

# Blockchain for public finance

Applications in capital markets and beyond





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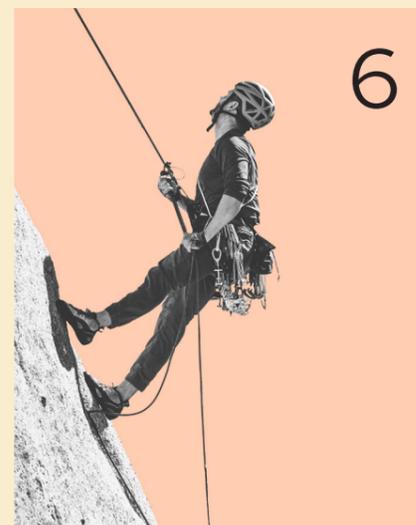
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## Introduction

# IMPROVING PUBLIC POLICY AND DELIVERY

**More effective and efficient policy-making can be realised by a public finance management system that places transparency and the seamless sharing of data at its heart.**

What should a well-designed public finance management system do? At its simplest, a PFM system should ensure that funds reach their intended recipients and are used for their intended purpose. And it must give the central budgetary authority accurate and regular reports of how its resources are being used, providing it with the information necessary to formulate and design fiscal policy.

The advent of digitalisation promised simplification and efficiency. However, since each entity involved in the finance management and budget delivery process uses their own systems, the consequence is often a huge duplication of effort – financial and nonfinancial reporting conducted anew at every level, requiring manual reconciliation. This duplication wastes time and resources. A more automated process would not only cut down on this, but also reduce the incidence of costly mistakes. A key challenge in the construction of an efficient PFM system is to address these problems.

Despite the duplication of effort, most present PFM systems offer only a very limited view of how resources are deployed. Many budgetary authorities have little to no idea how large portions of the funds they dole out are actually used. Quite apart from the risks of fraud or waste, this hampers the budgetary authority's ability to formulate effective policy. Again, achieving this kind of transparency should be a priority in the design of new PFM systems.

Delivering this transparency and efficiency is, in essence, about ensuring the seamless sharing of information. Although one tends to look at a government, be it local or national, as a monolithic central authority, it is more accurate to consider it as a network – a complex web of overlapping systems and hierarchies through which policy and funding must be carefully steered from conception to delivery. Sharing information throughout this network is a challenging

process that requires careful design.

There is another reason why these institutions must pursue the ability to scrutinise their budgets. Public bodies are, more and more stringently, required to adhere to high environmental, social and governance standards. This is likely to be one of the key vectors of scrutiny of public finance over the next 10 years.

Thanks to the sustainable finance movement, capital markets have become an important tool in the incentivisation of good behaviour in both the public and private sectors. The push for enhanced visibility on the use of funds began there with investors putting pressure on the recipients of their money to uphold these ESG standards. Meeting these demands for visibility requires a greater degree of transparency and oversight over how funds are spent.

The required standards of public spending scrutiny are climbing rapidly and what was once an acceptable standard of oversight will soon be outdated and inadequate.

Public finance management is no longer simply a tool to keep track of budgets, but is now a means of ensuring public institutions can maintain the standards of oversight, delivery of outcomes and impact that are increasingly expected of them that are increasingly expected of them.

### Designing PFM systems

Typically, public finance management solutions come in two forms. These are laid out in the International Monetary Fund's 'How to design a financial management information system' paper. First, is a single comprehensive enterprise resource planning system spanning core PFM including budget execution, accounting, treasury and cash management as well as the more auxiliary functions – development planning, budget formulation, procurement,

payroll, debt management and asset management.

Although such a system can certainly be efficient once implemented, creating one system for every participant and stakeholder to use requires a high level of technical capacity. It is also important to note that finance management processes are run by people with skills, experience and preferences. Uprooting and replacing the status quo entirely requires a long and complex change management process across many stakeholders.

It is more feasible to implement incremental changes, allowing people to continue to use the systems in which they have expertise, while removing the most onerous, time-consuming and least valuable elements.

The second method keeps only the core PFM processes – budget execution, treasury and cash management, and accounting – on a single platform and manages the auxiliary PFM systems with separate IT systems.

The risk here is that the more disparate IT systems required for the PFM process, the more potential there is for duplicated effort in the reporting process. Information could also become siloed, limiting how effectively it can be shared between the layers of management and delivery.

The key to avoiding the wasted effort that characterises many PFM systems is to connect existing systems effectively, leading to easily shared information and enabling new, inter-institutional functions. Cutting down on duplicated effort frees up resources to be more effectively employed elsewhere. This delivers the information-sharing benefits of a single comprehensive system with a far less complex transition process.

### Architecture

While the precise architecture of such a system falls outside the scope of the report, it is worth considering the question of whether it should be based on blockchain or if the same or better results could be achieved with centralised infrastructure.

Some experts argue that the requirements of a PFM system do not fall within the specific confines of a system that could only be created via blockchain. Typically, blockchain systems are necessary in a specific context where there is a need for distributed consensus between distrusting parties and there is no trusted central party to oversee and maintain the network.

Government agencies could be seen as trusted parties, so it could be argued that a system involving public institutions could simply rely on the funding authority managing the record of transactions centrally.

However, it is worth acknowledging that most public sector programmes involve complex ecosystems with many counterparties, both from within and outside the public sector, each with specific agendas and reporting requirements, as well as distinct management information systems. Blockchain systems can provide this ecosystem with a single source of truth and a streamlined approach to sharing information, rather than relying on disparate systems. Providing an efficient



**'Public finance management systems have existed in one form or another for a long time but, in many cases, have failed to develop the sort of streamlined inter-institutional functionality now needed.'**

means of logging payments, accounting for uses and controlling these with smart contracts might most easily be done with blockchain, although it is not impossible that such a system could be developed with centralised architecture.

PFM systems have existed in one form or another for a long time but, in many cases, have failed to develop the sort of streamlined inter-institutional functionality now needed. There are various ways to achieve this, as highlighted above, but the question facing public institutions is how they can deliver this with the minimum of expenditure and disruption of services. This is likely to rule out a root-and-branch rebuilding of the system, because of the necessity for high investment and extensive retraining of staff. Instead, a solution like blockchain, which can be layered on top of and connect existing systems, allowing every party to benefit from the single source of truth, could deliver many of the same results with a far easier implementation process.

