



Bringing public assets out of the shadows

Optimizing infrastructure services,
unlocking revenues

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Abstract

Macro shocks like COVID-19, geopolitical turmoil and extreme weather events have hit economies hard. This reduces the funds that can be allocated to new infrastructure and highlights the need for governments to better manage the assets they already own. From disastrous failures to heightened corruption risks, the pitfalls of a business-as-usual approach to public asset management (PAM) are vast. A better approach is effective, proactive, and digitally oriented. This helps to safeguard against risks and presents major benefits in two key and interlinked areas. By adopting effective approaches to PAM, states can optimize public service delivery, which boosts growth and governance, and improves the wellbeing of citizens. Second, improved PAM unlocks revenues and can significantly increase fiscal sustainability. Better PAM prioritizes and enhances prospects for green, resilient, and inclusive development. It also ensures that practices and approaches are both optimized for digital-era demands, and leverage digital-era opportunities. The assets that governments already own are typically secluded in the shadows. Yet by adopting a fresh approach, governments can emerge from setbacks with new resilience, healthier balance sheets and greater prospects for growth.



Executive Summary



Governments face pressure to provide reliable and equitable services, and to generate revenues in a way that promotes growth, boosts resilience, and builds wealth and wellbeing. It is possible for nations to embark and remain on such a pathway to prosperity – but to achieve this, most states need to do a better job at managing their assets.

This note explores how improved public asset management (PAM) enhances infrastructure services and unlocks revenues. This can and ought to occur in a way that is green, resilient, and inclusive – and digitally oriented. Effective, digital-era PAM has several facets. It refers to ‘the way we do PAM’ – in other words, how the management of non-financial assets is enabled and optimized through modern business processes, data, and design support. Second, it refers to modernizing the stock of infrastructure to meet digital-era demands, for instance around connectivity. And third, it calls for improving the valuation, utilization, and management of digital assets like data, software systems and intellectual property as a category of non-financial public assets in its own right.

But first, let’s define which assets we’re talking about.

For the purposes of this note, we are referring specifically to **non-financial public assets**, such as infrastructure, properties, and land. As mentioned, digital systems and data are also growing in complementary value to physical assets.

Every government is a large holder of non-financial assets. The state of these assets determines a country’s capacity to effectively deliver services, and forms the cornerstone of every country’s public sector balance sheet. Yet in nearly every case, both the management of assets, and the assets themselves, are often secluded in the shadows.



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What are non-financial public assets?

Public sector balance sheets (PSBSs) give us insight into the health, wealth and resilience of national economies. PSBSs are composed of assets and liabilities: with the difference between the two reflecting net worth.

Public assets, in turn, are composed of financial and non-financial assets.

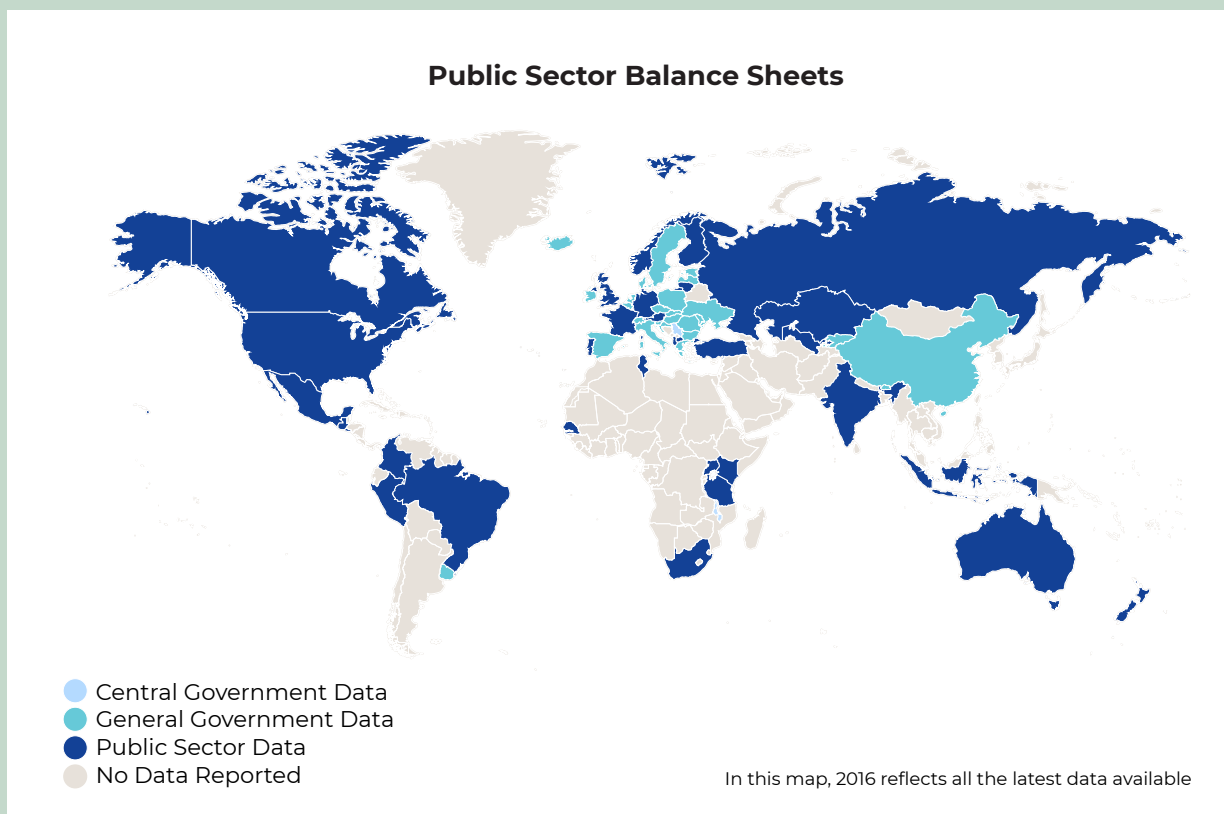
A financial asset is a liquid asset that gets its value from a contractual right or ownership claim, and includes examples like cash, stocks, bonds, mutual funds, and bank deposits. A non-financial asset is not traded on the financial markets, and can be tangible (e.g. protected areas, roads or clinics) or intangible (e.g. brand recognition or intellectual property). On government balance sheets they can be increased through investments, but reduced through depreciation, destruction, or disposals.

While rights to mineral and energy resources are also considered non-financial public assets, this note focuses mainly on infrastructure (both 'bricks and mortar' examples like bridges and waterways, and increasingly also digital infrastructure, like data centres and networks), land, properties, and virtual assets, like information.

What is the value of the public sector's non-financial assets?

Properly accounting for the value of non-financial assets – including infrastructure, properties, land, and even intangible digital assets – is a challenge for any country. Assets must be accounted for and valued in monetary terms. Headline measures see these stock values in comparative, per capita US dollar terms – or as a share of total economy annual gross domestic product (GDP) flows. Key reference practice frameworks include the International Monetary Fund's (IMF's) Government Financial Statistics and the International Public Sector Accounting Standards (IPSAS).

Figure 1: Public sector balance sheets – global snapshot



Source: IMF, 2019.

Most governments still have limited information, at best, to show the value of their non-financial assets – whether from an accounting or a physical asset management perspective. Yet an example like New Zealand shows that significant progress is possible. Using public sector accounting reforms, the country attained a solid view of its balance sheet for an accounting as well as a management perspective (see Ball 2021, 70).

