualified individuals to install photovoltaic panels in their houses or businesses. For a period of 5 years, beneficiaries receive a discount of up to 80 percent in municipal taxes - the Property and Urban Land Tax (IPTU), which is paid by all property owners in urban areas in Brazil, and the Real Estate Transfer Tax (ITBI), related to property sales. The technology consists of decentralized solar photovoltaic systems connected to the state electricity grid, enabling the final consumer to replace the expensive electricity from the grid with the electricity generated from the solar PV systems. The program also enables excess electrical power produced to be sold back to the grid.²

In 2020, the Palmas solar program enabled the solar capacity of 3,843.88 kWp, and the number of beneficiaries grew to 400 households corresponding to the reduction of 16,000 tCO₂ emission. The project produced economic stimulus. As of October 2020, the city has granted a tax credit of R\$415,785 (about US\$72,400). As a result, more than 20 photovoltaic companies were established in Palmas, increasing the level of corporate tax revenues necessary to offset the cost of the subsidies granted by the city.

The coordination of energy strategies and a stable municipal revenue base are the foundation for the success of the tax incentive policy. The Palmas solar project is in accordance with the national energy strategy and is legally incorporated into the

² Prefeitura Municipal de Palmas-TO (2018) *Energía Limpa, Caso Programa Palmas Solar*; Programa Internacional de Cooperación Urbana (IUC). Available at: http://iuc-la.eu/wp-content/uploads/2020/03/POR_Palmas__TO_-_Programa_Palmas_Solar.pdf

municipal budget. Therefore Palmas is able to implement tax incentives and ensure that the program is sustainable over time.

B. External financing

External financing for SNGs includes equity, bonds, loans and public private partnerships. External financing allows SNGs to access significant lump funding sources to cover the cost of infrastructure construction. It also allows SNGs to service periodic debt payments from operational revenues. However, subnational borrowing, particularly in developing countries, introduces risks to the creditor country's macro stability and fiscal sustainability. Furthermore, local governments have limited access to global capital markets, in part because creditors ask for a yield premium for exchange rate, liquidity and credit risks.

1. **Suggestions:** Cooperation and partnership is critical to increasing SNGs' resilience to financing shortfalls. However, SNGs in developing countries tend to lack infrastructure management capacity and pitching opportunities to attract external funds like multi financial institutions and private investors. Local governments in developing countries can foster investor confidence and attract private funding by demonstrating a clear development strategy and capable governance. Introducing financial innovation mechanisms, including but not limited to the issue of municipal green bonds, blended finance, leveraged mezzanine finance has successfully, in some regions, embedded resilience and sustainability in infrastructure projects, while at the same time, local governments coordinate development strategies with central governments, develop bankable projects to attract international funding for infrastructure projects from global financial markets.

2. Case study: Urban construction investment bonds (UCIBs) in China

Prior to 2014, the Budget Law prohibited local governments in China from borrowing on their own. To borrow funds and carry out urban development projects, local governments formed local government financial vehicles (LGFVs).

LGFVs are established as financial arms of local governments to circumvent restrictions and central supervision. LGFVs are pass-through entities enabling the issue of urban construction investment bonds; their issue provides local government funding to support their urbanization process. This financial engineering is well-suited to finance infrastructure finance and local government debt.

UCIBs is considered an emerging asset class in the Chinese financial industry. Qualified LGFVs have the support of the local government to issue urban construction investment bonds (UCIBs); they provide collateral in the form of state-owned assets. Bond rating agencies monitor the LGFV's loans' performance until they are redeemed. Local governments utilize state-owned property as collateral to improve the credit worthiness of LGFVs, lowering their liability-asset ratio.³ Local governments also provide bank issued commitment letters⁴ as guarantees to enhance the credit of Chengtou bonds.

As the use of LGFVs became more common to structure fundings raised through the Chinese financial market, local governments provided LGFVs with capital and guarantees. As a result, LGFVs' debt level increased. The accumulated debt of LGFVs is repaid through the issue of local government bonds. Although UCIBs generally have a low default risk, to mitigate the risk of default, some UCIBs, located in regions with low economic growth, have formed a mechanism that pledges the mortgages of existing infrastructure assets as a collateral to repay potential

³ K.Y. Tsui. China's infrastructure investment boom and local debt crisis. *Eurasian Geogr. Econ.*, 52 (2011), pp. 686-711, 10.2747/1539-7216.52.5.686

⁴ F. Liao. Quenching thirst with poison? Local government financing vehicles — past, present, and future. B.L. Liebman, C.J. Milhaupt (Eds.), *Regulating the Visible Hand?*, Oxford University Press, New York (2014), pp. 69-84

underperforming loans. Thereby, transferring the credit risk from the municipality to the LGFVs, and then, back to government owned entities⁵.

3. Case study: Ahmedabad green municipal bond in India

In 2015, India's central government launched the Atal Mission for Rejuvenation and Urban Transformation (AMRUT) program, which incentivizes local governments to issue municipal bonds to build solid robust sewage networks and water supply infrastructure. SNGs can issue bonds with a long tenor of 10-20 years, with suitable issue sizes for large-scale projects. In 2017, the Securities and Exchange Board of India (SEBI) eased regulation on the issuance of municipal bonds in order to boost such bond markets. It allowed municipalities with a surplus in their books in three immediately preceding financial years to issue public debt securities.

In January 2019, Ahmedabad, the largest city in the state of Gujarat, raised 200 crore Indian rupees (INR) (about \$26,2 million) issuing municipal bonds, for 'green projects', with a maturity of five years, and coupon interest rate of 8.7 percent.⁶⁷The municipality raised the funds for waste management, water supply and other infrastructure projects, including the cleaning of its Sabarmati River. The Ahmedabad Municipal Corporation (AMC) listed its bonds on the National Stock Exchange of India for projects to be implemented under the central government's AMRUT scheme.

There is a high demand for these financial products with a AA+ rating from both a global (CRISIL) and an Indian (India Ratings) credit ratings agency in the 2018-2019 fiscal year. AMC's bonds were oversubscribed 5.42 times. Since 2008, Ahmedabad has developed 31 projects within budget, as part of Jawaharlal Nehru National Urban Renewal Mission (JNNURM).

⁵ Yi Feng, Fulong Wu, Fangzhu Zhang, The development of local government financial vehicles in China: A case study of Jiaying Chengtou, Land Use Policy, 2020, 104793, ISSN 0264-8377, <https://doi.org/10.1016/j.landusepol.2020.104793>.

⁶ Manikandan, A. (2019). 'Ahmedabad Municipal Corporation raises Rs 200 crore via bonds'. ET Markets. (11 January 2019). Retrieved from: https://economictimes.indiatimes.com/markets/bonds/ahmedabad-municipal-corporation-raises-rs-200-crore-via-bonds/articleshow/67491868.cms?utm_source=contentofinterest&utm_medium=text&utm_campaign=cppst

⁷ Basumatari, A. (2019). 'India Ratings Assigns Ahmedabad Municipal Corp's Bonds Final 'IND AA+(SO)'/Stable'. India Ratings and Research. (23 January 2019). Retrieved from: <https://www.indiaratings.co.in/PressRelease?pressReleaseID=35630&title=India-Ratings-Assigns-Ahmedabad-Municipal-Corp%E2%80%99s-Bonds-Final-%E2%80%98IND-AA%2B%28SO%29%E2%80%99%2FStable>

Ahmedabad's success highlights the feasibility of issuing small green municipal bond issues to fund sub-national green infrastructure. While local governments have had to demonstrate good operational performance, financial health and strong governance, the decentralization of government and regulatory changes easing the issuance process of municipal bonds, supervised by the Securities and Exchange Board of India (SEBI), contributed to municipal governments' success to access funding through the bond market.