Complex systems with large numbers of counterparties that need to share certain information with each other, overlaid across a variety of enterprise resource management systems, deploying instructions implemented by smart contracts can work effectively with blockchain, even if there is no explicit need for trustless consensus-building.



## 1. EXISTING CHALLENGES

**Building a dedicated public finance management system that overlays internal ones will help aid data capture and sharing, delivering for the public good.**

The process of managing public finances is riddled with problems of inefficiency and failures of transparency. The IMF paper breaks down the failures into four categories: functionality, data sharing and interoperability, inadequate institutional coverage, and connectivity and IT platform issues. The first two relate to failures of design and are explored below, while the latter two relate to broader questions of infrastructure and governance that fall outside the scope of this report.

The IMF highlights that some systems do not have sufficiently effective financial reporting capabilities 'undermining the tool's ability to support PFM processes and transparent dissemination of fiscal information'.

Other systems are unable to track cashflows effectively. This should be achieved by efficient sharing of information between government accounting systems and bank accounts and payments services. Reconciling any discrepancies between accounts and bank statements is a costly process, often requiring manual intervention.

Other systems struggle to capture all the relevant data required to effectively control payments, like commitment ceilings to limit expenditure.

Finally, effective financial management requires accurate forecasts of cash positions. Some PFM systems fail to do this effectively because of a failure to electronically log payments and receipts or in capturing information on accounts payable.

Information sharing capabilities and interoperability

As mentioned, many of the different functions involved in the PFM process are performed by different people using different IT systems.

**'An effective PFM system must have a facility to ensure that information entered in one platform can automatically be read by another without manual re-entry of the relevant information.'**

An effective PFM system must have a facility to ensure that information entered in one platform can automatically be read by another without manual re-entry of the relevant information, which is resource intensive and introduces the possibility of human error.

**The PFM journey**

To illustrate some of the problems with present systems, we will trace the path of budgetary funds through a notional PFM system.

The public finance management process begins with a central budgetary authority. Consider the national treasury; it decides the budget for a given department – for example the UK’s Department of Health and Social Care – and attaches various policy aims for what the money should achieve, perhaps to reduce waiting times for urgent care.

The department receives the money and policy aims, adding additional details based on how these goals can best be reached – perhaps by a recruitment campaign to hire more nurses – and more specific instructions about how the money can be used – advertising positions, outreach and so on. A portion of the budget is spent on wages, administrative costs and other overheads at this level.

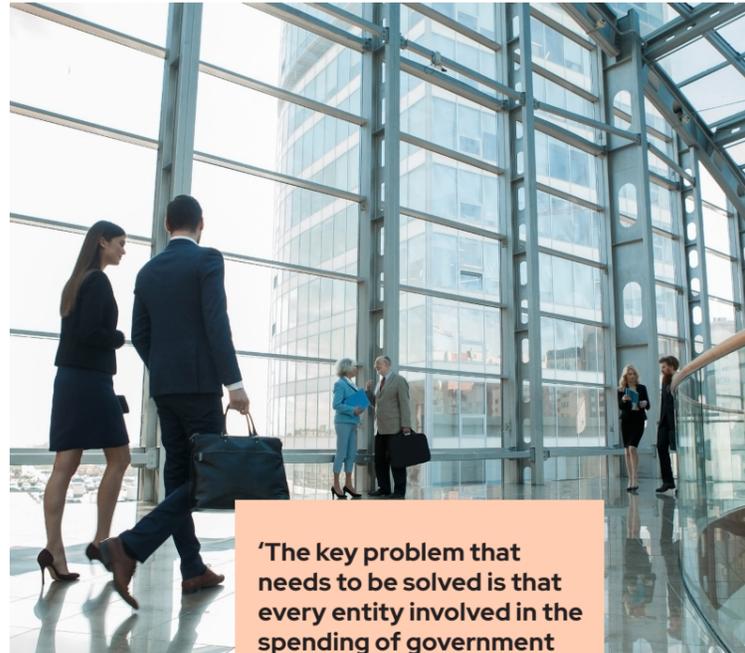
The remaining budget and the more detailed instructions move down another layer, perhaps to a local health authority where the money can be spent in various approved ways – such as on salaries, procurements, investments and fees. In practice, there may well be other layers before the actual delivery agent, made up of, in this example, individual hospitals, departments within each institution, contractors and more.

Hospitals and local administrators log that they have received the funding and deliver financial reports of their accounting processes back up the chain. Reporting on the outputs and outcomes achieved is typically reported separately and is not linked to the specific funding sources.

That is how it should work in theory, but this abstracts much of the complexity of the real experiences of those working in these systems.

At each layer, money must be tracked and reported on, entered into new enterprise resource management software and acknowledged to the upper layers. The financial reporting process and the reconciliation of payments across multiple systems is, at present, often manual and resource intensive. Fulfilling the financial reporting obligations each layer owes the previous layer is a costly and time-consuming exercise that is necessary to fulfil legal obligations but otherwise contributes little to the effective operation of government.

In addition to the resources required to keep this



**‘The key problem that needs to be solved is that every entity involved in the spending of government funds has their own internal systems, and financial reporting and auditing obligations.’**

system operating, the existence of human error also has substantial costs, which are detailed below

**Limitations**

It is also important to note that, while hospitals and local administrators deliver financial reports, there is very little transparency on how the money is actually used. This means there is no link between funds spent and outputs or outcomes achieved, no transparency on prices across a system and that the aggregated data is not available at the budget decision-making level for policy formation. This is discussed in more detail in a section on the benefits of effective PFM systems below.