The IMF Investment and Capital Stock Dataset (2022) provides estimates of the general government capital stock (thus, all the existing physical capital in an economy) for 160 countries for 2019. While these are on average 80.6 percent, the reported values range from 22.7 percent (Ghana) to 1,216 (Venezuela).

These figures are based on converting historical investment series into capital stocks using the perpetual inventory method. The perpetual inventory method is a system that tracks and records changes in the quantity and value of public assets over time, providing an up-to-date picture of their status and value. This approach is subject to a number of assumptions – including whether the investments are actually translated into actual asset values. These figures may therefore not capture the true quality of this capital stock – also given differences in how well investments were made (the public investment management [PIM] process), or how well the stock is used.

The IMF’s (2019) Public Sector Balance Sheet provides a comprehensive view of public sector assets and liabilities for 38 countries, covering 63 percent of the global economy, based on the IMF (2014) Governance Finance Statistics framework. In Georgia, for example, the non-financial assets of the general government amount to 38.6 percent of GDP. By including sub-national government and public financial corporations, this increased to 108.1 percent. But, as the IMF (2022, 7) notes: “A major part of the balance sheet are non-financial assets, such as infrastructure, land, and minerals, where valuations remain less reliable, so net financial worth remains the more reliable indicator [of net worth].”

Estimating the value of different types of public assets at any point in time can represent various methodological and data challenges, as states employ differing approaches. McKinsey (2021) provides a fuller integrated analysis of the balance sheet developments of the world’s 20 major economies. This suggests that changes in both financial and non-financial assets have significantly impacted headline numbers associated with this type of data.

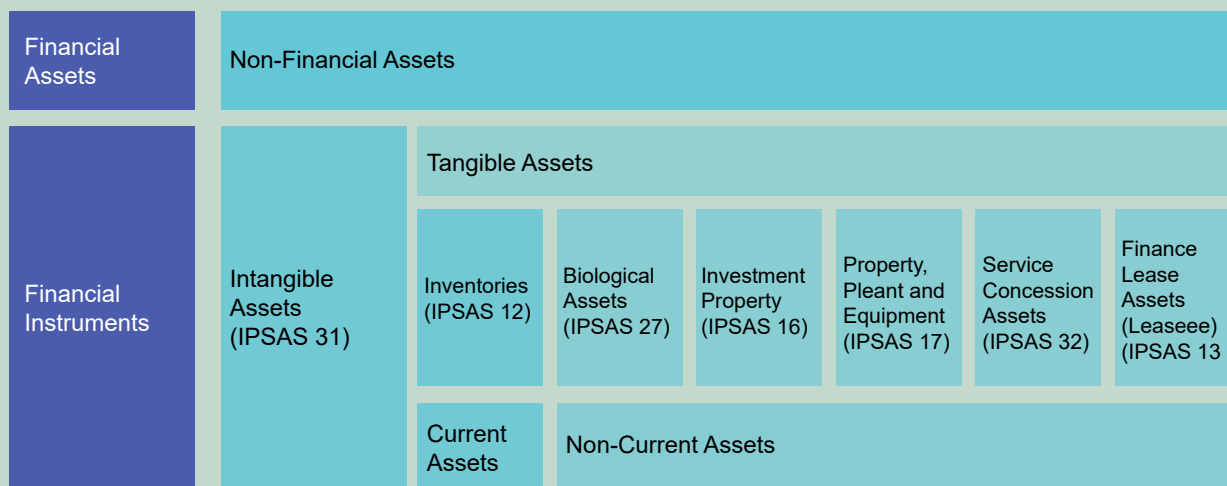
The focus of this note is on understanding and boosting the real value of public sector non-financial assets in enhancing service delivery and revenue performance over time. Integral to this understanding is also how green, resilient, inclusive, and digitally informed these non-financial assets are. Digital refers to both the modernization of how non-financial assets are managed, as well as the growing importance of digital data as an asset.



Overview of public sector assets

Non-financial assets encompass a range of assets. Out of the 43 current International Public Sector Accounting Standards (IPSAS), six elaborate on issues of financial reporting concerning non-financial assets (12, 13, 16, 17, 27, and 31).

Figure 2: Financial versus non-financial public assets



Source: Authors, based on Pulsar (2020, 10)

Table 1: Examples of non-financial public assets, per IPSAS

Standard	Name	Coverage/Examples
IPSAS 12	Inventories	Military inventories, consumable stores, maintenance materials, spare parts for plant and equipment, strategic stockpiles (e.g. energy), stocks of unused currency, postal services held for sale (e.g., stamps), land and property held for sales.
IPSAS 13	Leases	Leases to explore for or use mineral, oil, natural gas, and-or similar non-regenerative resources; licensing agreements for such items as motion picture films, video recordings, plays, manuscripts, patents and copyrights.
IPSAS 16	Investment properties	Properties held by entities for to manage government's property on a commercial basis.
IPSAS 17	Property, plant and equipment	Weapons systems, infrastructure assets, service concessions arrangement assets.
IPSAS 27	Agriculture	Biological assets (animals, crops), agricultural produce.
IPSAS 31	Intangible assets	Computer software, patents, copyrights, motion picture films, lists of users of a service, acquired fishing licenses, acquired import quotas, and relationships with a user of a service; heritage assets

Where have all our assets gone?

There are several reasons why assets and the way they are managed are marked by underperformance.

First, states typically allocate greater resources and attention to new investments and new asset acquisition, and seldom give sufficient consideration to their existing stocks. This can be politically motivated. Shiny new investment projects attract high-visibility opportunities for political grandstanding. In stark contrast to the ribbon-cutting fanfare, maintaining and mending assets can appear murky and mediocre, and are seen as par for the course.

Similarly, public debate about state finances typically focuses on the flows of public investment – as do internal budget preparation processes and debates about budget allocation. Rarely is similar scrutiny applied to the management and use of assets that already exist. (This, in turn, affects the quality of public investment management, as new investments need to take stock of existing assets.)

Shiny new investment projects attract high-visibility opportunities for political grandstanding.

A second reason is that many governments simply don't know their assets – including their location, value, state, and potential. Many non-financial assets are often held by the state as a result of some aspect of historical legacy. They may never have been acquired in any commercial way. This makes it impossible to effectively care for or manage these stocks, or to understand what investments are needed to maximize their use.

Many governments simply don't know their assets – including their location, value, state, and potential.

Assets are also typically scattered **across different levels of governments** and state-owned enterprises (SOEs). New investments are increasingly made by subnational governments (40 percent in Organisation for Economic Co-operation and Development [OECD] countries), which may lack the resources, capacity, or tax prerogatives to finance effective asset management and maintenance.

A third reason is that PAM has failed to keep up with the fourth industrial revolution. In many contexts, processes are either archaic and analogue, or have been replaced by ineffective digital systems. This results in a significant and unnecessary drain on resources, and prevents states from leveraging tech-enabled opportunities to improve PAM. It also has implications for how a new generation of assets – which includes data, information, and virtual systems – is valued, used, and managed. While digitalization is not a solution in itself, digital-era practices and approaches are needed to achieve impact.