4. Case study: Structured debt fund in Addis Ababa, Ethiopia

The aim of transit-oriented development (TOD) is to create a livable urban environment by improving the integration between land-use and transportation systems. The capital city of Ethiopia, Addis Ababa, sought to promote a sustainable transportation system by launching its first light rail transit (LRT) network to control the current pattern of increased congestion and to meet the need for mass transport.⁸ It is the first light rail and rapid transit in eastern and Sub-Saharan Africa.

To manage risks associated with such large investments, the Development Bank of Ethiopia, along with the Ministry of Finance and Economic Affairs, created a structured debt fund, designed to allocate funds from a variety of investors based on their funds' strategy, risk appetite, and return expectations. The Government of Ethiopia takes higher risk positions than commercial banks. When development projects are unable to repay their loans, the government absorbs the first losses.⁹ While this is a national level fund, the local government is responsible for the debt structuring and fund allocation.

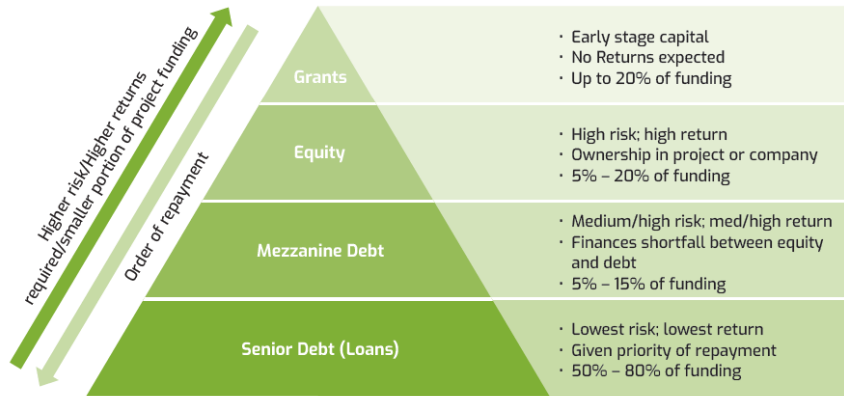
Notably, financing infrastructure with structured debt funds is a new funding approach and unprecedented in Ethiopia, bringing the challenge to attract private investment by improving project management capabilities and preparing regulatory frameworks. Though there is investor's interest, lack of historical performance data for structured debt prevents significant institutional investors from subscribing to the issue. As a result,

⁸ Teklemariam, E. A., & Shen, Z. (2020). Determining transit nodes for potential transit-oriented development: Along the LRT corridor in Addis Ababa, Ethiopia. *Frontiers of Architectural Research*, 9(3), 606-622.

⁹ Public NAMA (n.d) NS-167 - Ethiopia Railway's Addis Ababa Light Rail Transit, Transit Oriented Development. Available: <https://www4.unfccc.int/sites/PublicNAMA/layouts/un/fccc/nama>NamaSeekingSupportForPreparation.aspx?ID=102&viewOnly=1#> [2019, September 3].

85% of the \$475 million final cost of the railway had to be financed with a concessional loan from Export-Import Bank of China.

Indicative composition of different types of finance for projects



Source: ICLEI Africa

II. Asset life cycle and budget cycle

Selling infrastructure to private investors upfront is an effective way to improve the fiscal position of a government and raise large sums of capital, but the mechanism may not serve public interests, in the long-term. However, privatization can be less problematic, if there are mechanisms in place to ensure transparency in pricing to establish the fair value of the asset and transparency in engineering the privatization deal, and the allocation of the funds received from the sale.¹⁰ To ensure transparency, it is advisable to hire independent advisors or auditors to monitor the integrity of the bidding process. To establish the fair value of the asset, the discount rate used should be based on a relevant benchmark for the asset. Finally, the dispersion of the sales proceeds needs to be documented and made publicly available. To illustrate the disposal of public owned assets that met these criteria, this research chose a case study from a developed country, not to suggest that such an approach is a blueprint for developing countries rather to illustrate a robust example of privatization highlighting the benefits of addressing the factors aforementioned. This case study also speaks to the challenges and opportunities a state or municipality considers to determine if it should sell an asset to the private sector; and the bidding mechanism it might consider to protect public interests and provide value.

¹⁰ William Blake & Company. (2009). Chicago Metered Parking System Transaction Summary and Valuation Analysis

A. Transfers of an asset to mitigate liquidity risk and funding gaps

In 2008, the city of Chicago confronted two problems. First, a fiscal deficit, imputed to the reduction of tax revenues and subsequent higher yield premium on municipal bonds expected by investors. Secondly, the city had liquidity challenges to meet pending principal and interest bond payments. To be solvent, the city decided to sell one of its troubled assets to private investors, a concession of parking metering systems for seventy-five years. The investor agreed to pay \$1.15 billion up front. With other parking system deals, the city was able to collect \$3.6 billion. It allocated \$3.6 billion to long-term service funds to guarantee the revenue stream expected from the meter rates; it also allocated \$925 million to retire existing debt; \$700 million for mid-term budget relief and \$322 million for community improvement. As a result, the city's solvency and improved fiscal position enhanced its credit rating from credit agencies, thus, the city's borrowing cost decreased and its capacity to raise funds in debt markets increased¹¹.

B. The process to value an asset

The city implemented several measurements to come up with the dollar value. First, it employed an independent advisor to value the asset. The advisor adapted a conventional valuation approach of long-term free cash flow and cost of capital. The expected value came up from a model which incorporated the probability of occurrence that could influence the future cash flow. The city and advisor took the discount rate in a published research paper for infrastructure assets. It categorized the risks into three categories: very low (Discount rate of 7.06%), low (8.26%) and medium (10.4%). Though parking was in the low-risk category, the advisor adjusted risk rating to medium due to the additional risks: the concession required intense capital investment. The metering system had its own unique risks which could not be diversified or spread, which will be discussed later. Then, the discount rate was compared to the appropriate market rate. Risk-free rate was referenced to the then-current yield on a 30-year treasury bond of 4.59% and adjusted for the longer term.

¹¹ William Blake & Company. (2009). Chicago Metered Parking System Transaction Summary and Valuation Analysis

Risk-premium was referenced to A-rated corporate bonds which had a risk-premium of 3% to 5% at the moment. The valuation came up with a minimum of \$650 million, maximum of \$1.2 billion and the sales threshold of \$ 1.0 billion. If the bidding price was below the threshold, the city would withdraw from the bidding. Secondly, the city requested for qualification to 150 potential investors and qualified 6 bidders. In the first round of bidding, there were two prominent bidders, whose bids were 10% apart from each. The city saw this as a sign of a further possible increase in the bidding price and went on to the second round. Chicago Parking Meters, LLC. eventually won the bid with the price of \$1,156 billion. It was near to the \$1.2 billion on the high-end¹².

C. Strategy to place bids

Investors can take market risks but unmitigatable long-term externalities can jeopardize the acquisition of public assets. In the case of the Chicago metered parking concession, investors were exposed to two major challenges. Investors had limited risk mitigating solutions for variables shaping the infrastructure of the City of Chicago that were expected to change. Demand for parking space is considered to be inelastic in general. If municipalities' decisions limit parking fees or locations, private management's decisions are constrained and may have no material impact on customer's demand and profitability of the concession may be limited, or negative. The city remodeling of its traffic system may indeed negatively impact future cash flows. In Chicago, an approximated 75% of the metering rates of the parking spaces had not increased for two decades¹³. Without a significant increase in the metering rate system, the parking concession would not be profitable. The rates needed to be normalized but normalization would mean taking into account 20 years of CPI growth rates in a short period of time. Moreover, normalization might not be possible if the city decides that the normalization of parking rates interferes with the public interest. And there are no effective financial products that can mitigate such risks over 75 years. If lower returns motivate investors to sell, only a few investors with patient large capital might be interested to buy. To sell the parking concession the city needed to

¹² William Blake & Company. (2009). Chicago Metered Parking System Transaction Summary and Valuation Analysis

¹³ William Blake & Company. (2009). Chicago Metered Parking System Transaction Summary and Valuation Analysis

share investors' downside risks to place their bids. To that end, the city provided several layers of protection to investors. It agreed to predetermined scheduled parking rates until the expiration of the concession. If the city determined that metering rates adopted by the investors were deviating from the predetermined rates, it was contractually obligated to pay the gap between scheduled and actual parking rates, to investors. The concession agreement also includes a "Reserved Powers Adverse Action Compensation" provision that reserves the city's right to change the environment or business structure of the parking system. If the city right to remodel the traffic system or removing parking space would incur a loss in parking fee revenues, the city agreed to compensate investors for incurred losses¹⁴.