**How to improve**

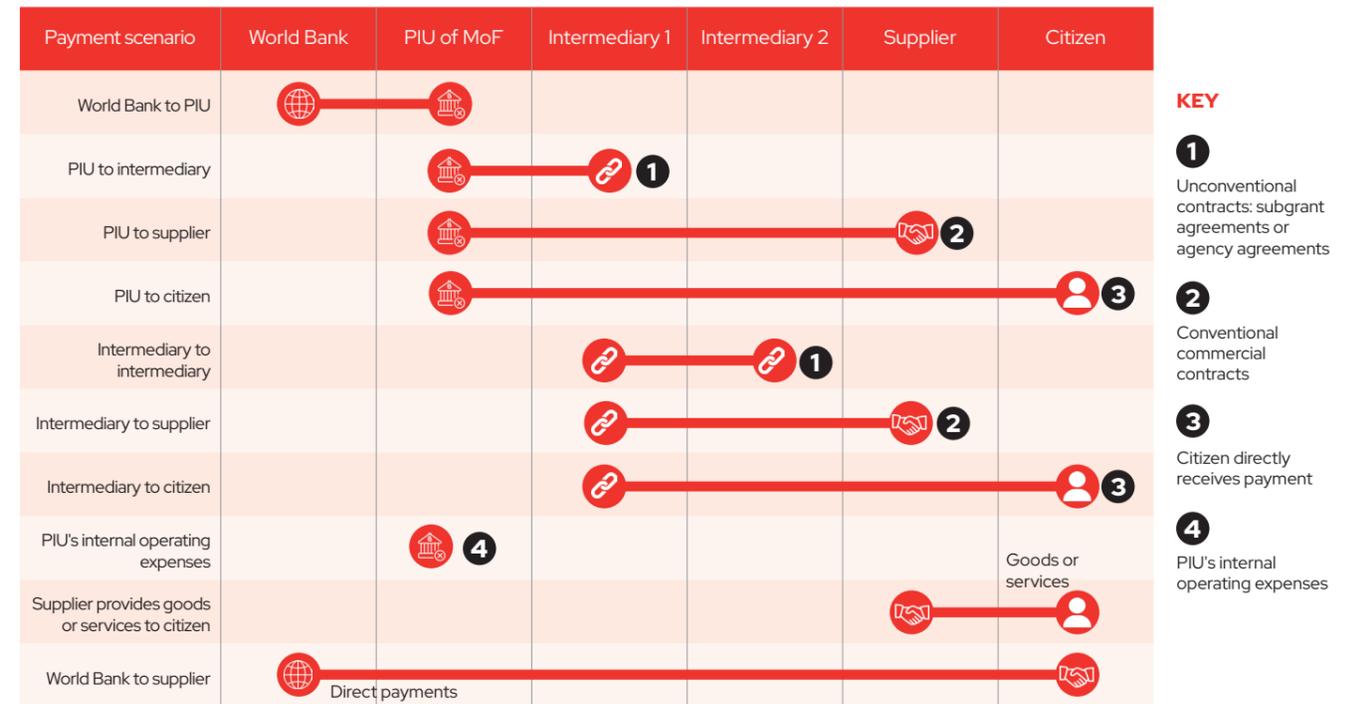
The key problem that needs to be solved is that every entity involved in the spending of government funds has their own internal systems, and financial reporting and auditing obligations.

What is needed is a system that can overlay – not replace – the enterprise resource planning systems of each institution and automate the process of generating financial reporting data.

Such a system, if properly designed, could also give upper layers the ability to append conditions to the budget funding they pass on, restricting and guiding its use. One might imagine some

**FIGURE 1.1: PFM SYSTEMS MUST BE ABLE TO TRACK PAYMENTS THROUGHOUT THE PROCESS**

Traceability scenarios across actors beyond the project implementation unit



Source: World Bank

budget, digitally earmarked for wages, funnelled automatically to the control of the payroll team. Other funds might be allotted for use by a particular project, channelled to the team in charge of it and restricted such that they can only be spent on contractors on an approved list.

In some cases, these conditions already exist but are only communicated via strategy and policy documents. These must then be manually disseminated among those responsible for spending the budget and delivering the projects. A system wherein these conditions were effectively attached to the budget payments would improve managers’ awareness of and ability to adhere to these conditions.

Information also flows the other way. As delivery agents spend the funds, they enter in their own systems the outcomes that the spending achieves. A sophisticated resource management system should be able to integrate with these internal systems and feed this information up to higher managerial levels, giving them both granular and aggregated visibility in near real time of how the budget is spent and what it achieves.



**‘A sophisticated resource management system should be able to integrate with these internal systems and feed this information up to higher managerial levels.’**



## 2. ECONOMIC ADVANTAGES OF IMPROVEMENTS

**A modern PFM system would not only save on overhead and administrative costs, but bring benefits through fraud and waste reduction, as well as better tracking what how impactful spending is.**

A report, commissioned by EY and conducted by Prysm Group, specialists in the economics of emerging technologies, evaluated the potential savings that could be achieved from the implementation of an improved public finance management system of the type described.

The first category of savings they identified was improper payments, defined by the US Office of Management and Budget as a payment made by a federal agency that is 'made in an incorrect amount or to the wrong recipient'.

The OMB's dataset on payment accuracy reported improper payments of \$277bn in 2021, of which \$255bn were overpayments. Around 40% of this was recovered. It is worth noting that 2021 appears to have been anomalously high, as a result of economic stimulus payments.

Prysm Group's medium scenario, where a digital public finance management architecture prevents 50% of improper payments caused by a failure to access data and 20% of improper payments where data was inaccessible or missing, suggests that some \$695bn of losses would be prevented over a decade.

Even if this figure would come down with a lower base year than 2021, the scale of the cost of improper payments – and the savings from preventing them – are likely to be in the hundreds of billions of dollars.

### \$277bn

The OMB's dataset on payment accuracy reported improper payments of \$277bn in 2021, of which \$255bn were overpayments.



**Reduced overheads**

The administrative burden of the financial reporting that could be alleviated by an efficient public finance management system is difficult to calculate. Prysm Group identified \$4.8bn in annual salary expenditure in 2021 in US government agencies that could be targeted across three relevant job categories: accounting & budget; financial analyst; grant management. They then used a 2020 survey that suggested federal employees spend roughly 13% of their full-time hours on tasks they consider low value and that could potentially be reduced via automation. However, this proportion could be considerably more among employees in accounting and financial management roles – for example, the National Science Foundation estimates that grant managers spend 40% of their time on compliance related tasks that could be reduced via automation.

Making assumptions about the effectiveness of a solution in reducing these low-value tasks, Prysm Group estimated the administrative savings would be between \$1.6bn-\$4.8bn over 10 years.

This does not include any benefits that might accrue from freeing up people’s time to complete more valuable work.