The call for more whole-istic approaches

Bringing assets and asset management out of the shadows requires conscious action and an integrated approach. As assets are spread across multiple entities, efficient PAM calls for coordination across, for instance, finance agencies, local governments and SOEs. In the absence of a systemic, whole-of-government approach to PAM, interventions will inevitably occur in a costly, fragmented, and ad hoc manner.

The net result is that the assets that governments already own are typically secluded in the shadows, where their potential cannot be maximized, and they gradually lose value.

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The value of an iconic asset: Rome's Colosseum

The present value of Rome's Colosseum was recently estimated at €76.8 billion (Bove 2022). But that doesn't mean Italy is about to sell an iconic asset to reduce national debt.

The value of the Colosseum as a public asset was arrived at by considering direct contributions, such as entrance fees and revenue from events held at the site. Indirect contributions, such as the economic multiplier effect, were also factored in, including the 47,000 full-time employment opportunities created by the asset, and the resulting boost to the local economy. The value also accounts for the significant role the Colosseum plays in generating revenue, both directly and indirectly, for the tourism industry.

Furthermore, the study accounted for the indirect use value of the asset, which improved the quality of life of those living or passing regularly near the asset. Finally, it also accounted for the iconic social value of the Colosseum.

The systematic exercise not only served to generate a better understanding of where value could be further enhanced, but also how risks could be mitigated. This could include greater emphasis on investments in digital technology, and boosting its value for Italian culture and educational outreach.



Beyond the pandemic: a critical crossroads

There has been no shortage of macro shocks in recent years. **These have hit economies hard.** Global shocks such as the pandemic, major geopolitical events, and extreme weather occurrences are exacerbating an already constricted fiscal space. Given that this reduces the funds that can be allocated to new infrastructure, these stressors highlight the need for governments to better manage the assets they already own. Not only are asset performance and service delivery improved, but states are better able to absorb shocks around climate change and other macro pressures.

As we take stock of the economic, human, and environmental costs of ineffective PAM in the wake of macro shocks, an urgent rethink is required in the way states invest in, and manage, their public assets. A starting point needs to be to elevate the case for the value of better PAM.

In this note, we explore in greater detail why governments and partners should adopt an effective, proactive, and digitally oriented approach to PAM. We also illustrate how governments can achieve this.

Lessons from COVID-19

The scale and long duration of the COVID shock and fiscal responses have exacerbated underlying fiscal challenges, and led to unprecedented levels of public debt (estimated at 120 percent of GDP). This has raised significant debt sustainability concerns, and many governments have been left with little fiscal space to finance the much-needed recovery of their battered economies.



An urgent rethink is required in the way states invest in, and manage, their public assets.



Why proactive PAM trumps 'business-as-usual'

A 'business-as-usual' approach to PAM is not a neutral pathway but presents a series of pitfalls that stand to be worsened by the next global shock, and which will become more costly over time.

In the extreme, this can lead to disastrous failures. Poor PAM may also undermine the legitimacy and trust vested in state institutions. Furthermore, it increases corruption risks, as a lack of transparency over state assets and their management can contribute to an abuse of power (e.g., in the selling off state land, or in the issuance of tender).

A better approach to PAM is, among others, effective, proactive, and digitally oriented. This can help to safeguard against risks, and presents major benefits in two key and interlinked areas, namely:

1. First, by adopting effective approaches to PAM, states can significantly enhance public service delivery, which in turn boosts growth and governance, and improves the wellbeing of its citizens.
2. Second, it's good for generating revenues. With improved PAM, states can optimize public wealth and significantly increase fiscal sustainability.

Better PAM also prioritizes and enhances prospects for green, resilient, and inclusive development (GRID). It also ensures that practices and approaches are optimized for digital-era demands, while leveraging digital-era opportunities.

Let's look at each of these in greater detail.

A 'business-as-usual' approach to PAM is not a neutral pathway but presents a series of pitfalls.

Improving infrastructure services

Public assets come about, or are created, through different means and for various reasons. Some are a byproduct of a regulatory system (land and business ownership, or patents) or enable complex economic and social logistics and interactions (such as roads, internet connectivity and access to electricity). Many were created to deliver or support services.

For much of government, it is impossible to think of service delivery without considering **the assets involved**. Healthcare systems need hospitals, the education sector needs schools and universities, and public transit systems need buses and trainlines. Other sectors include administration and judicial services, housing, and social welfare. Governments have a duty of care to enhance the productivity of a countries' asset portfolio for future generations. Citizens need to enforce it, and should be given a voice in the decision-making process.



For much of government, it is impossible to think of service delivery without considering the assets involved.

New perspectives

Using proactive PAM objectives as a starting point means viewing non-financial assets from a number of different perspectives. These could include, for instance, a focus on a portfolio of assets (e.g., health facilities) or systems (roads and bridges transport networks). Holistic, strategic and resilient service delivery would also mean taking stock of the overlaps between assets, for instance, how and where health, roads, and drainage infrastructure assets intersect.

When assets are not managed well, for example through inadequate or **deferred maintenance**, this increases vulnerability to breakdowns in efficient and equitable service delivery, and asset loss. The result is that citizens are asked to pay higher taxes and shoulder heavier debt than should be necessary – as well as receiving inferior services. In turn, this can erode trust in governance and public institutions, cause a fraying of the social fabric, and contribute to insecurity and unrest.

Through better PAM, such a lose-lose scenario can be halted and, in many ways, reversed.

'Pay me later' – what happens when maintenance is deferred

Maintenance deferred means (asset) life curtailed – and a lower return on investment. Insufficient and/or poorly prioritized maintenance expenditures result in reduced infrastructures service quality and short-term pressures for rehabilitation investments. For major assets such as roads and bridges, they may also reduce transport safety. Poor asset management in terms of inadequate maintenance also increases vulnerability to service delivery breakdowns and asset loss in the face of shocks. A poorly maintained road is less likely to withstand environmental shocks. Lack of maintenance of storm drains can aggravate flooding in the face of mounting climate change extremes.

This is not specific to developing or emerging countries. Many OECD countries tend to have large and aging infrastructure assets that require substantial maintenance, and more proactive asset management. For example, after the collapse of the Genoa bridge in Italy in 2018 during a storm, an assessment conducted in Germany revealed that more than 40 000 bridges in the country needed urgent maintenance and repair.

Macroeconomic stability increases as the adverse effects of external shocks are softened through the provision of well-structured and robust infrastructure that ensures service continuity in times of crisis. When non-financial state-owned assets are managed in an effective, proactive, and digitally oriented manner, citizens' wellbeing can also be improved significantly through the effective provision of critical services. It's good news for accountability, transparency, and governance, and helps to keep taxes lower. The effective, equitable and continued provision of essential economic infrastructure such as roads, telecommunication networks, and access to potable water also unlocks opportunities for sustainable growth.

When non-financial state-owned assets are managed in an effective, proactive, and digitally oriented manner, citizens' wellbeing can also be improved significantly

Poor PAM: when society foots the bill

Natural hazards not only damage assets and strain public budgets, but also disrupt services with significant impacts on households and economic activities (Hallegatte 2019, 2). The direct costs of public infrastructure structure losses or disruptions to government typically pale compared to those borne in consequence by society. It is estimated that "... in low and middle-income countries, direct damages from natural hazards to power generation and transport alone cost \$18 billion a year... but the disruptions to services cost households and firms at least \$390 billion".