D. Safeguards to protect the welfare and interests of the public

The city announced privatization guidelines to serve the interest of the public. Those are still used by the city in asset transfer transactions. The guidelines highlight that privatization of assets must present substantial benefits to the Chicago tax payers and residents; that the assets involved do not affect the core competencies of City government; and that experienced and professional operators will improve efficiency, quality of service and make enhanced capital investments in the assets. The city is required to maintain transparency and foster robustness in the bidding process as well as in the planning of the uses of the sales' proceeds. In this case, the city of Chicago included protective provisions in the concession agreement, including performance standards enabling the system to operate properly. To that end, the metering rates after the first five years have been capped to prevent the rates spiraling out beyond affordable¹⁵.

¹⁴ City of Chicago and Chicago Parking Meters, LLC. (2013). Amended and Restated Chicago Metered Parking System Concession Agreement (With First and Second Amendment Changes)

¹⁵ William Blake & Company. (2009). Chicago Metered Parking System Transaction Summary and Valuation Analysis

E. Concession deal impact

Following the concession, the city increased its access to debt funding. It's transportation system became more efficient. Before the concession, on-street parking meter rates were lower than off-street parking meter rates, thereby incentivizing drivers to cruise for empty parking space, creating traffic congestion, longer travel times and air pollution. It also unintentionally subsidized drivers at the expense of the public transportation system. Increased metering rates would have discouraged driving and incentivized the use of public transportation. The city was also able to avoid public resistance to the rate increase while transferring investors' risks stemming from the decrease in demand or obsolete technology. Finally, the city no longer incurred capital expenditures and operating expenses¹⁶.

This case highlights mechanisms enabling the robust privatization of assets that are initially un-investable, while developing countries' governments with liquidity risk and funding gaps may face different challenges, their consideration for risk-sharing incentives with investors may facilitate the sale of their un-investable assets. While it may be unfeasible to transfer all risks to the private sectors without a deep discount on the asset price, risk sharing, guarantee transparency and bid up the price, might attract investors. Second, a conservative approach to estimate the value is recommended. Lastly, evidence points that non-financial positive externalities from robust transferring of an asset to the private sector benefit the public interest in the long-run.

III. Long term objectives of IAM finance, their benefits and implications for infrastructure asset managers

C. Achieving optimal utility from assets, through adequate repair (e.g.: safe, reliable, asset users benefits, environmentally sustainable)

1. Benefits: Asset maintenance and rehabilitation can extend asset life, save operational costs in the medium and long term, and provide economic, social, and environmental

¹⁶ Richard M.Daley. (2009). *Chicago Parking Meter Facts*

benefits to users¹⁷. Routine maintenance fixes and capital maintenance enhancements are included in optimal maintenance regimes. However, asset related data capture and modeling are significant challenges to manage assets for full, efficient and impactful utilization.

2. Recommendation(s) for consideration:

Asset management practices can be combined with condition assessment tools using Artificial Intelligence (AI), specifically Machine Learning programs understanding the impact of an asset's unplanned failure while streamlining operations, providing better services, minimizing waste, and creating positive impact by combining a data driven asset management approach aligned with the SDGs.

The use of an AI or Machine Learning approach in sub-national asset management is in its infancy, but has been successful based on its use in the water infrastructure sector (to assess the condition of buried water mains while providing a method for aligning maintenance, repair and replacement strategies to better allocate limited resources)¹⁸. Doug Hatler, Vice President of Sales & Marketing at Fracta¹⁹, an AI and Machine Learning water infrastructure management service company, believes that “AI can be used to solve a \$1 Trillion infrastructure problem” (e.g.: aging infrastructure, mismanagement, risks). An AI and Machine Learning approach to infrastructure management would analyze/match/compare collected data with governmental accounting standards guiding state and local governments to report their finances and the full cost of providing public services, including infrastructure. The existence of accounting standards guiding state and local governments²⁰ in assessing the full cost of their infrastructure is therefore essential to the performance of this innovative approach. By tying infrastructure expenditures directly to infrastructure condition, asset managers can substantiate maintenance cost, re-investment or disposal of the assets. The accuracy of such analysis would add robustness and credibility to

¹⁷ B. (2019). *PFM blog: Why Maintaining Public Infrastructure is So Important*. Public Financial Management Blog. <https://blog-pfm.imf.org/pfmblog/2019/05/-why-maintaining-public-infrastructure-is-so-important-.html>

¹⁸ Machine Learning for Water Main Pipe Condition Assessment, by Irene A. Onyeneho, PhD, Product Manager Machine Learning, Data Engineering at Fracta.ai, 2020

¹⁹ <https://www.fracta.ai>

²⁰ E.g.: the GASB 34 Reporting Guideline for Government Financial Statements, <https://www.gasb.org/st/summary/gstsm34.html>

the management of the asset, fostering access to increased funding, with the best credit terms, when needed. Machine learning is already a major trend having an impact on diverse industries from healthcare to airline and agricultural land management. Data driven repair or replacement of assets, would optimize both the performance of sub-national assets and their use of resources. Increasing evidence highlight the value added using GPS²¹ tracking devices to ensure the safe delivery of goods and services to ensure the efficient, safe delivery of goods and services, in various industries : transportation and logistics, construction, government, energy and utilities, agriculture has contributed to data centric management of assets.

The research also highlights the value of third party due diligence audits, and whenever possible, third-party risk advisory companies in maintaining the asset. Using comprehensive risk data analysis to screen and uncover unreported and underestimated risk with the intent to flag potential financial crime and corruption schemes. Providing due diligence reports on company ownership, operating and litigation history, key management executives and decision-makers, prior questionable business conduct, reputation history, and hidden liabilities. If subnational governments increase the frequency of mandating assets' maintenance, legal, and prudential requirements, they could better assess and budget actual maintenance spending as needed. With these changes, they might also be able to fund infrastructure aligning funding deals with capital market's interests through long-term bond market development, superannuation, and pension fund portfolio's allocation in bonds issued for infrastructure development²²

D. Increasing underlying assets' quality and level of service

1. Benefits: Increasing the quality and level of service provided by underlying assets can help assure dependable operations, cost-effectiveness and resilience against man-made or natural disasters. throughout the asset's life.
2. Recommendation(s) for consideration: Asset managers may consider shifting their focus from the physical use of assets to measuring the service delivered as a primary

²¹ <https://www.futuremarketinsights.com/reports/gps-tracker-market>

²² Mueller, S. (2018, October 25). *Three ways to improve the quality of infrastructure investments*. Sostenibilidad. <https://blogs.iadb.org/sostenibilidad/en/three-ways-to-improve-the-quality-of-infrastructure-investments/>

goal of the infrastructure procurement and maintenance, and common size methodology to estimate consistently, appraisal, costs and benefits of assets. Doing so, would facilitate the upgrade/retrofitting of infrastructure, ideally with enhanced resource efficiency and higher use of clean and ecologically sound technology.