It is important to note that the less effectively automated a process is, the more likely it is for mistakes to be introduced. As well as causing improper payments, checking for, identifying and rectifying these mistakes is a major requirement of time and resources in this area.

It is also not obvious that financial reporting, since it is mandated by law, would necessarily be considered low value activity by survey respondents.

**Indirect benefits of blockchain for PFM**

**Outlay tracking: Fraud and waste prevention**  
With the outlay tracking system mentioned above, governments and other public institutions would have greater visibility of how their budgets are deployed. Waste should become more obvious and easier to avoid. Corruption should become easier to identify and prevent.

The enhanced transparency and traceability of payments should make it much easier to identify the recipient of funds. This should make embezzlement of funds more apparent and easier to prevent.

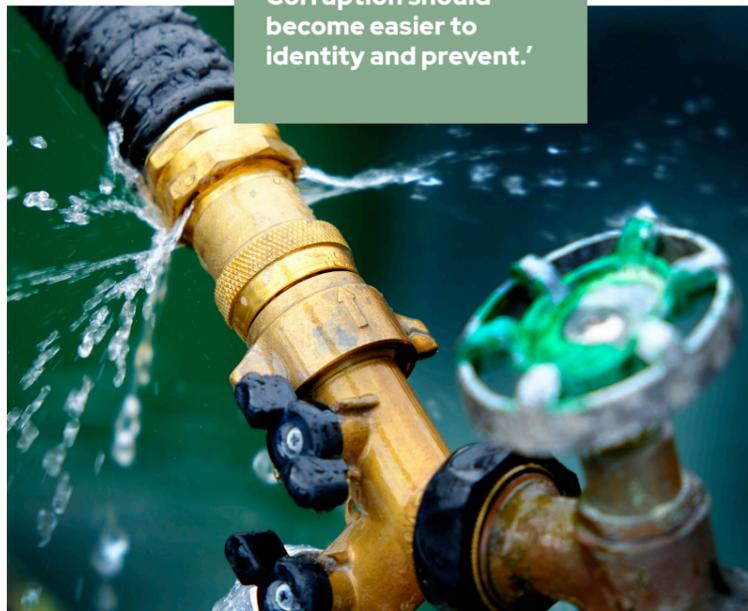
There has been a substantial rise in fraud globally, causing costs to businesses. Regulators want to better protect consumers and businesses from more advanced forms of fraud, including ransomware and cybersecurity attacks intercepting payments or stealing from accounts. The pandemic caused a noticeable change on the type of scams that transpired in 2020. Unsolicited calls, robocalls and phishing emails saw dramatic increases during the period in question due to lockdown. According to the Federal Trade Commission, overall identity fraud

incidents increased around 45% in 2020, incurring financial losses for many. Businesses face increasing losses from business e-mail compromise and invoice fraud (which costs businesses £92.7m per year, according to a UK Finance survey).

Invoice fraud, where invoice letters or emails are intercepted for the purpose of rerouting a payment by changing an account number, has become more common. The advent of a blockchain public finance management network would reduce the opportunity for invoice fraud, since recipients’ payment details could be stored within the network. Paying an invoice would simply involve the click of a button to initiate a payment to the recipient, rather than sending payment details on paper or digitally, which a payer would have to enter without being able to verify the recipient. The possibility of errors (either accidental or as the result of malicious interceptions) would be mitigated by this kind of system.

If a central bank provides a digital currency, it could work with a new public financial management system. With a master wallet for the government and various sub-wallets for different departments, perhaps giving permissioned visibility to certain parties, the government’s financial position could be made clear. However, while a digital currency would mesh well with this kind of system, it is certainly not a necessity.

**‘Waste should become more obvious and easier to avoid. Corruption should become easier to identify and prevent.’**



Many of the benefits can be achieved without changing payments rails, simply by improving the PFM architecture.

Governments would also be more effective at efficiently managing their cash and forecasting their future cash position. Knowing when payments will be made or received reduces the need for the institution to keep excess liquidity on hand, allowing it to be used elsewhere more productively.

**Outlay tracking and allocation efficiency**

Perhaps most importantly, the outcome of government spending programmes would be easier to track and identify.

Financial reporting and nonfinancial reporting typically occur in completely different systems. They are only rarely used together to design policy.

‘The NHS [National Health Service] distributes a fixed budget and not much information flows back to the centre, so it’s difficult to get control of what is spent across the whole system. Tracking where the budget goes is an area of great complexity,’ said Noel Gordon, chair and non-executive director of NHS Digital. ‘Many resources are expended on people trying to track where money is spent. Questions of how to most efficiently procure high volume, low ticket price consumables are particularly difficult to assess.’

One of the consequences of this is that there is little in the way of price transparency. The Carter review in 2015 highlighted unwarranted variations in procurement costs, noting for example that the average price for a hip prosthesis varied from £788-£1,590 and that the NHS trusts purchasing the most were not doing so at the lowest price.

For some consumables, prices are negotiated centrally. However, this means the health service faces the challenge of distributing the materials to hospitals all over the country. With budgets distributed around the country and delivery occurring at various levels of decentralisation (nationally, regionally or institutionally), the pricing strategies suppliers are using for different institutions is not at all clear to the central budgeting authority, meaning that it cannot be confident that it is getting good value for money.

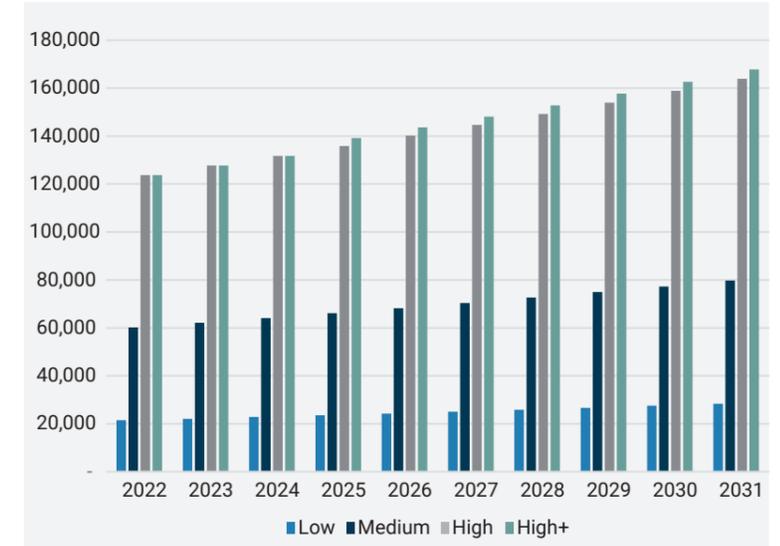
On logistical matters, there is even more variation and even less clarity on its causes. The Carter review revealed that cost of running facilities varied between £105-£970 per square metre, with little clarity on reasons for the variation.

