Funding our infrastructure: proven models and innovative approaches

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Authors

David Tournier

Partner, Lawyer

Jessy Menard

Lawyer

The first article[1] of this series provided an overview of infrastructure financing in Quebec and Canada, explaining why it must adapt to address maintenance backlogs, the imperatives of the energy transition and increasing fiscal constraints. This second article turns to emerging financing models and their concrete applications.

Updated, Alternative and Emerging Financial Models

Public-Private Partnerships[2]

Public-private partnerships (PPPs) are a well-established financing and management model for infrastructure projects, under which the private sector may be involved in the design, construction, financing and, in some cases, the operation and maintenance of a public asset.[3] In return, the private partner receives payments that are contingent on performance, including the achievement of predetermined milestones during construction and the availability or quality of the service during operation.

Contemporary PPPs are distinguished by their contractual mechanisms for performance monitoring and change management, permitting adjustments to financial or operational conditions over time based on the actual performance of the private partner. This approach facilitates an improved distribution of risks among parties, with the private sector typically assuming risks associated with costs, timelines, and performance, while the public sector retains responsibility for defining service levels and ensuring that essential services remain accessible to the population.

Modern PPP agreements increasingly incorporate detailed performance clauses and financial review

mechanisms based on quantifiable project outcomes, which helps ensure rigorous contract management. These measures enhance transparency and accountability, allow for a more equitable allocation of benefits and increase resilience in the face of unforeseen events.

From a public finance perspective, PPPs also offer an important budgetary advantage. Because the private partner provides the initial financing and is repaid over time through service payments, the upfront investment does not always appear in the same way as traditional public debt, depending on the applicable accounting framework. Instead, it is reflected in long-term contractual commitments, which can help governments move forward with priority projects despite tight borrowing limits or annual budget constraints. This should not, however, be confused with the economic rationale for PPPs, which is based primarily on risk allocation, implementation discipline and performance over the project lifecycle.

When maintenance and lifecycle renewal are included in the contractual framework, assets developed under PPPs also tend to be better maintained over time, since these obligations fall on the private partner and are not dependent on future political decisions to allocate maintenance budgets. For example, the Highway 25 PPP agreement expressly provides for the design, construction, financing, operation, maintenance and refurbishment of the infrastructure, and entrusts the private partner with responsibility for the operation and maintenance of the relevant section.

That said, private financing often carries a higher nominal cost and is generally more expensive than sovereign borrowing. At the outset, the decision to opt for a PPP should therefore be supported by value-for-money analyses to assess, on a project-by-project basis, whether the premium associated with private financing is offset by the value created. The value of PPPs therefore lies in the transfer of risk, the discipline in project delivery and the more predictable management of the lifecycle – all factors that must be carefully assessed on a case-by-case basis.

Performance-Based Contracts[4]

Performance-based contracts (PBCs) are increasingly used tools in the financing and management of public infrastructure, particularly in the energy, transportation and water management sectors. In such agreements, the private operator is compensated based on the quality of the service provided or the efficiency achieved, rather than through purely fixed or input-based remuneration.

This model encourages a results-oriented culture, where payments are conditional on meeting measurable indicators such as asset availability, energy consumption, response times or user satisfaction. By directly linking compensation to performance, PBCs motivate private partners to innovate, optimize processes and maintain a high level of service throughout the project lifecycle. They can also help reduce long-term operating costs and better manage risks related to maintenance and obsolescence by promoting a proactive rather than corrective approach.

PBCs and PPPs are not mutually exclusive. In practice, PBCs can be embedded within PPP agreements (for example, where payments for availability or energy performance are central to the business model) or used on a stand-alone basis in more traditional procurement arrangements, particularly for the operation and maintenance of existing assets. In both cases, the common thread is that of aligning financial flows with objectively measured performance.

Blockchain and Automation[5]

The integration of blockchain technology into infrastructure projects is emerging as a useful innovation, particularly where multiple stakeholders, large payment flows and complex supply chains are involved. Blockchain’s decentralized and tamper-resistant structure allows for the implementation

of “smart contracts” — agreements whose key conditions (for example, completion of a construction milestone or delivery of materials) are encoded and can trigger automatic actions once verified.

Applied to construction and infrastructure, this can streamline procurement and payment processes. For example, once an independent engineer validates that a bridge pier has been completed in accordance with the plans, a smart contract could automatically release the corresponding payment from an escrow account to the contractor, while updating the project ledger shared by the owner, contractors and lenders. Similarly, deliveries of critical materials can be recorded on a shared blockchain register, ensuring that only approved products are used and reducing the risk of fraud or substitution.

By automating these steps, blockchain can reduce administrative delays, limit disputes over invoices and strengthen audit trails. From a financing perspective, this increased transparency and the reliability of project data are of particular interest to lenders and investors. More robust, real-time information about progress, costs and compliance can make it easier to monitor covenants, reduce perceived counterparty risks and ultimately support a more efficient disbursement of funds and potentially lower financing margins for well-structured projects.

Crowdfunding[6]

Crowdfunding has increasingly emerged as a complementary mechanism for financing infrastructure and construction projects—especially smaller-scale, community-oriented ones—by tapping many smaller contributions rather than relying solely on large institutional investors or government grants. For example, the Luchtsingel pedestrian bridge in Rotterdam was partly financed through a campaign in which residents could “buy” individual wooden planks, each engraved with their names. Thousands of small donations collectively triggered a larger municipal grant, proving that citizen-led investment can catalyze broader public-private partnerships.[7]

While crowdfunding as an alternative source of financing offers greater community engagement and more transparency, it also requires strong campaign design, clear revenue models or public benefit justifications and credible governance to succeed. For the moment, it remains a niche instrument, but one that illustrates how citizens can be directly involved in financing and shaping the infrastructure of their communities.

