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Public-Private Partnerships in Infrastructure

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Abstract

Public-private partnerships (PPPs) have been deployed across more than four decades and dozens of national contexts as a primary tool for closing infrastructure gaps without exhausting public budgets. Their record is mixed. Some programs have delivered roads, tunnels, and utilities that governments could not have built as efficiently on their own. Others have produced financial distress, stranded assets, costly bailouts, and long-term constraints on public policy that their architects did not foresee. Understanding why the outcomes have varied requires looking past individual project stories toward the governance conditions and structural features that determine whether a given PPP arrangement is likely to work.

This paper builds that understanding from the ground up. It starts with what PPPs actually are, as defined within the frameworks developed by the International Monetary Fund and the World Bank, and explains how the economic logic of bundling long-term design, construction, and maintenance responsibilities is meant to align private incentives with public service delivery. It then examines the conditions under which that logic holds and the conditions under which it breaks down. The failures follow a consistent pattern: fiscal obligations that governments did not properly account for, demand forecasts that proved far too optimistic, contracts rigid enough to punish normal governance decisions, and risk that was presumed transferred but ultimately returned to the public. This paper clarifies the distinct institutional mandates of the World Bank and the IMF, examines the broader role of multilateral development banks and risk-mitigating instruments such as MIGA guarantees in PPP structures, identifies the principal categories of private-sector participants, and expands the treatment of risks, including foreign exchange exposure, political risk, and environmental and social governance considerations.

The paper uses India's national highway program as its primary case study, because no modern example more clearly demonstrates both what can go wrong when risk allocation is poorly designed and what structural reform looks like when a government chooses to correct course rather than abandon a program. The paper then turns to the future of infrastructure PPPs, focused on the energy and water demands generated by artificial intelligence and hyperscale data center development. The paper closes with a policy agenda derived from that analysis.

I. Introduction

Infrastructure is expensive to build, slow to permit, and politically difficult to fund. Governments around the world have grappled for decades with a gap between what communities need, in roads, water systems, power grids, schools, and hospitals, and what public budgets can reliably deliver. The World Bank estimates that low- and middle-income countries alone face an annual infrastructure investment gap of over \$1 trillion.¹ Public-private partnerships emerged as an institutional response to that gap. The basic idea is that a private partner, with access to capital markets and management expertise, can take on the financing, construction, and long-term operation of a public asset under a contract that specifies what the government actually needs: not a building, but a service.

The United Kingdom's Private Finance Initiative (PFI), launched in 1992, is the program most often cited as the beginning of the modern PPP era.² It created a framework in which private consortia financed and built public facilities—hospitals, schools, and government offices—and then received long-term payments from the public sector in exchange for keeping those facilities available and operational. The model spread quickly. By the 2000s, versions of it were operating in Australia, Canada, Portugal, South Africa, Chile, India, and dozens of other countries. Multilateral institutions, including the World Bank and the IMF, developed analytical frameworks and technical assistance programs to support their deployment.

Over time, the evidence of its impact accumulated. Some programs produced genuine efficiency gains and delivered infrastructure that governments had been unable to build on their own. Others became cautionary tales: projects that collapsed when traffic volumes did not materialize, utilities that extracted value while service quality deteriorated, concession companies that renegotiated contracts almost immediately after financial close, and governments that discovered they had committed to decades of payments they had not properly disclosed to legislatures or citizens. The question that this pattern demands is not whether PPPs work, but when do they work? What distinguishes the programs and contexts that produce good outcomes from those that do not?

¹ World Bank, "Bridging the Infrastructure Gap," Sustainable Development Brief, 2019.

² HM Treasury, "Private Finance Initiative and Private Finance 2 Projects: 2018 Summary Data," December 2018. PFI was formally abolished by Chancellor Philip Hammond in the 2018 Budget.

The answer that emerges from the evidence, and from the frameworks built by the IMF and World Bank over the same period, is primarily a governance answer. The efficiency gains that PPPs can produce—in lifecycle cost management, construction delivery, and long-run maintenance—are real but conditional. They depend on governments that can specify what they want, procure it competitively, and enforce the contract over many years. Where those conditions hold, PPPs have a genuine track record. Where they do not, PPPs tend to produce the failure modes that have given the instrument its mixed reputation.

The Global PPP Landscape by the Numbers

Private participation in infrastructure (PPI) investment in low- and middle-income countries reached \$100.7 billion in 2024, a 16% increase from \$87.1 billion in 2023 and the first time investment exceeded \$100 billion since COVID-19 (World Bank PPI Database, 2024 Annual Report).