Without improved transparency on how resources are used, it is difficult to smooth out variations like these. The data are generally available at the level of budget delivery, but the architecture for feeding it back up to central budgetary authorities to inform policy decisions is lacking.

As Gordon put it, ‘It’s clear to policy-makers that there are savings to be made, but it’s difficult to know how to get at them.’

**FIGURE 2.1: MONETARY LOSS PREVENTION FROM EFFECTIVE PFM SYSTEMS**

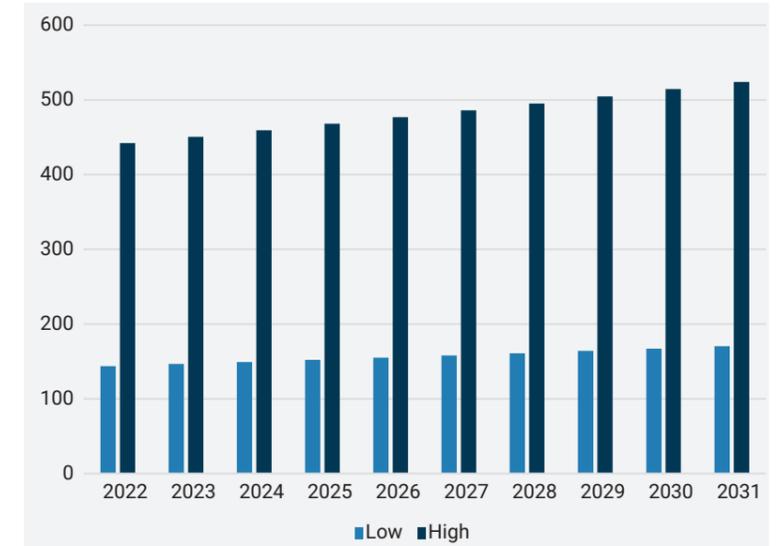
Returns from PFM improvements grow year on year, \$m



Source: Prysm Group

**FIGURE 2.2: ADMINISTRATIVE SAVINGS FROM EFFECTIVE PFM**

Substantial opportunities to cut overheads, \$m



Source: Prysm Group

### Utility of public funds

Prysm Group also goes into some detail on the analysis of how the money saved via the introduction of a digital PFM solution might be better spent. The reallocation of money lost through inadequate PFM system would benefit gross domestic product growth and the broader economy.

They estimate that the intended recipients of improper payments have a higher marginal propensity to consume and that if the payments were directed appropriately, US economic output will climb by \$260bn over the course of 10 years.

As well as boosting raw output figures, properly directed government spending should cause an increase in general welfare. Assessing the benefits of government spending across all departments is immensely complex. Prysm Group borrows a unified framework from 2020 research by Hendren et al, which employs the marginal value of public funds metric to capture the utility benefit of public spending to the recipient.

With better outlay tracking, it is reasonable to expect that money saved by the introduction of a PFM system could be reallocated to programmes with a higher MVPF. Prysm Group's assumptions yield a marginal increase in social welfare of \$165bn over the next 10 years, solely by redirecting improper payments.

But this might just be scratching the surface of the benefits achievable through this kind of analysis. If we accept the assumption that a more effective PFM system improves the ability to assess the impact of government spending, why would this technique only be used on the funds saved by the prevention of improper payments? It could also be used to redirect funds from underperforming programs to programs with a higher impact in terms of outcomes.

Hospitals and administrators must gather data on how effective the policy was. For example, did the additional money spent on a recruitment campaign lead to an increase in staff and reduced wait times? Without a channel to feed this information back up to central budgetary authorities, the information cannot be used to inform policy decisions.

At present, governments do receive data on how their funds are spent, but, typically, this is delivered annually, biannually or, at best, quarterly. Much of the valuable data is stored in siloes belonging to a particular institution or department that is not smoothly communicated to collaborators.

With an effective means of digitally tracking outlay of funds and programme outcomes, public sector institutions will have a better idea of the effect of their spending.

There are regulatory directives coming into play in some jurisdictions that will make this additional transparency a necessity. This is discussed in more



**'Knowing when payments will be made or received reduces the need for the institution to keep excess liquidity on hand, allowing it to be used elsewhere more productively.'**

detail below.

With this improvement of the oversight of the performance of government spending programmes, public institutions will be better informed about how their funds are used and what programmes achieve their intended purpose.

The richer data offered by this improvement in oversight means that governments can begin a more effective process of evaluating their spending.

The Hendren MVPF framework offers one possible framework for the evaluation of public spending, but the discipline of welfare economics offers other tools for this assessment.

Governments might also consider analysis of the efficacy of their spending based on the cost benefit ratio or the net social benefits criterion.

Hendren et al assess the relative merits of these frameworks as tools for the evaluation of public spending, but the decision on how to quantify the impact of government spending is a political one and falls outside the scope of this report.

However, all forms of welfare economics analysis are easier with the richer sources of data generated by an effective PFM system.

### PARTNER'S COMMENT



## REWRITING THE RULES ON MANAGING PUBLIC MONEY

**Digital technology can improve the management of public finances and funds, and unlock significant value for governments, citizens and communities, writes Mark MacDonald, global public finance management leader at EY.**

Imagine you could rewrite the rules of public finances. Imagine not having to cut social services nor raise taxes to close that damaging hole in a budget. Imagine building more schools and training more doctors without having to borrow money, raise taxes or cut other budgets. Imagine being the generation of public service leaders that creates high quality, well-funded government services without leaving tomorrow's taxpayers to pick up the tab.