Boosting revenues, reducing debt

The pandemic and climate change have battered economies and increased fiscal pressures around the world, but through effective, proactive, and digitally oriented PAM, governments can unlock significantly underutilized opportunities for generating revenue.

Public debt financing may be a short-term cyclical response, but revenue optimization will be critical for financing sustainable public service delivery and contingency demands over time.

There are many ways to achieve this, but let's consider a few.

Various studies show, for instance, massive untapped potential in the more efficient use of **public properties and land** – both within the public sector as well as in partnership with the private sector. Whether applied to land or other asset classes, public-private partnerships (PPPs) also offer a way for national and sub-national governments to generate revenue from assets – under the condition that the value proposition has been adequately assessed.

Privatizing government assets is another way to raise finance. As a transaction, this replaces one asset (a business or physical asset) with another (cash). The cash can then be applied for different purposes, including investment in new assets. It may not be necessary to sell real property to generate cash: other ways include consolidating government occupancy and renting to other commercial occupants, or charging for the air and exposure use associated with some assets. This is done on city rail systems and airports, for instance. Another option is the **development of vacant land** owned by the government and partnering with the private sector for commercial and residential uses.

Whether applied to land or other asset classes, public-private partnerships offer a way for national and sub-national governments to generate revenue from assets

Better use of existing land

A report by the Inter-American Development Bank (García Mejía and Kaganova 2021) cites the Volpe Transportation Center in Cambridge, Massachusetts, as an example of how good PAM can unlock the potential value of property. The government recognized that 14 acres of valuable land made up of “aging federal buildings and abundant surface parking” could be put to far better use and offered vast development potential.

Three acres of land was allocated to future occupancy and remained under federal control, while 11 acres was exchanged to the highest bidder – the Massachusetts Institute of Technology (MIT). The deal yielded \$750 million in value. The agreement also required MIT to construct a new facility on the federal grounds. Following the construction of the facility, the portion of the property that the federal government no longer needed would be conveyed to MIT.

Net fiscal benefits could also flow from more efficient **user charge collection**, e.g. through improved billings and collections systems for services delivered. This depends on the quality of the service, as well as the willingness and ability to collect those revenues. Enhanced profitability can also stem from reducing generation-plant downtime through maintenance planning (increasing volume sold), and from making capital spending more efficient (reducing capital acquisition costs). Not only can this help to offset expenditures associated with the costs of provision, but a real rate of return on assets in service should also support the generation of a surplus, which can fund a dividend stream to government and other shareholders.

Many opportunities for boosting revenues are hampered by a lack of clarity and valuation and a political reluctance to charge. A starting point for many ministries of finance is simply to know which assets they have, what their market value is or how to incentivize their use more efficiently (see ‘Information’ below).

Unlocking green, resilient, and inclusive development

Extreme weather events are becoming more frequent and severe, and increasingly expose the vulnerability of public infrastructure assets. This means assets must be made more climate resilient, but that often entails additional capital or operational costs. Against a constrained fiscal backdrop characterized by a rising public debt burden, proactive PAM is an opportunity to implement a carefully calibrated transition towards climate resilience. Although this may include a higher upfront investment, this approach is more cost effective in the long term.

Asset destruction, breakdowns in services, and significant public sector liabilities occur **in the wake of a disaster**. This adds urgency to the need for an improved approach to PAM. Climate change poses uncertainties concerning likely environmental stresses on assets, as well as the service delivery demands of assets.

The cost of a natural disaster

A growing number of post-disaster damage and loss assessments (“DaLAs”) present stark numbers of the mounting annual costs of extreme events. In Mozambique, the total cost of recovery and reconstruction following Cyclone Idai in March 2019 was estimated at \$2.9 billion, with damage concentrated in just four provinces (see Trujilo 2019). In Vietnam, a recent Resilient Shores report suggests that an average of \$852 million – or 0.5 percent of national GDP – and 316,000 jobs are at risk annually due to coastal flooding (see Rentschler et. al., 2021). Countries need to leverage these assessments to rebuild or build back assets in a cost-effective way.

Better PAM, on the one hand, will enable adaptations that allow assets to withstand weather extremes for longer durations, which means assets are more resilient. A resilient asset performs optimally and ensures better value and reliability of services and revenues. It can accommodate or quickly recover from severe climate events, which reduces the likelihood of damage or irreversible impact, and extends asset life (see UN 2021).

Factoring in climate change in asset management therefore helps to safeguard investments and protect financial outlays, as governments also reduce the need for costly retrofit while acquiring greater value from infrastructure investments.

Better PAM will enable adaptations that allow assets to withstand weather extremes for longer durations

Climate change is also making more urgent the transition towards carbon-neutral economies. As this shift gains much-needed traction, the impact on the life cycle and value of assets is also becoming more significant. While climate-friendly assets such as solar power will be gaining in value, more carbon-intensive energy or infrastructure assets will lose value or even become **stranded**.

Building climate resilience in assets begins at the planning and design stage, with climate horizons and resilience aspects included in PAM policies, asset management plans, service definitions, and asset performance measurement. Likewise, maintenance strategies and plans should include specific allowance and adaptation measures to address items that limit impacts from climate change.

In this way, states can also be optimally supported in their nationally determined contributions and long-term low carbon transition strategies. It also means that assets which harness natural resources can be designed to do so through green investments, which are more sustainable. Decarbonizing public sector assets can make a significant contribution to meeting climate mitigation targets.

What is a stranded asset?

A non-financial asset may suffer premature write-downs or devaluations owing to changes in regulatory environments of technology. For example, coal-fired power plants may no longer be viable in the face of carbon pricing, or hydro-electric power plants may no longer function due to extended droughts or reductions in water flows associated with climate change. These would be considered examples of ‘stranded assets’.

Digital lag: Why modern-era PAM is overdue

Rapid changes in technology have long necessitated a shift in how governments think of non-financial assets and liabilities. The longer states take to implement a digitally oriented approach to PAM, the more expensive it becomes: both in terms of opportunity costs, and the investment required to catch up to modern, digital-era practices, policies and approaches.

Digital-era PAM calls for transformation in three key aspects.

First, as mentioned above, states can effectively digitalize administrative processes. The development and implementation of digital systems must occur with the end user in mind, rather than being relegated to information technology (IT) experts and departments. Sufficient and ongoing user testing must form part of this conversion to drive adoption.

Second, governments can proactively pursue innovative opportunities whereby technology can improve PAM. Digital platforms and data can and should serve as important tools to deliver better PAM decision support and value. Technology can, for instance, assist greatly in monitoring the access to, use and performance of physical assets, and can help to measure and anticipate exposure to climate risks. Doing so can reduce costs, and makes good sense for modern-era PAM. In the process, human resources are also freed up to be directed more effectively.

Third, states can take stock of how the digital revolution has put increased demands on different asset classes. Traditional public infrastructure asset concerns have been heavy on concrete and steel. In recent times, governments have had to catch up on their digital infrastructure. They also need to explore and utilize intangible assets like digital data, software, and technology patents as an increasingly prominent and even dominant asset class.

These trends are clear if looking at the balance sheets of global technology giants such as Google and Facebook, as well as the platform economy that derives value simply by better leveraging existing physical assets, without investing in them (e.g., Uber and AirBnB). As the World Bank's 2021 World Development Report suggests, the fact that data is a non-rivalrous good that can be repeatedly used in different ways can endow it with significant public-good value.