Our research shows that the quality and level of service provided by the assets is positively correlated with the maintenance of statewide rules, procedures, access to technical guidance, training and technical assistance contributing to maintenance of the assets based on established quality assurance (QA) and quality control (QC) processes²³. Those may be specific to smaller in scale and scope sub-national rural areas, such as arterial roads. As outlined in UNDESA's "Managing Infrastructure Assets for Sustainable Development: "A Handbook for Local and National Governments", capturing and utilizing the right data and information to ensure the accuracy, quality and quantity of asset information is a collective effort. The performance of QA and QC processes requires a Data Portal as a platform for locating data related to the core value of the assets. The Data Portal could be funded by several regions together or by the State to achieve economies of scale and scope and develop standardized metrics and data uploaded to the portal. Such a Data Portal (e.g.: transportation data portal²⁴) would nevertheless need to be able to manage the data from a diverse group of assets and be administered by an organization with the statutory responsibility to operate/maintain the portal to be accessible online by all regions of the State. The existence of an apex data portal is expected to minimize the costs of collecting, validating and maintaining assets' data.

E. Greening of Assets

1. Benefits: Greening brownfield assets can provide economic benefits by creating employment and thereby increasing tax revenues; as well as encouraging environmental, and social benefits (e.g.: protecting groundwater resources, wetlands, wildlife and fostering key elements of human development). Greening of assets investment is contingent upon investors' perception of risk-adjusted returns. Investors

²³ <https://asq.org/quality-resources/quality-assurance-vs-control>

²⁴ Transportation, land use and integration: Applications in developing countries by I M Schoeman, WIT Press 2017

with limited risk appetites (i.e.: institutional investors) tend to overestimate the risk of new greener technology and new geographies, the combination of real or perceived risk translate into limited supply of investors' capital or the demand for prohibitively, unsustainably high returns.

2. Recommendation(s) for consideration: Both asset managers and governments would benefit from challenging their risk assumptions as part of their due diligence evaluation of brownfield redevelopment initiatives. Assets' valuation would gain from accounting for the impact on risk of environmental externalities. Robust federal and state regulatory requirements would help establish a baseline to assess environmental risk's cleanup costs; enable asset managers to devise strategies to be compliant with the regulatory framework, while also managing bankable projects.

Explore common risk mitigation solutions, for greening brownfield assets from developing and emerging economies, that aim to offset institutional investors' risk concerns and short-termism in delivering returns. In May 2017, the governments of Argentina, Australia, Brazil, Burkina Faso, Cameroon, Chad, France, India, Ivory Coast, Mali, Namibia, Niger, Nigeria, Senegal, Seychelles, Uganda and Yemen agreed to form a Common Risk Mitigation Mechanism (CRMM), which was created to pool multiple risks (political, off-taker, and foreign exchange risk). The CRMM²⁵ is designed to use pooled public resources to crowd in more, newer and cheaper private investment into grid-connected solar assets around the world. The adoption of such mechanisms is still marginal but deserving of investigation to address the urgent need to develop de-risking instruments to bridge the funding gap for green assets in the developing world.

F. Sustainable and resilient Asset

1. Benefits: An integrated long-term management of infrastructure assets that is sustainable and resilient will collect cash flows throughout the asset's life-cycle and more precisely estimate its cost and benefits, maximizing the asset's total worth. Infrastructure investments are long-term, asset-heavy, localized, and relatively

²⁵ Council on Energy, Environment and Water, Confederation of Indian Industry, The Currency Exchange Fund, and Terrawatt Initiative. 2017. Common Risk Mitigation Mechanism Feasibility Report. New Delhi: Council on Energy, Environment and Water

illiquid, hence risky; sustainability and resilience of the asset can be achieved when these risks are hedged.

2. Recommendation(s) for consideration: A life-cycle approach to infrastructure management focusing on increasing the value added of the asset as a public good, that is independent from the interests of shareholders, investors and stakeholders and can deliver material impact to the population it serves. Financing a sustainable and resilient infrastructure, which effectively manages environmental, social and governance (ESG) risk, while supporting the delivery of the United Nations' (UN) Sustainable Development Goals (SDGs) is not only attractive from an investor perspective, it can also mitigate various forms of financial risks. Consideration should be given for the use of a Hybrid Sustainable Infrastructure²⁶ (HSI) Asset Class to bridge infrastructure equity investor interests and debt holder interests under one asset. The HSI Asset Class would raise institutional investors' interest in funding infrastructure projects without needing to know the debt-equity mix. Rather the investment decision will rely on the risk-return profiles of the various HSI Vehicles. Corporate and government policy makers interested to bridge the infrastructure gap are encouraged to harmonize²⁷ and standardize the infrastructure sector in order to improve project comparability.

G. Case Study: User-financed Ecosystem Conservation for Water Security in Ecuador

The Quito Water Fund (Fondo para la Protección del Agua, FONAG²⁸), one of Latin America's first water funds, is an endowment fund that receives money from the government, public utilities, electric companies, private companies and non-government organizations. The fund protects the main water sources of Quito city with

²⁶ Financing Sustainable and Resilient Infrastructure by Creating a New Asset Class for Institutional Investors, the Global Infrastructure Basel Foundation, 2020, <https://gib-foundation.org/resources/>

²⁷ Global Infrastructure Basel, ISCA and ISI to derive from their respective leading standards an Aligned Set of Indicators that synthesizes and captures the sustainability and resilience features of infrastructure projects. This one-of-its-kind collaboration is supported by the Private Infrastructure Advisory Facility (PPIAF), 2020

²⁸ <http://www.fonag.org.ec/web/>

2.5 million people. In addition to this, it supports local communities that live close to the water sources to maintain sustainable watershed management and water supply all year.

Quito's 2.3 million population rely on high-altitude reservoirs in the Andean páramos for drinking water. Quito experienced increasing strain on its water resources in the late 1990s due to rising demand, and limited financial resources. Existing water tariffs/revenues were below the expenses for water distribution, representing at least a budget deficit of over 30% of the water distributed²⁹. Despite being protected, the water reserves were increasingly endangered by city development, deforestation, and landscape degradation caused by unsustainable agriculture, grazing activities, and a growing network of highways.

The degradation was projected to harm the watershed's important functions and long-term water-security for Quito. The need for long-term, reliable funding for conservation and restoration of these vital ecosystems was identified as both a challenge and an opportunity. Quito's public water utility (Empresa Pública Metropolitana de Agua Potable y Saneamiento, EPMAPS) established the Quito Water Fund in 2000 as a trust fund in collaboration with The Nature Conservancy (TNC) to finance efforts to maintain quality water supply, particularly during the dry season³⁰. Additional user constituencies have now joined the fund, and it has received considerable financing from other foreign donors.

The Water Reserves of Quito span about 520,000 hectares and are part of the natural páramos ecosystem in the Andes Mountains that surround the city, which is distinguished by sponge-like grasslands and cloud forests noted for its ability to retain humidity and control water flows (Echavarría 2002). When snow from nearby glaciers melts or low-level clouds and fog hang over the forest canopy, the precipitation is

²⁹ Echavarría, M. 2002. *Financing Watershed Conservation: The FONAG Water Fund in Quito, Ecuador*. London: Earthscan Publications.

³⁰ Encalada, A., E. Suarez, J. Schrekinger, R. Arboleda, M.E. Sanchez, S. Benitez, M. Saenz, et al. 2015. "Case Study 2 FONAG." *In Bridging Theory and Practice for Hydrological Monitoring in Water Funds*, edited by L. Bremer, A.L. Vogl, B. de Bievre, and P. Petry. Arlington, VA: The Nature Conservancy. http://www.naturalcapitalproject.org/wp-content/uploads/2015/11/Monitoring_Theory_to_Practice_full_30Nov2015.pdf.

collected by the páramos system's plants and soils, guaranteeing long-term water retention and delayed release into diverse bodies of water and wetlands. The Reserves are also part of Ecuador's national park system, which is overseen by the Ministry of Environment (Echavarria 2002).