Or imagine you could rewrite the rules of public sector lending. Imagine if organisations that spend donor or investor money on public projects could accurately, and in near real time, track how that money was spent and generate data to demonstrate the impact it made. Imagine how much more confident donors or investors would be that their money was being spent effectively and efficiently – and the impact this confidence could have on our collective capacity to do good around the world.

Is this too good to be true? Not anymore.

#### Managing within long-held constraints

Effective public financial management is always a top priority for governments. But in recent years – as demographic change and crises, including the Covid-19 pandemic, have driven public spending and investment, while low growth has emerged as a feature of the modern global economy – renewed fiscal pressures have increased the urgency for advances in the way public finances are managed.

For decades, governments and public sector agencies have been spending taxpayers', donors' and investors' money as effectively as they could. But the system hasn't been perfect. It costs money to move funds through the government value chain, as they make their way from the central treasury or finance ministry through programme departments to delivery agencies and their partners, and to the ultimate payment or service recipient. It's the same for a development agency, as money is allocated to a programme and then makes its way through the

chain of funding and delivery agencies toward the ultimate beneficiary.

A \$5bn investment in a key public programme may have shrunk to \$4bn by the time it gets spent on actually delivering it. A great deal of administrative time, effort and cost are involved in managing the allocation and disbursement of public funds. Considerable staff time is consumed with relatively low value, manual tasks associated with, for example: managing controls and compliance; reconciling payments; processing cash transfers; and collecting, auditing and reporting financial and nonfinancial results.

Until now, public sector leaders have had no way to understand in anything like real time what spending this money actually achieves, hampering their ability to make effective decisions and allocate more of the funds to what actually works. The complexity of public service ecosystems, data siloes and a lack of integration between the various actors' financial and nonfinancial reporting systems has made it almost impossible to gain a consolidated view of the flow of funds and the outputs and outcomes associated with them.

Reporting and auditing often long after the fact limits the ability of leaders to make timely and informed decisions about the most effective allocation of funds, and to prevent waste, fraud and abuse within the system.

None of this is the fault of public servants. They are taking care of public money within the constraints of the systems and tools currently at their disposal.

#### Throwing off the shackles

But all this is about to change. New digital technology gives them the opportunity to free themselves from these shackles – to vastly reduce the cost of spending public money, to improve control over that spend and to see, in close to real time, the outcomes it achieves.

This gives governments the opportunity to use



# \$695bn

**Potential savings from preventing improper payments by US federal agencies over a decade.**

money more effectively – in ways that improve public services, boost economies, benefit communities and change lives. It provides accountable outcomes for citizens and investors.

Public sector leaders who have the vision to adopt the new technology now can gain an unprecedented level of visibility, predictability and control over the use of public money, without disrupting or replacing existing systems and controls. They can realise a long-held ambition of more efficient and effective management of public money.

#### Size of the prize

The Prysma Group, specialists in the economics of emerging technologies, has carried out research for EY. Prysma studied the US federal government to explore the potential impact of using a digital technology-based approach to better manage public money.

For example, it looked at the well-documented levels of monetary losses due to improper payments, such as payments made to ineligible recipients or incorrect amounts paid to eligible recipients. Making conservative assumptions, Prysma's

research found that using a system that would enable better data sharing, tracking and reporting throughout the value chain, US federal agencies could prevent losses of \$695bn due to improper payments over a 10-year period.

It also found that using the same technology to reallocate these funds to eligible and intended recipients could lead to an uplift in US gross domestic product of around \$260bn over 10 years, given that these recipients would have a higher marginal propensity to consume. Redirecting these funds from programmes with relatively low social value to those with even a medium social value could boost social welfare by \$165bn over the decade. Prysma estimated that by automating data exchange and reducing the time federal employees spend on the routine manual tasks involved in disbursing, tracking, reporting and auditing the flow of funds could bring a further administrative saving of over \$1.5bn over the 10-year period.

These numbers are significant. But they are just the tip of the iceberg.

Imagine using this technology across the whole public sector budget – from national through to local government – not just

**'Public sector leaders who have the vision to adopt the new technology now can gain an unprecedented level of visibility, predictability and control over the use of public money.'**

to prevent improper payments but to see, in real time, where properly allocated money is having a tangible impact and where it is not.

Imagine the savings that could be made and reinvested into services and programmes that make a real difference to people's lives. And imagine being able to prove it to your stakeholders.

#### Can blockchain provide part of the answer?

Public expenditures and services are managed through a complex ecosystem of government departments, agencies and delivery partners. Up to now, no one organisation has centralised authority over, or visibility of, how every dollar is spent.

That's why EY has developed an approach called blockchain for public finance. This approach integrates financial and nonfinancial reporting in government, reconciles and consolidates information within and across government and its external partners, and produces near real time spend and performance reporting and advanced analytics. This enables a government organisation to see exactly where money is being spent and what is being achieved across the entire ecosystem, down to the level of individual assets purchased or recipients paid.

This approach can be used by central budget authorities, government ministries or departments, delivery agents and international development donor agencies and their partners. It can streamline multi-government entity funding agreements and provide visibility and transparency across the entire ecosystem. And it synchronises with each participant's existing enterprise resource planning and financial management systems – it does not replace them. It even enables delivery partners and recipients, who may not have digitalised management systems, to input data directly into the system via a simple mobile interface.

Blockchain for public finance can reduce the administrative effort associated with financial reconciliations, tracking and reporting. Business terms or eligibility and compliance rules can be embedded into the system to automate transaction controls via smart contracts. Automated tracking and reporting can significantly reduce the cost for partners of interacting with government.

Access to view or amend data in the system can be strictly controlled through user permissions. And the fact that the

approach uses distributed ledger technology means that it provides an immutable, shared and verifiable record of every transaction, thus reducing the scope for fraud and abuse, and improving trust between partners in the ecosystem.

EY has demonstrated the potential for blockchain for public finance to improve efficiency and effectiveness. For example, EY teams used the approach to help a global city in North America improve how it tracked and managed contract spend through its shared services model. EY teams worked with the city to reduce reconciliations and reporting from over 30 days to near real time, while significantly reducing manual inputs and errors. It streamlined the city's ability to track and demonstrate asset utilisation, status and condition to drive increased business value, and tie contracted spend directly to assets.