The PPI database tracks over 10,000 infrastructure projects across 137 countries in energy, telecommunications, transport, and water/sewerage.

Five countries—China, Brazil, Malaysia, the Philippines, and India—captured 71% of global PPI investment in 2024. Investment was similarly concentrated by sector: energy alone accounted for roughly 51% of 2024 PPI commitments and transport for a further 30%, while water and sewerage attracted only about 2%.

All dollar figures in this paper refer to U.S. dollars unless otherwise noted. PPI figures cover low- and middle-income countries only; total global infrastructure PPP investment, including OECD nations, is substantially larger.

This paper works through that argument systematically. Section II defines PPPs and explains their economic and institutional logic, including the distinct roles of the World Bank and the IMF and the broader ecosystem of multilateral development banks that participate in PPP structures. Section III identifies the governance conditions associated with success, expands the treatment of risk allocation to address foreign exchange risk, political risk, and ESG considerations, while also identifying the principal private-sector participants in PPP transactions. In doing so, it highlights how the implementation of the Dodd-Frank Act restricted traditional commercial bank lending by imposing stringent balance-sheet and regulatory capital requirements, thereby reshaping global capital flows toward infrastructure projects and accelerating the adoption of the sponsor model. Post-Dodd-Frank, global banks became unable to warehouse long-dated foreign exchange and country risk, which quietly restructured cross-border financing and shifted the ground-level de-risking burden onto highly sophisticated private sponsors. This structural shift demonstrates that while capital allocation often aligns with rigid institutional self-interest and regulatory compliance on the surface, the enduring viability of the

sponsor model ultimately relies on cultivating ethical accountability, moral legitimacy, and social trust among an interconnected network of global stakeholders. Because commercial banks now underwrite the reputable sponsor rather than navigating individual sovereign risks, international operations have become deeply dependent on the moral authority and institutional trust these platforms establish across borders. Section IV catalogs the primary failure modes and explains why they are recurring rather than idiosyncratic. Section V examines India's national highway experience in depth as the clearest modern case of both failure and structural reform. Section VI addresses the emerging challenge of AI and data center infrastructure. Section VII concludes.

II. Defining Public-Private Partnerships: Economic Logic and Institutional Context

A. The Basic Structure

A public-private partnership is a long-term contract through which a private entity takes on significant management responsibility for delivering a public infrastructure service in exchange for compensation tied to service performance rather than to inputs.³ This is how the World Bank's PPP Reference Guide frames the instrument, in terms of service outputs, not investment inputs, and this framing is crucial because it distinguishes PPPs from two concepts with which they are often confused. A PPP is not traditional public procurement, in which the government pays a contractor to build something and then separately manages it. It is also not privatization, in which the private sector assumes full ownership, and the government exits the service relationship. A PPP is a middle ground: the government defines what it needs, retains regulatory authority, and monitors outcomes, while the private partner is responsible for achieving those outcomes through capital deployment and operational management.

In practice, PPP contracts take several forms. A Build-Operate-Transfer (BOT) concession requires the private partner to finance and construct the asset, operate it for a specified period during which it recovers costs through user fees or government payments, and then transfer ownership back to the government. A Design-Build-Finance-Operate-Maintain (DBFOM) arrangement adds explicit maintenance obligations, which is important because it

³ World Bank, PPP Reference Guide, Version 3.0 (Washington, DC: World Bank Group, 2017). Available at https://ppp.worldbank.org/PPP_Online_Reference_Guide/Introduction. The World Bank's definition emphasizes that "the private party bears significant risk and management responsibility and remuneration is linked to performance."

aligns the same party's incentives across construction quality and long-term upkeep. An availability-payment structure removes the private partner's exposure to demand uncertainty by having the government pay a periodic fee conditional on the asset meeting performance standards, rather than leaving the concessionaire dependent on traffic or ridership levels that neither party can fully control.

The distinction between user-fee and availability-payment structures matters enormously in practice, and the difference is worth explaining in plain terms. In a toll highway concession, the private partner's revenue depends on how many cars use the road. If traffic is lower than projected, the concessionaire earns less, potentially cannot service its debt, and eventually returns to the government asking for relief. Spain's radial toll highways around Madrid illustrate this pattern starkly: traffic on the R-3 and R-5 reached only 16% of the levels forecast when the concessions were signed, leading to insolvency of multiple concession companies and an eventual government bailout exceeding €5 billion.⁴ In an availability-payment concession, the government agrees to pay a fixed amount regularly as long as the road is open and maintained to a specified standard, regardless of traffic volume. The demand risk stays with the public sector, where it belongs if the private partner cannot meaningfully control or predict it.