FONAG implements a number of interventions targeted at preserving and improving the operation of the Reserve watersheds, including on-the-ground restoration and conservation efforts, an environmental education program, and a hydrologic data management program for monitoring and assessment. Since 2005, FONAG has safeguarded 33,000 hectares of critical páramo regions from grazing and fire by employing park guards and restoring 2,500 hectares of degraded areas by riparian fence, livestock and fire exclusion, and restoration of native vegetative species³¹.

While in its current consolidation phase, FONAG is substantially investing in generating information on the hydrological advantages of its actions. By quantifying its impact, the fund can understand how on-the-ground activities affect ecosystem integrity, water flow, quality and evaluate return on investment (ROI). To that end, FONAG is transitioning from a broad approach to conservation and restoration of ecosystem services to a model that assesses the delivery of real benefits in terms of water quantity and quality for individual users.

The fund's board of directors includes FONAG constituents, and is managed by a technical secretariat of 50 staff members, including park rangers, technical and administrative personnel, and an executive director³². Enlace Fondos, an independent financial manager, is responsible for the funds' allocation, and the proceeds are utilized to support yearly watershed preservation efforts directly executed by the fund³³. The fund began with a \$1,000 investment from TNC and a \$20,000 investment

³¹ TNC. 2018. "Water Funds Toolbox: Quito Water Fund (FONAG)." <https://waterfundstoolbox.org/regions/latin-america/quito-waterfund>.

³² Arias, V., S. Benitez, and R. Goldman. 2010. "Water Fund for Catchment Management in Quito, Ecuador." The Economics of Ecosystems and Biodiversity (TEEB) case study. <http://www.teebweb.org/wp-content/uploads/CaseStudies/Water%20fund%20for%20catchment%20management%20in%20Quito,%20Ecuador.pdf>.

³³ Coronel, L., and P. Zavala. 2014. "Guide and Practical Tool to Create a Water Fund: Lessons Learned and Experiences in Ecuador." Quito, Ecuador: U.S. Agency for International Development (USAID). http://pdf.usaid.gov/pdf_docs/PA00KNG1.pdf.

from the Quito water business and has now grown to \$12 million with an annual budget of approximately \$2 million.

Other key stakeholders recognizing the importance of protecting their water supply, companies such as the Quito Electric Company, Cervecera Nacional and Tesalia Springs, and the NGO CAMAREN, have joined FONAG since its inception in 2000.

FONAG has inspired the creation of hundreds of other water funds regionally. This system guarantees broad-based stakeholder engagement and connects nature and its water quantity and quality advantages to water users over the long term, assuring water availability and flow. The objective is for well-managed watersheds that benefit downstream users, to be able to pay for the protection of the watershed and its ecological benefits. Equally important is to quantify, understand and be able to replicate the fund's hydrological impact on local ecosystems, to target expenditures effectively to preserve watersheds.

H. Underlying constraints and solutions

Benefits of infrastructural development are realized when infrastructure asset management finance address constraints throughout the asset lifecycle. Most of these challenges occur during the implementation phase. Hence the attention needed during feasibility assessment to evaluate if the project can be funded based on favorable cost-to-benefit analysis, while meeting funding organizations' requirements. Equally important is to provision resources throughout the expected lifespan of the asset, 25 to 100 years, to ensure its durability.

It is crucial for subnational governments and project officials to implement policies and regulations to raise funds. Other critical responsibilities include the collection analysis of project-related data throughout the asset lifespan to develop structured strategic plans detailing the project's execution processes, and its expected returns or the breakeven point.

I. Disincentives for public sector to pursue lifecycle finance and solutions

Infrastructure projects balance sheet mismatch, between capital fundings (long-term asset), and their operating budgets (short-term liabilities), incurs interest rate, currency, and duration balance sheet risks and an unsustainable finance cycle. Matching the amount/value of interest, currency, duration sensitive assets with interest, currency, duration sensitive liability is a cost-effective approach to hedge balance sheet risks. Lack of accounting/finance expertise and experienced finance and management teams, infrastructure projects in developing nations, impedes the due diligence planning and later management of infrastructure assets. As a result, investors request a risk premium to fund deals while infrastructure assets experience financial deficits.

Subnational governments would gain from recruiting experts or training existing staff whenever possible, to better identify lifecycle costs throughout the full lifespan of the assets and estimate with better accuracy the timing and cash outflows. Also, governments may consider leveraging available non-governmental organizations data, having an impact on the communities at the subnational level. Aligning regional business' interests with the infrastructure business operation can minimize infrastructure maintenance costs by "free riding" incurred businesses' operational expenses. Finally, infrastructure projects should provision higher levels of maintenance costs throughout the asset's life rather than front-loading costs in the funding phase.

Poor pricing signals of the quasi-market: When creating and assessing budgets for an infrastructure project, pricing is based on various factors that are hardly predictable. Public sector use of outsourcing results in so-called quasi-markets (i.e., planned markets/internal markets) for services that are primarily tax-financed. It emphasizes the distinction between markets for tax revenues-financed services and conventional markets; most notably the fact that a third party—the government—pays for "consumed" services. Unlike markets where prices of goods are determined by the changing equilibrium between prices (demand) and supply (what we are willing to

pay), the prices in quasi-markets are mostly administered or negotiated prices. Therefore (private) suppliers with stronger negotiation power tend to get their deal terms accepted. Thus, the pricing signals of the quasi-market are more difficult to track and analyze, leading to inaccurate long-term pricings. Resulting discrepancies lead to a misalignment of interests between financiers/investors in infrastructure assets and authorities representing recipients/users. It also jeopardizes the completion or management of infrastructure assets.

Given that providers expect to compete on a level-playing field, subnational governments may consider adopting procurement competitive neutrality regulatory preconditions, that standardize collective bargaining agreements, and ownership rules.

To effectively budget for expenditures associated with maintaining infrastructure assets, the subnational governments must be able to mine accurate data and maintain records to understand the maintenance requirements.

Governments can play an important role shaping a regulatory framework enabling the collection of real-time data including but not limited to: costs, asset ownership, asset use, asset maintenance and condition, servicing companies responsible for asset repair. Also, national governments should explore the feasibility of deploying artificial intelligence and big data solutions to accurately detect, record, and evaluate maintenance needs, thereby reducing costs. In some rural areas of Kenya, in the absence of electricity, households rely on candles, batteries, and kerosene lamps as their energy sources. The government's response was to facilitate the use of a solar-powered pay-as-you-go model developed by Azuri Technologies, that uses AI to offer the power output needed to meet the home energy needs³⁴.

J. Case study: Lesotho Highlands Water Project

Lesotho Highlands Water Project is the largest bi-national infrastructure project between Lesotho and South Africa, which involves the construction of an intricate network of tunnels and dams to divert water from the mountains of Lesotho to South

³⁴ About. Azuri Technologies. (n.d.). Retrieved December 23, 2021, from <https://www.azuri-group.com/about>

Africa³⁵. The World Bank and the Africa Development Bank have funded an estimated \$3.5 billion³⁶ for the project, designed to increase water supplies in the South African province of Gauteng while creating employment, electricity, and reducing poverty in Lesotho. Nonetheless, graft in the contract bidding process, extraction of various tangible resources, and low labor compensation, exacerbated the precarity of living conditions of the poor in Lesotho.

The Lesotho Highlands Water Project highlights the profound impact of infrastructure development on the environment. Careful planning and inspection before and after the project is as critical as the enforcement of both local and international environmental laws. Contractors should be liable for infringing established environmental norms, regulations, and laws. In the absence of accountability, infrastructures developed cannot sustainably produce public goods. Worse, negative externalities erode the social, environmental and governance of communities and furthermore, the lack of environmental laws and their enforcement could dry up funding sources.