Multilateral organisations finance large capital development projects around the world through an intricate network of borrowing countries, implementing agencies, contractors and suppliers. As is typical in these large ecosystems, they lose visibility into the downstream distribution of funds and the outcomes they generate. EY teams have worked with multilateral organisations on a blockchain approach that was able to provide broad disbursement and traceability of funds across the global ecosystem. The approach provided enhanced end-to-end transaction analysis capabilities to monitor flow of funds and associated metrics, and included a mobile application for remote connectivity and end-user reporting.

#### A generational opportunity

This is a moment to be seized. There are so many demands on government resources: building better health and social services; investing in skills and economies; and creating more secure, cohesive societies – all while ensuring that people keep hold of enough of their own money to maintain and improve their living standards in a time of unpredictable and rising costs.

This moment demands vision and a boldness of purpose. Technology such as blockchain presents today's generation of public sector leaders with a priceless opportunity to make public money go further and deliver more than before.

Now is the time to take it – for the taxpayers who fund the services that governments provide, the donors and investors whose money agencies spend around the world, and the citizens who depend on public services and programmes.

Let's turn these long-held dreams of better public finance management, and better government, into reality.



### 3. APPLICATIONS IN CAPITAL MARKETS

**Green bond issuers and investors will benefit from a modern PFM system, tracking more efficiently how proceeds are spent and regulations are adhered to.**

In the past, equity investors stood out in the capital markets because they had a say in the governance of the companies to which they provided capital. Over the past 10 years or so, tools have emerged to allow creditors in the fixed income market to have a degree of oversight and the power to incentivise positive behaviour from debtors.

Green bonds have raised almost \$2tn, according to the Climate Bonds Initiative, some \$509bn of which was raised in 2021 alone.

More and more institutions, both public and private, are turning to the green bond market. Motivations vary. Some issue green bonds to obtain a cheaper cost of funds. Others to obtain access to a broader range of investors, since all investors will buy green bonds while some investors will not buy conventional bonds. But perhaps the most important reason is that issuing a green bond has become an important symbol of commitment to a broader environmental, social and governance agenda.

The concept is simple. The language around the use of proceeds for conventional bonds is that the funds are to be used for 'general budgetary purposes'. For green bonds, this is replaced by an in-depth framework detailing the types of projects eligible for funding.

The bond's proceeds must be spent in accordance with this framework and investors are entitled to receive impact reports detailing how the money has been used and what has been achieved by the funded projects.

There are different sets of principles and rules governing what should be eligible for green bond funding. The most significant of these is the European Union's green taxonomy, which aims to classify economic activities to determine their alignment with the bloc's goal to achieve net zero carbon

## \$2tn

Green bonds have raised almost \$2tn, according to the Climate Bonds Initiative, some \$509bn of which was raised in 2021 alone.



emissions by 2050.

Bonds adhering to the EU’s green bond standard must finance only projects that follow the taxonomy’s criteria. As well as prescribing what investments are eligible, the green bond standard outlines the requirements for issuers to report on the impact of the proceeds to investors.

Adherence to the standard is voluntary, but many investors see it as an assurance of quality and will not invest in assets that do not meet it.

Even where funds raised by green bonds could have been raised in the conventional market, the commitment to transparency that issuing under a green bond framework implies is a powerful statement of intent for issuers.

Achieving this transparency necessitates a far higher degree of oversight on the use of proceeds than is typical for conventional bonds.

Bond issuers must know with a high degree of detail how the money is used. This requires a PFM system of the sort described above, capable of giving budgetary authorities the tools to oversee how resources are used.

Smart contracts restricting how funds are used would have a natural application in this asset class. An issuer can design their green bond framework governing the use of proceeds but is at the mercy of budget delivery agents to adhere to this. With smart contracts imposing spending restrictions and limits, this could be much more rigidly enforced.

‘Given the complex nature of the green bond taxonomy, it will be a cumbersome task to verify alignment, unless there are efficient digital mechanisms in place to support this activity,’ said a sustainability official at a green bond issuer.

**Greenium**

There is a commercial incentive at play here. Young people care much more about the impact of the money they invest than previous generations. Accordingly, fund managers with strong mandates to invest in ESG products are more likely to attract funds. According to a CNBC poll, one-third of millennials and 19% of Gen Z reported taking ESG factors into consideration in their investment decisions, while 16% of Gen X and only 2% of baby boomers said the same.

It’s not just young investors though. The priorities across capital markets are changing. A survey conducted by Funds Europe found that over half of respondents said that an ESG platform was a critical feature for asset managers’ success this decade, easily beating an alternatives platform, at 33%, an exchange traded funds platform, at 11%, and a crypto/digital assets platform, at 5%.

Fulfilling these mandates requires investors to preferentially seek out assets where the impact of the proceeds will be reported. The growth of these ESG-themed funds has far outstripped the supply of green

bonds, leading to a supply and demand imbalance, which generally causes green bonds to trade at higher prices than equivalent conventional bonds, meaning that issuers can raise money at lower interest rates. This saving for issuers is known as the ‘greenium’ and it is an important part of the value proposition for issuers.

Germany’s green bond programme provides an excellent demonstration of this. To ensure liquidity, Germany issues its green bonds twinned with conventional bonds with the same coupon and maturity. At any point, a holder of the green bond can swap it for the equivalent conventional bond at the Finanzagentur.

The green Bunds typically trade with a yield of around 3 basis points below that of their conventional twins.

The dynamics underpinning the precise value of this greenium are complex and vary over time and between types of issuers. A note from economists at ING discussed this variance in detail.

**‘Even where funds raised by green bonds could have been raised in the conventional market, the commitment to transparency that issuing under a green bond framework implies is a powerful statement of intent for issuers.’**



A greenium is a feature of a healthy and effective green bond market. The larger the greenium, the more powerful the incentive for issuers to engage in environmentally friendly activities.

It is worth noting that investors are not blind to distinctions of quality and rigor between green bonds. Those issuers with the most effective investments and the most transparent oversight frameworks are preferred by ESG investors, particularly those with the resources to do their own ESG-specific research. A well-designed PFM system that can deliver enhanced transparency over the use of funds could conceivably boost the greenium an issuer is able to achieve in the marketplace.