Digital platforms and data can and should serve as important tools to deliver better PAM decision support and value



What does successful PAM look like?

Proactive PAM can deliver significant and tangible results in terms of service delivery and revenues. Proactive PAM can also make countries more green, inclusive, resilient, and digital. Each of these measures, in turn, can serve to attract greater public and private financing, both from global and domestic resources. PAM success stories can be identified at both national and sub-national levels. Here are four examples:



The **United Kingdom** has adopted an integrated approach to asset management to consolidate service delivery locations, enhance efficiency, and reduce greenhouse gas emissions. According to the State of the Estate report (UK Cabinet Office 2020, 3): “Public sector buildings are responsible for approximately 9% of building CO2 emissions. It is therefore essential that the government shows leadership in this area and drives down carbon emissions.” The report adds (2020, 61) that the British government had reduced its emissions by 57 percent in 2020–21 compared to 2009–10. “It is estimated that 38% of the reduction in emissions was due to the improved management of the estate and a further 19% was due to the decarbonisation of the national grid.”




In the **United States**, authorities have emphasized the link between roadway infrastructure maintenance and safety, including lives lost. As part of its ‘Safe Roads for a Safer Future’ messaging, the Federal Highway Administration (FHWA) of the US Department of Transportation campaign states that: “Incorporating safety into daily road maintenance activities has the potential to reduce fatalities and serious injuries on the local and rural roadways.” In a user-friendly briefing sheet, the FHWA lists a series of “... no or low-cost activities that can be incorporated into roadway maintenance or identified during maintenance activities to improve safety on rural and local roads”.



In **Estonia**, authorities developed a comprehensive and up-to-date platform of asset registries, which is also reflected in strong performance on maintenance prioritization. This is captured in the IMF’s (2018) Public Asset Investment Management Assessment (PIMA) (15) monitoring of public assets and (3) maintenance and funding scores.



In **South Korea**, the government made a concerted effort to leverage digital innovations to improve revenues for non-financial assets, and asset portfolio performance overall (García Mejía and Kaganova 2021, 29). This has included the use of drones to complete the investigations of over 820,000 combined and general administrative properties. Interlinked systems such as the OnBid State Property Management System (BPM), and the State-Owned Geographic Information System have transformed the country’s business process and results in this domain. For example, improved efficiency in the management of public assets in Korea has generated an annual increase of 36.7 percent in revenues from asset sales, 23.7 percent in rents, and 34.2 percent in fines for misuse of state property, which have implied new annual revenues for the state of nearly US\$873 million (García Mejía and Kaganova 2021, 12).



How do we get there?

Touchstones towards proactive PAM

It starts with taking responsibility

Elevating PAM from the shadows demands a new sense of urgency, momentum – and leadership. Proactive PAM is challenged by bottlenecks such as a lack of data; insufficient policy frameworks; a lack of integration in planning; and a rapidly changing environment. These issues are often relegated to different technical specializations, but a critical mass of attention and will is needed to map these bottlenecks against expected results, and in turn address them.

A PAM policy and reform strategy can build common understanding and consensus, and a robust institutional coordination mechanism is critical for its implementation. Such a mechanism needs to have high-level buy-in (at minister or secretary level), and include all critical stakeholders (finance, planning/investment, comptroller general, home affairs [for sub-national governments], environment [climate], technology and select sectors).

Effective PAM has a lot to do with caring for the assets we already have, and making sure we know enough about them to make good decisions

Get to know your assets

For PAM to be effective, officials need detailed data on the condition, value, and potential of public assets to make informed decisions, prioritize maintenance efforts, and identify opportunities for efficient use. In this way, PAM can support sustainable recovery and put countries on a pathway to wealth, resilience, and wellbeing.

However, a major challenge is that governments or sectors often do not know their assets, their condition, value or even their ownership. This can lead to duplications, or the underfunding of maintenance or refurbishment costs that could increase assets' life span and resilience. It can also curtail the economic benefits of the assets' infrastructure network.

Knowing the extent, state, and location of all key physical assets is therefore a starting point for a better PAM. This means that first and foremost, governments need to use and maintain asset registries and asset maps to make sure they know what assets they have. Registers must be accurate, comprehensive, and updated regularly. They should also include the value of most nonfinancial assets, which must also be frequently re-evaluated.

Asset registers also provide important non-financial information for public sector decision-making – such as type, nature or physical condition, and replacement schedule. For example, for revenue purposes, a building block for revenue recovery and capital charging is a **robust register** with information about the current state of specific assets.

Responding to current demands and futureproofing service delivery capacity, administrative and operational entities are also required to track the condition and deterioration of assets in the provision of services or public goods. Proactive management may, for example, involve getting rid of assets that are not working for citizens and replacing them with functional, effective, and sufficient assets.

Robust digital registers

Like asset ownership, registries are often also scattered across institutions. Many are also paper-based and include outdated information. Thus, there is a need to digitalize and integrate asset registers, preferably in a central location and ensure inter-operability of systems. After a successful initial setup of asset registers, their sustained and systematic maintenance should also be institutionalized. This can be achieved through the regulation of responsibilities and a clear task allocation, and by providing enabling instruments. A pitfall occurs where such registries are regarded or treated as IT systems, instead of being designed, valued, and utilized as public digital assets in their own right.



Interventions: seven signposts and red flags

Data is a necessary starting point towards innovative, effective, and proactive PAM. However, adequate data alone will not automatically lead to the benefits described above. Below, we consider seven key signposts, or elements that can be considered hallmarks for more proactive, effective, and digitally oriented PAM. We also identify some 'red flags' – or commonly encountered pitfalls.

Data is a necessary starting point towards innovative, effective, and proactive PAM



Signpost #1

Having an **effective legal and regulatory framework** is a cornerstone for effective PAM, as laws and regulations establish public authority over public fixed assets.

Red flag: These frameworks often focus unduly on budgeting (flows), rather than the stewardship of the assets under control of government agencies. To institutionalize effective, modern PAM, it may be necessary to update legal frameworks.



Signpost #2

An integrated and practical **asset management policy and roadmap** is an important step to address a disconnect between policy and practice.

Red flag: Typically, the surrounding legal and regulatory framework is fragmented, as a policy and roadmap fulfil a cross-cutting function that should include everything from planning, public investment and accounting to climate change strategies, disaster risk management, and decentralization frameworks. There are also multiple objectives to consider, including optimization, valorization, and accountability. These complexities must be acknowledged and addressed for an asset management policy and roadmap to be close the gap between policy and practice.



Signpost #3:

The **effective maintenance of assets** is core to effective, proactive and digitally oriented PAM. Assets can exist for a lengthy period of time and are intended to be productive and profitable throughout. To achieve this, assets require adequate care across their life cycle: not just the inception, creation, or disposal phases.

Red flag: The largest losses from poor PAM tend to be more slow brewing and initially inconspicuous. A classic example is deferred asset maintenance. While relative neglect of asset maintenance may not reveal itself in the short term, the impacts are likely to be more deleterious over the medium to longer term. Asset maintenance also tends to be underfunded. Reasons can include political (and donor) bias; a disparate approach (across different agencies); a lack of accurate and timely data on the condition of assets, and the costs associated with maintenance. That is why this note calls for a more integrated and data-driven approach.



