Blockchain for public finance
Applications in capital markets and beyond
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.

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.

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 impactful spending is.

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.

Towards better public finance management

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.
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, once 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 non-financial 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 or 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. Upsetting 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 these ecosystems with a single source of truth and a streamlined approach to sharing information, rather than relying on disparate systems. Providing an efficient 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.

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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 fulfill legal obligations but otherwise contributes little to the effective operation of government.

In addition to the resources required to keep this 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 outcomes or achievements, 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
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A sophisticated resource management system should be able to integrate with these internal systems and feed this information up to higher managerial levels.
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.
Reduced overheads
The administrative burden of the financial reporting system is difficult to calculate. Prysm Group estimated that between $8bn and $12bn a year is spent by governments to meet the legal requirements of financial reporting. The Federal Trade Commission, for example, reported that identity 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 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.

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 needs. 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 Digital’s Financial Services and Digital team observes that “financial reporting is an attempt to monitor and control how government funds are spent.” The outcome of these processes is rarely reported to the public or to policy-makers. Prysm Group estimated the administrative savings would be between $16bn-$48bn 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. This would 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.

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FIGURE 2.1: MONETARY LOSS PREVENTION FROM EFFECTIVE PFM SYSTEMS
Returns from PFM improvements grow year on year, £m

FIGURE 2.2: ADMINISTRATIVE SAVINGS FROM EFFECTIVE PFM SYSTEMS
Substantial opportunities to cut overheads, £m
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 re-purposed to programmes with a higher MVPF. Prysm Group’s assumptions yield a marginal increase in social welfare of $166bn over the next 10 years, solely by redirecting improper payments.

But this just might 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 programmes with a higher MVPF. Prysm Group’s assumptions yield a marginal increase in social welfare of $166bn over the next 10 years, solely by redirecting improper payments.

However, all forms of welfare economics analysis falls outside the scope of this report.

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.

Digital technology can improve the management of public finances 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 do so more effectively. Imagine if the money was being 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.

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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.

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
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 imparts 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 rigourously 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.

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 required for 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 banks and authorities and budget delivery authorities 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 (NFRD) 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 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, or unbundling 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 NFRD regulations, Kommuninvest although entirely publicly owned is a credit institution and therefore is in scope.

Björn 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 will 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.
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 combating 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.

Conclusion

‘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.’