**Reporting requirement challenging**

Issuing a green bond is not a simple process. Developing the framework and gathering the impact reporting data required by investors are challenges. The technical capacity to gather and deliver data requires substantial investment. For many in the green bond market, these costs eat up any funding advantage conferred by the greenium. This is particularly the case for set-up costs. Over time, the cost of continuing to deliver these reports is likely to go down but investing in developing the capacity initially remains a stumbling block for potential issuers.

An effective PFM system for sharing data between budgetary authorities and budget delivery agents is likely to lessen this burden, potentially lowering the barrier for entry.

Indeed, if this greater level of transparency is available across an institution’s budget, it might reveal areas of eligible expenditure that can be funded via green or sustainable bonds.

**A regulatory imperative**

Spurred by the climate crisis and the advent of sustainable finance, a slew of regulations is in train requiring businesses and financial market participants to report more thoroughly on their activities.

The nonfinancial reporting directive (NFDR) is intended to improve the business transparency and accountability on social and environmental issues.

Similarly, the International Sustainability Standards Board, with the backing of the International Financial Reporting Standards Foundation, is working on two sets of draft requirements: general sustainability-related and climate-related disclosures. These proposals are being developed in response to requests from G20 leaders and the International Organisation of Securities Commissions.

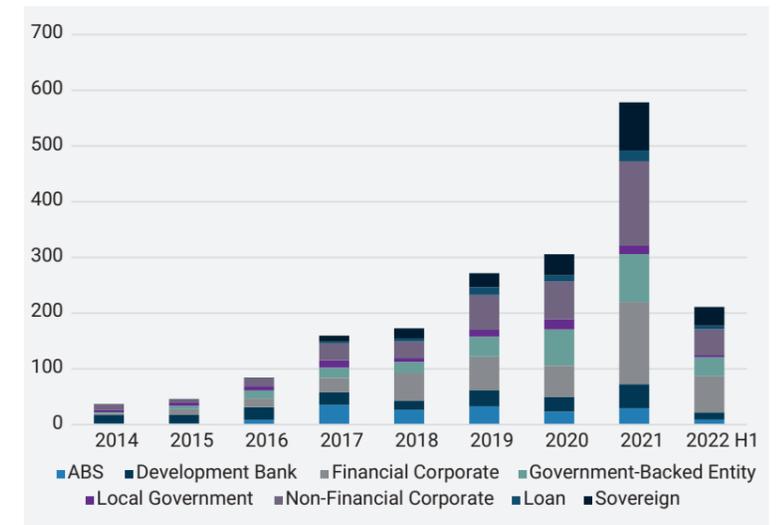
Delivering these requires improvement in the availability of data and the disclosure of nonfinancial information.

This certainly requires enhanced finance management capacities in the private sector.

Much of the public sector is out of the immediate

**FIGURE 3.1: GREEN BOND MARKET GROWING RAPIDLY**

Public sector dominating the marketplace, \$bn



Source: Climate Bonds Initiative

scope of this regulation. However, credit institutions are not. Kommuninvest is a funding aggregator for Swedish local authorities. Since their individual funding needs are too small to access wholesale capital markets in liquid size, they pool their needs via Kommuninvest, which issues on their behalf, onlending the proceeds to the local authorities. This is a common model in many countries, especially in Scandinavia.

While the local authorities are public institutions and therefore not in scope for NFDR regulation, Kommuninvest although entirely publicly owned is a credit institution and therefore is in scope.

Bjorn Bergstrand, head of sustainability at Kommuninvest, said, ‘We are all coming under increased scrutiny. We need greater insight into how our clients deploy the money they borrow from us so that we can assess the degree to which it is in alignment with the EU taxonomy. Unavoidably, this requires a greater amount of data transferred by clients to us.’

This might increase the volume of green bonds issued since a much higher proportion of the clients’ budgets will be subjected to scrutiny on taxonomy alignment. ‘They’ll have to map their investment activities versus the taxonomy, disclosing their green asset ratio in their lending portfolio and then mirror that disclosure requirement to us,’ said Bergstrand.

At present, 13% of Kommuninvest’s borrowing is for green projects.

## Conclusion

# TOWARDS BETTER PUBLIC FINANCE MANAGEMENT

**Transparency and oversight will be needed by any government that wants to tackle the climate crisis, for which a well-designed public finance management system is key.**

The research from Prysm Group provides compelling evidence that investing in digital improvements to public finance management systems will not only be rapidly recouped but will generate impressive returns, both in increased gross domestic product and social outcomes.

There are inefficiencies in the present system and benefits to eliminating them. A well-designed system would do a great deal to prevent erroneous payments and reduce administrative costs. Even beyond these substantial benefits, however, an emergent property of enhanced oversight on the use of funds is that it can reveal opportunities for savings that are not obvious in the absence of transparency. Effective oversight will provide new insights for the formulation of policy and spending strategies.

Beyond this though, it is rapidly becoming clear that the present level of oversight of public sector budgets will not be acceptable for much longer. The climate crisis is intensifying and to even begin to think of hitting targets like carbon neutrality by 2050, governments must have a means of assessing what portions of their budget are in alignment with these goals.

The incentives built into the sustainable finance market are an important tool in encouraging borrowers to uphold high environmental, social and governance standards, but policy-makers are rapidly coming to the conclusion that carrots are not enough and that sticks will be required. Over the next few years, public finances will come under sharper scrutiny than ever to ensure that those in charge of budgeting decisions are doing everything in their power to avert climate catastrophe.

Both the carrot and the stick require the ability to see how funds are used to a far more granular level than most PFM systems presently allow. It will be imperative for governments and public institutions to develop a means of providing this level of granularity in their assessments of their budgets' alignment with ESG goals. It will soon become required of any country that wants its commitment to combatting climate change – and driving broader social and governance objectives – to be taken seriously.

A blockchain-based system provides a way to improve the efficiency of public finance management and delivers the transparency required to meet increasingly stringent ESG reporting requirements without a costly development and implementation process.

**'The climate crisis is intensifying and to even begin to think of hitting targets like carbon neutrality by 2050, governments must have a means of assessing what portions of their budget are in alignment with these goals..'**

**'A blockchain-based system provides a way to improve the efficiency of public finance management and delivers the transparency required to meet increasingly stringent ESG reporting requirements.'**





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