IV. Tools to strengthen and support IAM finance

K. Land Value Capture Tools

Publicly owned land is a valuable part of any municipal portfolio. Land value capture tools that can be transferable development rights, betterment contributions, public land leasing, inclusionary housing and zoning, linkage or impact fees, and business improvement districts, can help local governments improve their finances,³⁷ in the absence of the efficacy of governments' generic fiscal tools.³⁸ Land value capture

³⁵ Verdict media limited. Water Technology. (n.d.). Retrieved December 21, 2021, from [https://www.water-technology.net/projects/lesotho-highlands/#:~:text=Lesotho%20Highlands%20Water%20Project%20\(LHWP,of%20Lesotho%20to%20South%20Africa.](https://www.water-technology.net/projects/lesotho-highlands/#:~:text=Lesotho%20Highlands%20Water%20Project%20(LHWP,of%20Lesotho%20to%20South%20Africa.)

³⁶ NBCUniversal News Group. (2007, December 24). Examples of failed aid-funded projects in Africa. NBCNews.com. Retrieved December 21, 2021, from <https://www.nbcnews.com/id/wbna22380448>

³⁷ Lincoln Institute of Land Policy. (2021). Value Capture and the Property Tax. Retrieved 2021, from <https://www.lincolnst.edu/key-issues/value-capture-property-tax>

³⁸ Hart, M. (2020). Developing Cities Need Cash. Land Value Capture Can Help. World Resources Institute. Retrieved 2021, from <https://www.wri.org/insights/developing-cities-need-cash-land-value-capture-can-help>

tools are proportional to land value increases, which implies that governments with stagnant economies will not benefit from using the tools aforementioned. Lack of developers' interest implies a loss of revenues for municipalities from development rights. Legislative changes enabling municipalities to use value capture tools take a long time to implement particularly if informal settlements (e.g.: slums and homeless campgrounds) on these lands are observed.

Two value capture tools stand out as allowing the government to fund a development project by expending tax revenue from the area where the population benefits directly from the project.³⁹: Tax Increment Financing (TIF) and Special Purpose Taxing Districts.

Tax Increment Finance

Tax Increment Finance (TIF) uses the increased property or sales taxes generated by new development to finance the development. This is an appealing financing option because it does not require them to raise funding or taxes upfront to fund infrastructure projects. In practice, a government would designate a TIF area and issue a bond backed by the expected tax revenue from the future planned development. Property tax, sales tax and income tax are all valid options to leverage the financing. The government may also engage in a pay as you go arrangement with developers where increased tax revenue is paid to developers as they are generated. This latter approach requires greater risk tolerance from developers.⁴⁰

TIF is a tool US state lawmakers gave local governments since 1952, but the use of this funding method in developing countries is controversial, because it is believed to starve off spending on public goods that would be otherwise funded with future tax revenues. A review of over 30 TIF projects in the United States concluded that “in

³⁹ Council of Development Finance Agencies. (2010). CDFA - Tax Increment Finance Resource Center. Retrieved 2021, from <https://www.cdfa.net/cdfa/cdfaweb.nsf/resourcecenters/tif.html>

⁴⁰ Smith, L. A. (2009). Alternatives to Property Tax Increment Finance Programs: Sales, Income, and Nonproperty Tax Increment Financing on JSTOR. *The Urban Lawyer*. Retrieved 2021, from https://www.jstor.org/stable/27895745?seq=1#metadata_info_tab_contents

most cases, TIF has not accomplished the goal of promoting economic development.”⁴¹

In some instances, TIFs have been wrongfully utilized for areas that are used to implement an economic development or redevelopment plan. TIF’s developers/investors are able to lower their effective tax rates, secure tax credit equity, increase their cash flow, increase their after-tax earnings, and improve their corporate social responsibility profile. In the United States, TIFs generous incentives have led developers to use them to develop infrastructure that could have otherwise been developed without the TIF designation.⁴²

Estimating the expected tax revenue increase in economically underserved areas is near impossible. TIFs capture most of the tax revenue increase of an area after its designation. Critics highlight that TIF subsidizes developers at the expense of less politically influential competitors and ordinary citizens. In regions impacted by high inflation, revenue increase incurred by nominal inflation will often be captured in poorly written TIFs and imply higher payments owed to TIFs’ investors/developers. Designating an area larger than the development area benefiting from the TIF to capture revenue from areas is also problematic.⁴³

As a redeveloped area grows and generates more tax income, its population likely grows and will demand more public services. Because the increase in tax income is earmarked to repay developers for the redevelopment, the burden of increase in demand for public services falls on the government⁴⁴ that will need additional funding to cover the TIF liability funding gap. These issues are rampant in developed nations

⁴¹ Merriman, D. (2018). Improving Tax Increment Financing (TIF) for Economic Development. University of Illinois. Retrieved 2021, from <https://www.lincolninst.edu/publications/policy-focus-reports/improving-tax-increment-financing-tif-economic-development>

⁴² *Id.*

⁴³ *Id.*

⁴⁴ Dye, R., & Merriman, D. (2000). The Effects of Tax Increment Financing on Economic Development. *Journal of Urban Economics*. Retrieved 2021, from <https://www.semanticscholar.org/paper/The-Effects-of-Tax-Increment-Financing-on-Economic-Dye-Merriman/7e8ef77ca1ecc48cda8af45ebe11a147948e4f60>

(e.g.: the United States) and will only become more challenging in developing economies.⁴⁵

TIFs also invite corruption or cronyism because its mechanism secures near-term financing by leveraging an arbitrary future expectation. To curtail abuse, government authorities should consider using competitive bidding processes and guarantee transparency through public notice. This may prove difficult in some nations.⁴⁶

L. Special District Financing

Special District Financing is an alternative tool using government issued tax-exempt bonds to finance public improvements in a specific area. The bonds are repaid from designated taxes and assessments. This allows property owners in the district to directly finance the improvements without taxpayer subsidy from people who do not benefit from the improvements. Unlike TIFs, Special Districts Financing can be established to finance all forms of public improvement projects without the need for an estimation of potential tax revenue increase.⁴⁷

Special District bonds are appealing to private sector developers for a variety of reasons. First, Special District bonds are long-term financing solutions with terms ranging from 20 to 40 years. Second, their tax-exempt interest rates are less expensive than other forms of financing. Third, Special District Financing adds flexibility to supplement equity and traditional borrowing and reduce the financing cost of developers. Fourth, issuing government authorities may choose to make Special District financing non-recourse borrowings that do not penalize the developer should the project default. Last but not least, Special Districts may borrow several years of capitalized interest to fund debt service requirements, allowing property owners within the district to avoid paying extra taxes while the project is under construction.⁴⁸

⁴⁵ Id.

⁴⁶ Id.

⁴⁷ The National Association of Home Builders. (2014). An Overview of Special Purpose Taxing Districts. Retrieved 2021, from <https://www.nahb.org/~media/NAHB/advocacy/docs/industry-issues/land-use-101/infrastructure/overview-of-special-purpose-taxing-districts>

⁴⁸ Id.

1. Case Study: Special Rating Area in Capetown, South Africa⁴⁹

The government of Cape Town, South Africa implemented Special Rating Areas (SRAs) in 2000 through the Municipal Property Rates Act. An additional property rate to finance municipal services is levied in the SRAs. One of the first SRAs established in Cape Town, the Claremont SRA, financed the construction of a bypass road that eased traffic within the suburb and improved the quality of life for poor communities that live in the outskirts of Cape Town. The Claremont Improvement District Company (CIDC) managed the Claremont SRA and created RoadCo, a special purpose vehicle for the bypass road project, using various institutional and financial innovations. This is the only case in South Africa where levies from an SRA was used to finance the construction of a major public infrastructure.