This is not a minor technical distinction. It is the source of some of the most consequential failures in the global PPP record, as well as the basis for the reforms that have made subsequent programs more stable.

B. The Economic Logic: Why Bundling Can Create Value

The economic case for PPPs rests on what the literature calls the benefits of bundling.⁵ When a government builds infrastructure through traditional procurement, the construction contract belongs to one firm and the maintenance responsibility belongs to another, often different, entity. The construction contractor has a financial incentive to minimize upfront costs even when doing so increases future maintenance expense, because that future expense falls on someone else. The maintenance contractor inherits an asset whose design reflects someone else's optimization and faces higher costs and weaker performance incentives as a result.

⁴ Phys.org, "Spain's Empty Highways Lead to Bankruptcy," October 2012; El País, "Autopistas Radiales: The Rescue," 2016. The state assumed control and debts by 2016, converting them to free public use.

⁵ Oliver Hart, "Incomplete Contracts and Public Ownership: Remarks and an Application to Public-Private Partnerships," *Economic Journal* 113, no. 486 (2003): C69-C76.

Bundling design, construction, and maintenance within a single concession is intended to internalize these tradeoffs. The private partner that must maintain a road or tunnel for thirty years has a financial reason to build it well in the first place, because the savings from better construction accrue to the same party bearing the maintenance obligation. This is the lifecycle incentive that PPP advocates point to as the instrument's primary efficiency advantage over traditional procurement, and in contexts where it operates as intended, it is genuine.

The important qualification is that this incentive works when service quality can be specified, measured, and enforced in the contract. If the performance standards in a concession agreement is vague, if the government lacks the technical capacity to monitor compliance, or if penalties for non-performance are not applied consistently, the lifecycle incentive weakens. The private partner optimizes toward whatever the contract actually measures and enforces, not toward an abstract notion of service quality.⁶ This is why the governance framework surrounding a PPP matters as much as the contract template itself.

There is also a cautionary side to private ownership of public service assets. A private operator that controls a highway, a water system, or a hospital has an incentive to find ways to reduce costs, even when doing so harms users who have no alternative service or no recourse. The extent to which these quality-degrading shortcuts are available depends on how contractible the relevant quality dimensions are. For highways, lane availability and pavement quality are fairly measurable. For a hospital, clinical outcomes are less so. This distinction is important: PPPs for hospital construction and facility management (keeping the building operational) have performed reasonably well in countries like the UK, Canada, and Turkey. PPPs that extend to the delivery of clinical services—the actual practice of medicine—raise far more complex contractibility questions and have a more uneven record. This provides one basis for the widely observed pattern that PPPs tend to perform more reliably in transportation and energy infrastructure than in social services, where outcomes are harder to specify.

⁶ Elisabetta Iossa and David Martimort, "The Simple Microeconomics of Public-Private Partnerships," *Journal of Public Economic Theory* 17, no. 1 (2015): 4-48.

C. The World Bank and IMF: Distinct Mandates, Complementary Frameworks

The World Bank and the IMF have each developed analytical tools that together constitute a practical governance framework for PPP programs. However, their institutional mandates are fundamentally different, and conflating them obscures the distinct contributions each makes to the PPP policy landscape.⁷ The World Bank is a development institution. Its mandate centers on reducing poverty and promoting shared prosperity through project-level lending, technical assistance, and capacity building in client countries. The IMF is a macroeconomic surveillance institution. Its mandate centers on international monetary cooperation, exchange rate stability, and the fiscal sustainability of member states. Their approaches to PPPs reflect these distinct orientations.

The World Bank Group engages with PPPs primarily through its private-sector arm, the International Finance Corporation (IFC), which has closed over 180 PPP advisory transactions across 60 countries since 2004, facilitating nearly \$67 billion in private investment in developing countries.⁸

The World Bank also operates the Public-Private Infrastructure Advisory Facility (PPIAF), a multi-donor technical assistance facility that has deployed \$400 million to catalyze \$29 billion in infrastructure investment across 130 countries.⁹ PPIAF focuses specifically on building the enabling environment for PPPs: the legal frameworks, regulatory institutions, and procurement systems that governments need before they can structure viable concessions. The World Bank's PPP Reference Guide, now in its third edition, provides the operational template that most developing-country PPP programs use as their starting point.