International Case Studies

Europe: Green Bonds and PPPs

In French public procurement, the prevalent model is the *marché de partenariat*, an integrated contract by which a private operator, under private project management, undertakes to provide private source financing, design, construction, maintenance, and possibly operation of an asset, in exchange for deferred public payments tied to performance. Created in 2015 by a reform aligning domestic law with EU rules, it unified prior heterogeneous PPP-like schemes into a specific category of public contract, distinct from concessions.

The *marché de partenariat* targets whole -life cost optimization and transfer of relevant risks (design, construction, availability, energy performance) in return for a private financing premium, enforced through performance-based payments, financial adjustment clauses, and reinforced oversight. It suits complex, long-term projects integrating design–build–maintain and smoothing budget outlays.[8]

These advantages come with governance challenges: the contracts are complex, long-term and often costly to prepare and monitor, which raises issues of transparency, capacity of public

authorities to negotiate on an equal footing, and democratic control over commitments that can span several decades.

This partnership model is increasingly fuelled by green bonds and other sustainable finance instruments at the European level, which have emerged as central tools for sustainable infrastructure finance and provide a pipeline of targeted capital that can be structured within *marché de partenariat* frameworks to deliver measurable environmental performance. According to data from the European Environment Agency, green bonds accounted for 6.9% of all corporate and government bonds issued in EU27 countries in 2024, up from 5.3% in 2023-,[9] while the European Investment Bank approved over €15 billion in new financing in mid-2025 directed at water, transport, energy, and housing infrastructure projects that support the green transition-.[10] This reflects the region's strategic shift toward the channelling of capital into low-carbon- infrastructure such as public transport, renewable energy, and thermal building renovation.

Asia: Digital Modelling and Blockchain

The Land Authority of Singapore built the first nation-scale digital twin: a high-resolution 3D model of the entire country created from airborne and vehicle-based laser scanning, covering above- and belowground assets. The platform integrates real-time data (buildings, infrastructure, mobility, environment) to simulate scenarios for urban planning, infrastructure management, sustainability, and emergency response. It enables cross-agency and public–private collaboration, supports data-driven policy, and provides a testbed for Smart Nation services and applications. With the ongoing integration of AI, Virtual Singapore functions as an evolving operational tool for resilient, efficient city management and research, with anticipated partial public access to enhance transparency and civic engagement.[11]

Complementing this digital modelling infrastructure, the OCBC bank and Land Transport Authority of Singapore have launched a pilot of a blockchain-based conditional payment solution for construction projects. Under this arrangement, the Authority can disburse "mobilization advance payments" to contractors once predefined conditions, encoded in smart contracts, are verified. This innovation streamlines the disbursement process, ensures greater transparency over the use of funds, and reduces administrative friction associated with large upfront payments typical of major infrastructure works. As of the initial deployment, over 22 million Singaporean dollars had already been disbursed under this mechanism.[12]

By combining digital modelling with blockchain, Singapore has adopted a technologically integrated approach to infrastructure development and financing. The digital twin allows for more precise planning, cost estimation and risk assessment, which helps structure bankable projects and gives greater comfort to investors and lenders. The blockchain-based payment system, for its part, secures and accelerates the flow of funds once milestones are reached. Together, these tools strengthen project transparency, coordination among stakeholders, risk management and lifecycle governance.

Latin America: Mobilizing Regional Markets for Infrastructure Financing

The Development Bank of Latin America and the Caribbean ("**CAF**") has significantly stepped up its role as a structural financier of infrastructure across Latin America and the Caribbean. In December 2024, its board approved US$2.478 billion for sustainable development and infrastructure projects spanning water and sanitation, urban mobility, energy transition, and social infrastructure across 10 [13]

countries. In 2025, CAF further committed US$1.086 billion to support climate-resilient and strategic infrastructure operations in Brazil, Colombia, Uruguay, and Chile, including urban development, railway reactivation and water security for metropolitan areas.[14] Beyond project-by-project financing, CAF has announced a broad long-term commitment. Over the next five years, it aims to mobilize up to US$40 billion to support a "triple transition": green, digital and social, targeting energy transition, climate resilience, water and sanitation, sustainable mobility, ecosystem preservation and inclusive infrastructure.[15] Through these combined efforts, CAF seeks to close the region's infrastructure deficit and orient development toward sustainability, resilience and social inclusion, while deepening regional capital markets for infrastructure financing.

Conclusion

The evolution of infrastructure financing is being shaped by a convergence of innovation and technology, on the one hand, and by growing investment needs on the other. From modern PPPs and performance-based contracts to blockchain-enabled automation and community-driven crowdfunding, emerging instruments broaden the spectrum of available capital while improving efficiency, transparency, and accountability.

International case studies demonstrate that these innovations are already being applied in practice. Europe is scaling sustainable finance with green bonds embedded into long-term partnership contracts; Asia is pioneering the integration of digital modelling and blockchain to streamline project delivery and provide financiers with more reliable, real-time information on risks and performance; and Latin America is mobilizing regional development banks to close infrastructure gaps through climate-resilient, socially inclusive investment.

Taken together, these approaches reveal a global shift toward infrastructure systems that are more data-driven, performance-oriented, participatory, and financially diversified. As governments face rising fiscal constraints and increasing demands for sustainability, the adoption of these new financing models offers a path to delivering projects that are not only bankable, but also resilient, transparent, and aligned with long-term societal goals.

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