CIDC managed to secure a 15-year long-term loan from the Development Bank of Southern Africa (DBSA) as well as private sector financing for the construction and maintenance of the road. This was unique in South Africa as the DBSA traditionally focused on short-term funding of public entities. RoadCo was created specifically for the project and a number of safeguards were implemented. DBSA required a cessation agreement where the CIDC agreed to relinquish all its rights and title to the infrastructure levy. RoadCo would adopt these rights and bear all construction risks related to the project. The private sector invested around \$42 million ZAR which is roughly \$2.64 million in USD.

The Cape Town government played a crucial role in the redevelopment of Claremont. It facilitated the projects by broadly interpreting the language of the then newly minted Municipal Property Rates Act and allowing the construction of the road to be considered “improving or upgrading” the community. Cape Town developed the initial plan for Claremont Boulevard and commissioned studies that led to subsequent development plans for the

⁴⁹ Germond, A., & Matiashe, W. (2020). Special Assessment Districts and the Financing of Infrastructure in South Africa: The Innovative Use of a Special Rating Area in Claremont, Cape Town (WP20WM1). Lincoln Institute of Land Policy.

area. The government allowed RoadCO, a private SPV, to bypass most of the administrative requirements such as an urban management survey of properties, public participation and inspections of business and implementation plans. This cooperation between CIDC and Cape Town greatly improved the efficiency for redevelopment.

The redevelopment projects by RoadCo and the CIDC are believed to have caused a significant increase in property values in the area. The total valuation of properties increased four-fold within 10 years and tax revenue increased by \$68 million ZAR (excluding the SRA levies). The redevelopment was so successful that nearby property owners called for the extension of the area managed by the CIDC.

Lessons Learned:

The Capetown SRA was a success that resulted in significant infrastructure improvements made in the community through redevelopment. Improving existing assets prolongs the lifespan of these assets and enhances their functionality. In the case of the Claremont SRA, a major road was built to become a crucial solution to alleviating the traffic congestion in the area. This demonstrates that a new development project can improve the operations of existing infrastructures.

The success of the Capetown SRA, however, does not imply guaranteed success with each adoption of the Capetown model. Although the government accelerated the process of redevelopment by allowing the CIDC to bypass administrative procedures in Claremont, it reduced the transparency and accountability of the project. The lack of government supervision may have made the redevelopment process more efficient, but left open the opportunity for mismanagement and corruption. Any government seeking to replicate the success of the Capetown SRA needs to implement sufficient government oversight without hindering the efficiency of the redevelopment process.

M. Insurance against risks of external shocks

Using insurance to safeguard public infrastructure over the long term is an effective method of reducing the financial risk associated with assets being unable to perform services after external shocks (e.g. earthquake, tsunami, flood, etc.). Insurance coverage could mitigate financial risk by allocating a major portion of it to insurers. While external shocks are normally infrequent and unpredictable, the repercussions in terms of damage, restoration time, and costs could be enormous when a serious one takes place. Developing nations have high rates of natural disasters without insurance coverage. Insurance coverage from top-tier/apex insurers (with access to capital markets) offering insurance schemes to local governments would enable them to shift risk from the balance sheet of sub-national governments to capital markets. Top-tier insurers have large balance sheets and access to capital markets and structured financial products enabling them to hedge losses incurred by claims and thereby shift part of their risks onto investors. Such a scheme would strengthen their ex-ante financial resilience to natural disasters and integrate this into their overall fiscal risk management and public debt management plans.

1. Case study: Catastrophe risk insurance for public assets in Colombia

Colombia is one of the nations in Latin America with the greatest frequency of natural catastrophes. Colombia's losses from disasters are increasing⁵⁰. Legally obliged by law, every government entity in Colombia is responsible for insuring its public assets by purchasing catastrophe insurance. Nonetheless, the severe La Niña season in 2010-2011 indicated that public assets, notably PPP infrastructure, had not been adequately insured. Only US\$400 million of the expected US\$89 billion replacement costs for public assets were covered by private insurance. Damage to major and minor roads was estimated at \$1.7

⁵⁰ World Bank. 2013. Colombia : Improving Property Catastrophe Insurance Coverage of Public Infrastructure under Concessions. Disaster risk financing and insurance technical note;. Washington, DC. © World Bank. <https://openknowledge.worldbank.org/handle/10986/22415> License: CC BY 3.0 IGO.

billion, resulting in significant losses for the public transportation industry⁵¹. It can be seen that the current insurance scheme does not allow the Colombia government to benefit from risk pooling. Enhancing the insurance for public assets then becomes the priority to mitigate the government's contingent liabilities to natural disasters.

In response, the Ministry of Finance and Public Credit (MHCP) will partner with other public entities to improve the penetration and quality of catastrophe insurance's coverage of public assets. For subnational governments, Colombia's experience with developing the collective insurance scheme and PPPs' insurance requirements to develop guidelines on strengthening insurance of public assets could be used as a reference. Specifically, the Colombian government will implement the following approaches to enhance the strategy of insurance of public assets:

o **Improvement of insurance of road infrastructure through PPPs:**

The MHCP and the National Infrastructure Agency (ANI) collaborated to prepare a document on enhanced insurance requirements for PPPs, with technical assistance from the World Bank. The document has been utilized to define the technical criteria for concessionaires for the latest generation of infrastructure investment, which are now being implemented. Standard terms and conditions for property insurance coverage such as material damage, types of risks are also defined based on international (re)insurance market best practice⁵². In this way, the accountability for catastrophe damages could be identified and adequately borne by private sector partners.

o **Collective approach to insure public buildings:** The Colombian government is examining the feasibility of implementing a collective approach

⁵¹ World Bank. 2013. Colombia : Implementing a Collective, Standardized Approach to Catastrophe Insurance of Public Buildings. Disaster risk financing and insurance technical note;. Washington, DC. © World Bank. <https://openknowledge.worldbank.org/handle/10986/22416> License: CC BY 3.0 IGO.

⁵² World Bank. 2013. Colombia : Implementing a Collective, Standardized Approach to Catastrophe Insurance of Public Buildings. Disaster risk financing and insurance technical note;. Washington, DC. © World Bank. <https://openknowledge.worldbank.org/handle/10986/22416> License: CC BY 3.0 IGO.

to insurance of public buildings, beginning with those of the health and education sectors. The collective approach allows the government to pool risk into one diversified, well-structured portfolio to pass to the insurers via standardized group insurance policies. This would also save operating expenses and strengthen the government's negotiating position. The National Procurement Agency, Colombia Compra Efciente (CCE) and the MHCP are working together to establish and assess the technical, legal, and financial conditions for implementing a collective scheme. They will also offer guidelines for enhancing insurance coverage of non-central government entities⁵³.

- o **Enhanced information system on public buildings:** The MHCP is gathering additional information on the government's portfolio of assets such as historical disaster damages, insurance policies currently in force. With thorough data on public assets, the private insurance market can offer better coverage and rates, since the risk of loss can be assessed more precisely, allowing them to integrate reduced uncertainty costs in the premium, resulting in cheaper pricing and better terms and conditions.

N. Tap into asset-related income streams and enhance those streams, while ensuring adequate service for low-income populations

Selling public assets is considered to improve fiscal health when financial deficits remain high while demand for government expenditure increases. The process is slow, risky and the economic impact is lagging. Therefore, when considering selling off assets, regional governments may also consider fostering asset-related revenues such as public utility surcharges, water resource fees, user fees, assets exchange revenues, etc....and enhance these income streams through improving their operational efficiencies and pricing strategies.