Signpost #4:

For PAM to translate into optimal fiscal benefits, government need to **pay more attention to pricing and charging**. Many assets can be charged to recover full costs, including opportunity costs, which can generate revenue from those who are willing to pay. At the same time, governments need to ensure that charging is consistent with service delivery and inclusion objectives. For example, while changing for COVID-19 tests would have made sense from a cost-recovery point of view, it clearly would not have made sense from a public health or equity perspective. Conversely, encouraging revenue generating commercial activity in transportation hubs may make sense in providing a return additional to that made by the transportation system.

Red flag: While pricing and charging can often be improved across all types of assets, the value of digital assets can be the least explored and optimized.

The largest losses from poor PAM tend to be more slow brewing and initially inconspicuous



Signpost #5:

States should **consider portfolio as well as individual assets**. The diversity of the assets held by government means that there can be portfolio effects. That is, when some assets increase in demand (or value), others may reduce; or when some see a rise in their service use (such as health clinics), others may be in decline (primary schools).

Red flag: To optimize assets' usage in this way (as AirBnB is doing), it is important to project service demand (both public and private).



Signpost #6:

Enhancing the climate resilience of assets should also be embedded in a strategic approach to planning, viewed in the context of the system as a whole. Planning should be informed by assessments that identify the most serious climate risks (e.g., flooding, rising sea levels), as well as national climate mitigation goals (e.g., forest cover, mangroves, and natural dikes). These considerations should guide the prioritization of the most critical assets, whether new assets are needed, and the upgrading of existing assets.

Red flag: Climate considerations should be incorporated in planning frameworks and processes, but beyond that, systematic climate risk and impact screening must be mandated for large infrastructure assets and areas at risk (flood plains, river basins, coastal areas). Another frequently overlooked area is having in place robust information systems. Sufficient information, based on complete, reliable, and geospatially referenced data points, should be used to limit exposure to hazards and curb climate impact on assets.



Signpost #7:

Digitally oriented PAM can be mainstreamed in a cross-cutting manner. To reap the benefits of a proactive approach to PAM, management instruments, systems, and processes must seize the opportunities presented by technological innovation. This is critical to enable internal planning processes and guidelines to automatically factor in up-to-date information on assets.

Red flag: Digital systems are often developed without sufficient input from the end user. Modernizing PAM calls for creating and implementing effective and user-friendly digital platforms that are actually applied for decision support in the public sector. This is vital if national and sub-national governments are to overhaul a business-as-usual, paper-based, and bureaucratic management of public assets.

The diversity of the assets held by government means that there can be portfolio effects

Enhanced institutionalization

While the interventions outlined above can act as pragmatic entry points to align relevant stakeholders and deliver results, better PAM must be institutionalized in an ongoing manner as governments think through existing and emerging challenges. Successful and sustained improvements in PAM will hinge on the ability of advocates to articulate clear driving business cases, along with leadership to be able to demonstrate tangible results. Again, PAM cannot be deferred to individual disciplines such as accountants, engineers, or finance officials, but requires a whole-of-public-sector approach to emerge as a critical mass of cross-disciplinary skills and efforts.

Better PAM must be institutionalized in an ongoing manner as governments think through existing and emerging challenges

Successful PAM: A matter of metrics

To reap and build on the benefits of effective, proactive, and digitally oriented PAM, we also need to get better at measuring how successful we are at investing in and managing our assets. PFM benchmarks, including with their growing attention to climate change, are an important entry point. But building greater momentum for a new generation of proactive PAM measures hinges on clearly communicating the tangible service delivery and revenue mobilization benefits (and costs).

Beyond traditional service delivery and revenue mobilization motivations, governments across the global are increasingly under pressure to demonstrate ways in which they are green, resilient, inclusive, and digital.

PFM benchmarks for unlocking public asset wealth?

Public asset management also features in the context of global public financial management (PFM). The Public Expenditure and Financial Accountability (PEFA) framework (used to assess the status of a country's PFM system) includes a benchmark on PAM (12.2). Similarly, the IMF's Public Investment Management Assessment (PIMA – which evaluates a country's public investment management practices) captures PAM in indicator 15.

The PEFA has been conducted close to 500 times, and about 80 PIMA evaluations have now been completed. These assessments have been repeated over time to capture progress, but the PIMA also captures whether countries adequately focus on maintenance. These assessments can offer valuable insights for cross-cutting engagement. As part of the action plans associated with unlocking public wealth, a clear “North Star” should be service delivery and revenues – consistent with green, resilient, inclusive, and digital development.

This note has set out how improved PAM can enhance infrastructure services and unlock revenues. This can and ought to occur in a way that is green, resilient, and inclusive – and digitally oriented.

This note is intended to create awareness of the immense benefits that governments stand to unlock by adopting a proactive, effective, and digitally oriented approach to PAM. Climate change and COVID-19 have amplified the call for a new perspective on public asset management. By adopting a fresh approach, governments will emerge from these setbacks with greater resilience, healthier balance sheets and better prospects for growth.

Climate change and COVID-19 have amplified the call for a new perspective on public asset management

Bibliography

- ACT-IAC. 2020. *AI Playbook for the US Federal Government*. Washington, D.C.: American Council for Technology-Industry Advisory Council. https://www.actiac.org/system/files/AI%20Playbook_1.pdf.
- Andrews, Matt, Lant Pritchett and Michael Woolcock. 2017. *Building State Capability: Evidence, Analysis, Action*. Oxford University Press.
- APEC and World Bank. 2017. "Improving Public Assets and Insurance Data for Disaster Risk Financing and Insurance Solutions World Bank Technical Contribution to the APEC Finance Ministers' Process."
- Ball, Ian. 2021. "A New Zealand Case Study." In *Our Untapped Wealth: Towards Modern Management of Public Assets*, edited by Mauricio García Mejía, Alejandro Pareja and Pedro Farias, 70-88. Inter-American Development Bank, <https://publications.iadb.org/en/our-untapped-wealth-toward-modern-management-public-assets>.
- Bajpai, Rajni and Bernard Myers. 2020. *Enhancing Government Effectiveness and Transparency: The Fight Against Corruption*, Washington, D.C.: World Bank. <https://www.worldbank.org/en/topic/governance/publication/enhancing-government-effectiveness-and-transparency-the-fight-against-corruption>.
- Bell, Robert. 2021. *Norway's Public-Private Partnership Shows How Satellite Can Fight Deforestation*, <https://www.satellitetoday.com/opinion/2021/10/05/norways-public-private-partnership-shows-how-satellite-can-fight-deforestation/>.
- Blazey, Andrew, Fabien Gonguet, and Philip Stokoe. 2020. "Maintaining and Managing Public Infrastructure Assets", in *Well Spent: How Strong Infrastructure Governance Can End Waste in Public Investment*, edited by Gerd Schwartz, Manal Fouad, Torben S Hansen, and Genevieve Verdier. Washington, D.C.: IMF.
- Bove, Tristan. 2022. "Rome's Colosseum has just been given an actual price tag — and it's big." *Fortune*, July 26. <https://fortune.com/2022/07/26/how-much-is-the-rome-colosseum-worth-deloitte-report/>.
- Congressional Research Service. 2019. *Deferred Maintenance of Federal Land Management Agencies: FY2009-FY2018, Estimates and Issues*. Washington, D.C. <https://fas.org/sgp/crs/misc/R43997.pdf>.
- Deloitte. 2022. *The value of an Iconic Asset: The economic and social value of the Colosseum*. <https://www2.deloitte.com/it/it/pages/finance/articles/il-valore-del-colosseo-come-asset-sociale---deloitte-italy---finance.html>.
- Federal Highway Administration. (n.d.) "The Safety and Roadway Maintenance Link", https://safety.fhwa.dot.gov/local_rural/training/fhwasa14091/maint_link.pdf.
- Flavelle, Christopher; Denise Lu, Veronica Penney, Nadja Popovich, and John Schwartz. 2020. "New Data Reveals Hidden Flood Risk Across America." *The New York Times*, June 29, 2020. <https://www.nytimes.com/interactive/2020/06/29/climate/hidden-flood-risk-maps.html#:~:text=Nearly%20twice%20as%20many%20properties,effort%20to%20map%20the%20danger.&text=A%20100%2Dyear%20flood%20is,striking%20in%20any%20given%20year>.
- García Mejía, Mauricio and Kaganova, Olga. 2021. In "Towards Better Strategic Management of Public Assets in Latin America." In *Our Untapped Wealth: Towards Modern Management of Public Assets*, edited by Mauricio García Mejía, Alejandro Pareja and Pedro Farias, 9–70. Inter-American Development Bank, <https://publications.iadb.org/en/our-untapped-wealth-toward-modern-management-public-assets>.
- Global Infrastructure Hub. 2020a. "InfraTech Stock Take of Use Cases." http://www.d20-Itic.org/images/infratech/InfraTech_Stock_Take_Reference_Note_Final_June_2020.pdf.
- Global Infrastructure Hub. 2020b. *InfraTech Stock Take of Use Cases*, <https://cdn.gihub.org/umbraco/media/3060/the-global-infrastructure-hubs-reference-note-on-infratech-stocktakejuly-2020-revised.pdf>.
- Groom, Simon, Jonas Joerin, Michael Joos, Yi Wang. 2021 (forthcoming). "Getting Hotter? Screening Public Investment Projects for Climate Change using Digital Mapping Platforms." Applications note for the World Bank's Mainstreaming Climate Change in Governance global work programme.
- Hallegatte, Stephane, Jun Rentschler, Julie Rozenberg. 2019. *Lifelines : The Resilient Infrastructure Opportunity. Sustainable Infrastructure*. Washington, D.C.: World Bank. <https://openknowledge.worldbank.org/handle/10986/31805>.