⁵³ Colombia: Policy strategy for public financial management of natural disaster risk. GFDRR. (n.d.). Retrieved December 21, 2021, from <https://www.gfdr.org/en/publication/colombia-policy-strategy-public-financial-management-natural-disaster-risk>

Revenues collected from using public assets highlight public consumption levels, use patterns, and affordability, assisting governments in identifying different public demands for existing and future infrastructure. Data associated with these revenue streams can guide sound decisions on future capital investments and subsidy structure. It may also be used as indicators by public asset managers to determine the amount to charge per unit of service to recover costs; and enhance the quality of services. Expected stable income streams will also be attractive to investors to finance infrastructure projects. To ensure continued adequate service delivery and stable revenue streams, the subnational governments may consider the following:

- o **Use technologies and improve operational efficiencies to manage costs.**

While costs of production often vary a lot in terms of local geographic conditions, availability of resources, and levels of operational efficiency, local governments may choose to adopt new systems to reduce the overall costs. For example, the retail energy cost in the Solomon Islands is US\$0.65/KWH, making it one of the most expensive in the world. 97% of Solomon Islands electrical output is powered by diesel fuel, with only 12% of the households connected to the grid⁵⁴. In response, the Solomon Islands has transformed its power system and cut costs using the Tina River hydropower project⁵⁵. It reduces the reliance on expensive imported diesel fuel by developing renewable and indigenous sources such as hydropower and PV power.

- o **Minimize data gaps to understand infrastructure service pricing.**

In most cases, data availability on infrastructure services pricing remains low, in particular in rural areas. Data transparency, on the other hand, allows governments to make better cross-regional comparisons and more accurate cost estimates, and figure out how much demand there is for infrastructure development and financing. Therefore, subnational governments need to encourage or require utilities to publish costs and tariffs-related information to improve price transparency and to better

⁵⁴ Solomon Islands to reduce reliance on diesel fuel sources with Green Climate Fund Support. (2017, April 7). Retrieved from <https://www.worldbank.org/en/news/press-release/2017/04/07/solomon-islands-to-reduce-reliance-on-diesel-fuel-source-with-green-climate-fund-support>.

⁵⁵ A national project of the Solomon islands. Tina River Hydropower. (2021, October 14). Retrieved December 21, 2021, from <https://www.tina-hydro.com/>

monitor pricing trends. When available at low cost, use artificial intelligence and blockchain technology to track assets' performance, maintenance and estimate its residual value.

V. Conclusion

The case studies highlight that sustainably financed infrastructure and services are achieved when local governments improve fiscal revenues and infrastructure management capacity. Empirical evidence suggests that access to private sector funding solutions through capital markets, international banks, and special purpose vehicles can fund the management of assets throughout their life-cycle. The alignment of development strategies between States and municipalities, using innovative financial mechanisms also increases the robustness of financial management outcomes, including strong governance.

Our research validates four long-term objectives of IAM finance for sustainability: achieving optimal utility from assets through adequate repair, increasing underlying assets' quality and level of service, greening of assets, and building asset resilience.

These objectives need to be achieved by asset managers and subnational governments by extending assets' life under operational budget constraints, while maintaining assets resilience throughout their life cycle, maximizing the assets' total value accounting for direct and indirect costs and benefits. To that end, our recommendations for consideration are:

Adopting third party due diligence audits, increasing the frequency of maintenance operations, standardizing methodology to analyze costs and benefits, increasing the number of public-private partnerships involving local and state governments, and using new asset classes to align the interests of equity and debt investors.

The asset disposal stage is often overlooked in the life cycle management of the asset, undermining opportunities for asset managers to recover costs. Selling infrastructure to private investors upfront is an effective way to improve the fiscal position of a government while raising capital; but the mechanism may not serve public interests, in the long-term. While it may be unfeasible to transfer all risks to the private sectors without a deep discount on the asset price, risk sharing, guarantee transparency and bid up the price, transparency of the engineering of the privatization deal, and transparency in the allocation of the funds

received from the sale, the aforementioned might attract investors. Second, a conservative approach to estimate assets' value is recommended. Evidence suggests that non-financial positive externality resulting from robust transferring of an asset to the private sector, benefits the public interest in the long-run. To that end, the discount rate used to establish the fair value of the asset needs to be based on a relevant benchmark, it is advisable to hire independent advisors or auditors to monitor the integrity of the bidding process.

Evidence suggests that it is beneficial to develop well-structured strategic plans including sound budgeting, study maintenance needs by using real-time data, and leverage the power of businesses, non-governmental organizations and new technologies throughout the asset's life cycle. Optimal utility from assets can be achieved with condition assessment tools using Artificial Intelligence (AI), Machine Learning programs anticipating the impact of an asset's unplanned failure, but also streamline operations, provide better services, minimize waste, and create positive impact by combining a data driven asset management approach with the SDGs.

If subnational governments increase the frequency of mandating assets' maintenance, legal, and prudential requirements, they could better assess and budget actual maintenance spending as needed; and seek funding infrastructure via capital markets through long-term bond market development, superannuation, and pension fund portfolio's allocation in bonds issued for infrastructure development.

The research shows that the quality and level of service provided by assets is positively correlated with the maintenance of statewide rules, procedures, access to technical guidance, training and technical assistance contributing to maintenance of the assets based on established quality assurance (QA) and quality control (QC) processes. The use of an apex data portal supporting QA and QC is expected to minimize the costs of collecting, validating and maintaining assets' data.

Both asset managers and governments would benefit from challenging their risk assumptions as part of their due diligence evaluation of brownfield redevelopment initiatives. Explore common risk mitigation solutions, for greening brownfield assets that aim to offset institutional investors' risk concerns and short-termism in delivering returns. Form a Common Risk Mitigation Mechanism (CRMM) to pool multiple risks (political, off-taker, and foreign exchange risk).

Financing sustainable and resilient infrastructure, effectively manages environmental, social and governance (ESG) risks, while supporting the delivery of the United Nations' (UN) Sustainable Development Goals (SDGs). To address investors' risk management liabilities, consideration should be given for the use of a Hybrid Sustainable Infrastructure (HSI) Asset Class to bridge infrastructure equity investor interests and debt holder interests under one asset. The HSI Asset Class raises institutional investors' interest in funding infrastructure projects without needing to know the debt-equity mix, enabling the investment decision to rely on the risk-return profiles of the various HSI Vehicles.

Mismatch of capital funding (long-term asset) with operating budgets (short-term liabilities), incurs interest rate, currency, duration balance sheet risks and an unsustainable finance cycle. Subnational governments would gain from recruiting experts or training existing staff whenever possible, to better identify lifecycle costs throughout the full lifespan on the assets' balance sheet and estimate with better accuracy the timing and cash outflows.

Governments can play an important role shaping a regulatory framework enabling the collection of real-time data including but not limited to: costs, asset ownership, asset use, asset maintenance and condition, servicing companies responsible for asset repair. In the absence of accountability, infrastructures developed cannot sustainably produce public goods. Worse, negative externalities erode the social, environmental and governance of communities; lack of environmental laws and their enforcement could dry up funding sources.

Governments can use alternative tools such as tax increment financing and special district financing to strengthen and support IAM finance. Tax Increment Financing (TIF), widely used in the United States has had mixed economic and social impact and its use in developing countries is controversial. Unlike TIFs, Special Districts Financing can be established to finance all forms of public improvement projects without the need for an estimation of potential tax revenue increase. Special District Financing (SDF) allows for local stakeholders to have direct input and opportunity for investment in community redevelopment projects. Special District bonds are appealing to private sector developers because they are long-term bonds with terms ranging from 20 to 40 years; they are tax-exempt and are less expensive to engineer than other forms of financing. Special District Financing reduces the financing cost of developers. The non-recourse borrowing terms of a SDF do not penalize the developer should the project default. Finally, SDF can borrow several years of capitalized interest to fund debt service requirements, allowing property owners within the district

to avoid paying extra taxes while the project is under construction. SDF financed infrastructure can generate material increases in property tax income revenue.

Development policy and regulatory framework enable the securitization of insurance premiums of sub-national asset insurance policies. Thereby shifting asset replacement risk from sub-national governments' balance sheets to top-tier insurers able to issue bonds to capital markets.

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