- Hanif, Navid; Caroline Lombardo, Daniel Platz, Claire Chan, Jaffer Machano, Dmitry Pozhidaev and Suresh Balakrishnan (eds). 2021. *Managing Infrastructure Assets for Sustainable Development: A Handbook for Local and National Governments*. New York: United Nations.
<https://www.un.org/development/desa/financing/document/un-handbook-infrastructureasset-management>.
- Harshadeep, Nagaraja Rao, and William Young. 2020. "Disruptive Technologies for Improving Water Security in Large River Basins." *Water* 12, no. 10: 2783.
<https://doi.org/10.3390/w12102783>.
- Hino, Miyuki and Burke, Marshall, 2021. "The effect of information about climate risk on property values." *PNAS*, April 27, 2021 118 (17) e2003374118.
<https://doi.org/10.1073/pnas.2003374118>.
- IADB. 2019. "Our Untapped Wealth: Towards Modern Management of Public Assets."
<https://publications.iadb.org/en/our-untapped-wealth-toward-modern-management-public-assets>.
- IAM. 2015. *Asset Management – an anatomy, Version 3*. Bristol, UK: The Institute of Asset Management.
<https://theiam.org/knowledge-library/asset-management-an-anatomy>.
- IMF. 2014. *Government Finance Statistics Manual 2014*. Washington, D.C. : International Monetary Fund, 2014.
<https://www.imf.org/external/Pubs/FT/GFS/Manual/2014/gfsfinal.pdf>.
- IMF. 2018. *Public Investment Assessment Estonia*, June,
<https://infrastructuregovern.imf.org/content/PIMA/Home/Region-and-Country-Information/Countries/Estonia.html>.
- IMF. 2019. Public sector balance sheet database.
<https://data.imf.org/?sk=82A91796-0326-4629-9E1D-C7F8422B8BE6>.
- IMF. 2021. "What's New in the IMF Investment and Capital Stock Dataset: Estimating the stock of public capital in 170 countries, May 2021 update,"
https://infrastructuregovern.imf.org/content/dam/PIMA/Knowledge-Hub/dataset/WhatsNewinIMFInvestmentandCapitalStockDatabase_May2021.pdf.
- IMF. 2022. "Georgia: Updating the Balance Sheet and Quantifying Fiscal Risks from Climate Change, Fiscal Affairs Department," prepared by Harris, Jason , Tjeerd Tim, John Zohrab, Viera Karolova, and Jyoti Rahman,
<https://www.imf.org/en/Publications/CR/Issues/2022/05/27/Georgia-Technical-Assistance-Report-Updating-the-Balance-Sheet-and-Quantifying-Fiscal-Risks-518383>.
- IMF. 2022a. Investment and capital stock data set (ICSD).
<https://data.imf.org/?sk=1CE8A55F-CFA7-4BC0-BCE2-256EE65AC0E4> Latest update 06/15/2022
- Institute for Manufacturing. 2019. Infrastructure Digital Twins. University of Cambridge.
<https://www.ifm.eng.cam.ac.uk/research/asset-management/research-projects/infrastructuredigital-twins/>
- Jovel, Roberto J.; Mudahar, Mohinder. 2010. *Damage, Loss, and Needs Assessment Guidance Notes : Volume 1. Design and Execution of a Damage, Loss, and Needs Assessment*. World Bank. Washington, D.C.: World Bank.
<https://openknowledge.worldbank.org/handle/10986/19047>.
- Kaiser, Kai and Fabian Seiderer. 2019. "Where have all the public investments and infrastructure assets gone? Monitoring and optimizing public assets while improving financial reporting," *World Bank Blog*, June 14,
<https://blogs.worldbank.org/governance/where-have-all-public-investments-and-infrastructure-assets-gone>.
- Kaiser, Kai and Pedro Camargo. 2021 (forthcoming). "Improving Public Expenditures Impacts through User-Centric Digital Decision Support for Road Maintenance Prioritization," Background Note Prepared for Vietnam Disruptive Technologies for Public Asset Governance (DT4PAG), World Bank.
- King, Steven and Brown, Paul, 2007. "Fix my street or else: Using the internet to voice local public service concerns," Proceedings of the 1st International Conference on Theory and Practice of Electronic Governance, ICEGOV 2007, Macao, China, December 10-13, 2007.
- Kornejew, M., Jun Rentschler and Stephane Hallegatte. 2019. "Well Spent: How Governance Determines the Effectiveness of Infrastructure Investments," World Bank, August 6, 2019,
<https://elibrary.worldbank.org/doi/abs/10.1596/1813-9450-8894>.
- Kopanyi, Mihaly and Abdu Muwonge. 2021. *Managing County Assets in Kenya: Post-Devolution Challenges and Lessons*, Washington, DC: World Bank.
- Locke, Dave and Karen Lewis. 2016. "The anatomy of an IoT solution: Oil, data and the humble washing machine," *IBM Business Operations Blog*,
<https://www.ibm.com/blogs/internet-of-things/washing-iot-solution/>.

- Macaulay. 2018. "Rolls-Royce CDO Neil Crockett drives data into engine design," CIO, June 26, <https://www.cio.com/article/3525828/rolls-royce-cdo-neil-crockett-drives-data-into-engine-design.html>.
- Mandle, Lisa Ann, Stacie Wolny, Nirmal Bhagabati, Hanna Helsingen, Perrine Hamel, Ryan Bartlett, et al. 2017. "Assessing ecosystem service provision under climate change to support conservation and development planning in Myanmar." *PLoS ONE* 12(9): e0184951. <https://doi.org/10.1371/journal.pone.0184951>
- Mandle, Lisa Ann, Zhiyun Ouyang, James Edwin Salzman, Gretchen Cara Daily (eds). 2020. *Green Growth That Works: Natural Capital Policy and Finance Mechanisms from Around the World*. Washington, DC, Island Press.
- Martinez-Vazquez, Jorge. 2021. Adapting Fiscal Decentralization Design to Combat Climate Change. *Climate Governance Papers*; World Bank, Washington, D.C.: World Bank. <https://openknowledge.worldbank.org/handle/10986/35899>.
- McKinsey. 2019. "Decoding Digital Transformation in Construction." <https://www.mckinsey.com/business-functions/operations/our-insights/decoding-digital-transformation-in-construction>.
- McKinsey. 2020. "Climate risk and response: Physical hazards and socioeconomic impacts." <https://www.mckinsey.com/capabilities/sustainability/our-insights/climate-risk-and-response-physical-hazards-and-socioeconomic-impacts>
- McKinsey. 2021. "The rise of the global balance sheet: How productively are we using our wealth?" November 15, 2021, <https://www.mckinsey.com/~media/mckinsey/industries/financial%20services/our%20insights/the%20rise%20and%20rise%20of%20the%20global%20balance%20sheet%20how%20productively%20are%20we%20using%20our%20wealth/mgi-the-rise-and-rise-of-the-global-balance-sheet-full-report-vf.pdf>.
- Planet. 2021. "Universal Access To Satellite Monitoring Paves The Way To Protect The World's Tropical Forests," *Planet Pulse Blog*, March 2, 2021, <https://www.planet.com/pulse/universal-accessto-satellite-monitoring-paves-the-way-to-protect-the-worlds-tropical-forests/>.
- Pulsar. 2020. "Strengthening Fixed Asset Management through Public Sector Accounting," Center for Financial Reporting Reform, World Bank Group, November 2020, <https://cfr.worldbank.org/publications/strengthening-fixed-asset-management-through-public-sector-accounting>.
- PWC. 2019. "Final Report: Public Asset Registry – Design for the Philippines and global good practice and technology trends," https://worldbankgroupmy.sharepoint.com/personal/bsigner_worldbank_org/_layouts/15/onedrive.aspx
- Rentschler, Jun; Sophie de Vries Robbé, Johannes Braese, Dzung Huy Nguyen, Mathijs van Ledden, Beatriz Pozueta Mayo. 2020. *Resilient Shores: Vietnam's Coastal Development Between Opportunity and Disaster Risk*. Washington, D.C.: World Bank. <https://openknowledge.worldbank.org/handle/10986/34639>
- SEADRIF. 2020. "Financial Protection of Public Assets, Fact Sheet 4," Public Asset Management and Registry, SEADRIF Knowledge Series, <https://www.financialprotectionforum.org/seadrifknowledge-series-financial-protection-of-public-assets>.
- St. John, Jeff. 2020. "Climate TRACE: Using Satellites and Machine Learning to Pinpoint Global Emissions," <https://www.greentechmedia.com/articles/read/climatetrace-using-satellitesand-machine-learning-to-track-global-greenhouse-gas-emissions>.
- Suter, Luis; Dmitry A Streletskiy and Nikolay Shiklomanov. 2019. "Assessment of the cost of climate change impacts on critical infrastructure in the circumpolar Arctic," *Polar Geography* 42(12):1-20. https://www.researchgate.net/publication/337189435_Assessment_of_the_cost_of_climate_change_impacts_on_critical_infrastructure_in_the_circumpolar_Arctic.
- Tanzi, Vito and Tej Prakash. 2000. "The Cost of Government and the Misuse of Public Assets." IMF Working Paper 00/180.
- TCFD. 2021. "Proposed Guidance on Climate-related Metrics, Targets, and Transition Plans, Task Force on Climate-Related Financial Disclosures," <https://www.fsb-tcf.org/publications/>, <https://www.fsb-tcf.org/publications/>.
- Trujillo, Monica. 2019. "Mozambique Cyclone Idai: Post-Disaster Needs Assessment," Prevention Web. <https://www.preventionweb.net/publications/view/65769>.
- UK Cabinet Office. 2020. "State of the Estate in 2019-20," https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/979276/State-of-the-Estatein-2019-20.pdf

- World Bank. 2012. "FONDEN: Mexico's Natural Disaster Fund-A Review," World Bank, Washington, D.C.: World Bank.
<https://openknowledge.worldbank.org/handle/10986/26881>.
- World Bank. 2020. "Infratech Policy Toolkit," World Bank, Washington, D.C.: World Bank.
<https://openknowledge.worldbank.org/handle/10986/34326>.
- World Bank. 2020a. "Infratech Value Drivers," World Bank, Washington, D.C.: World Bank.
<https://openknowledge.worldbank.org/handle/10986/34320>.
- World Bank. 2021. "Financial Protection of Critical Infrastructure Services,"
<https://www.financialprotectionforum.org/event/world-bank-group-virtual-report-launch-financial-protectionof-critical-infrastructure>.
- World Bank. 2021a. "Resilience Rating System: A Methodology for Building and Tracking Resilience to Climate Change," World Bank, Washington, D.C.: World Bank.
<https://openknowledge.worldbank.org/handle/10986/35039>
- World Bank. 2021b. "Disruptive Technology for Public Asset Governance (DT4PAG): Vietnam Subnational Use-Case Incubations,"
https://docs.google.com/presentation/d/1lLApIpppHKTeVtGEkN3kXcsvq_je49nWLteYh7xGWo/edit#slide=id.p.
- World Bank. 2021c. "Strengthening Infrastructure Governance: A Portfolio Mining Review of Public Asset and Investment Management Strengthening."
<https://docs.google.com/document/d/1ek80TvBUzemFOS-7G7WuUodXe79VOKrdjsbxbnfMhc/edit>.
- World Bank. 2021d. *World Development Report 2021: Data for Better Lives*, Washington, D.C.: World Bank.
<https://www.worldbank.org/en/publication/wdr2021>.
- World Bank; SNG. 2020. *Spatial Finance: Challenges and Opportunities in a Changing World, Equitable Growth. Finance and Institutions Insight*, Washington, D.C.: World Bank.
<https://openknowledge.worldbank.org/handle/10986/34894>
- Zhao, Zhirong Jerry, Camila Fonsca-Sarmiento, and Jie Tan. 2019. "America's Trillion-Dollar Repair Bill: Capital Budgeting and the Disclosure of State Infrastructure Needs," Volcker Alliance Working Paper.
<http://www.volckeralliance.org/sites/default/files/attachments/Americas%20Trillion-Dollar%20Repair%20Bill%20-%20Capital%20Budgeting%20and%20the%20Disclosure%20of%20State%20Infrastructure%20Needs.pdf>.



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