The IMF's engagement with PPPs comes from a different direction entirely. Rather than helping structure individual transactions, the IMF evaluates whether a country's aggregate PPP commitments are consistent with fiscal sustainability. The PPP Fiscal Risk Assessment Model (PFRAM), developed jointly with the World Bank and released in its second version in 2019, is

⁷ For a comprehensive overview, see Independent Evaluation Group, *World Bank Group Support to Public-Private Partnerships: Lessons from Experience in Client Countries, FY02-12* (Washington, DC: World Bank, 2014).

⁸ International Finance Corporation, *IFC Public-Private Partnerships Advisory, Impact Brief, 2023*.

⁹ PPIAF Annual Report 2024. PPIAF is housed within the World Bank and financed by 11 multilateral and bilateral donors.

the principal quantitative tool for this purpose.¹⁰ PFRAM requires governments to map the full stream of future payments associated with a PPP portfolio, stress-test those projections under adverse scenarios, quantify contingent liabilities including termination exposure, and incorporate the results into debt sustainability analysis. The central observation behind PFRAM is that PPPs have frequently been used not to deliver infrastructure more efficiently but to move public spending off the current budget and defer recognition of public costs.

The IMF's Public Investment Management Assessment (PIMA) framework situates PPPs within the broader context of public investment governance.¹¹ PIMA evaluates the institutional dimensions of the full infrastructure investment cycle, from project selection and budget allocation through implementation and asset management. Its consistent finding across country assessments is that the quality of public institutions—in technical capacity, budget processes, and contract management—predicts infrastructure outcomes more reliably than the choice between public and private delivery. This finding reframes the PPP policy question: rather than asking whether PPPs are superior to traditional procurement in the abstract, governments should ask whether their institutional capacity is sufficient to realize the potential benefits of a PPP while managing the associated risks.

Together, these frameworks support a clear conclusion: PPPs are a governance tool, not a financing shortcut. Their value depends entirely on whether the public sector can use them with the discipline and sustained capacity that long-term infrastructure contracts require.

D. The Broader Ecosystem: Multilateral Development Banks and Risk Mitigation in PPP Structures

A PPP is often described as a bilateral arrangement between a government and a private concessionaire. In practice, particularly in emerging markets, the transaction structure involves a wider set of institutional participants. Multilateral development banks (MDBs) routinely serve as lenders, equity co-investors, guarantors, and technical advisors in PPP transactions. Their participation is not incidental. It addresses specific market failures—particularly the absence of

¹⁰ International Monetary Fund and World Bank, PPP Fiscal Risk Assessment Model (PFRAM), Version 2.0, 2019.

¹¹ International Monetary Fund, "Public Investment Management Assessment (PIMA) Framework," 2018.

long-term local-currency financing, elevated political risk, and weak institutional capacity—that would otherwise prevent viable projects from reaching financial close.

The International Finance Corporation, as the World Bank Group’s private-sector lending arm, provides direct project finance, equity investments, and credit enhancements to PPP special purpose vehicles. Beyond the World Bank Group, other multilateral development banks play analogous roles within their regional mandates. The Asian Development Bank (ADB) provides partial credit guarantees, political risk guarantees, and concessional equity through its Asia Pacific

Project Preparation Facility across more than 30 countries.¹² The African Development Bank (AfDB), facing an estimated \$68–\$108 billion annual infrastructure financing gap on the continent, approved a dedicated PPP Strategic Framework for 2021–2031.¹³ The European Bank for Reconstruction and Development (EBRD) has been active in transport PPPs across 30 transition economies since the early 1990s, providing specialized advisory and project preparation support. The Inter-American Development Bank (IDB) maintains a portfolio of PPP projects across Latin America and the Caribbean and has developed the Infrascopie diagnostic tool, which evaluates PPP enabling environments using more than 100 indicators across 26 countries in the region.¹⁴

A particularly important institutional participant is the Multilateral Investment Guarantee Agency (MIGA), a member of the World Bank Group established in 1988 to provide political risk insurance for cross-border investments in developing countries. MIGA is a guarantee agency, not a lender: it insures private investors against non-commercial risks that host-country governments create, thereby enabling projects that would otherwise be unbankable. MIGA covers four categories of non-commercial risk: currency transfer and convertibility restrictions (protecting against a government preventing repatriation of profits), expropriation (government seizure of assets), breach of contract by host governments (failure to honor agreed terms), and losses from war and civil disturbance.¹⁵ For infrastructure PPPs, MIGA guarantees can be

¹² Asian Development Bank, *Public-Private Partnership Monitor*, Second Edition (Manila: ADB, 2020).

¹³ African Development Bank, *PPP Strategic Framework 2021-2031* (Abidjan: AfDB, 2022).

¹⁴ Inter-American Development Bank, *Infrascopie 2023/2024* (Washington, DC: IDB, 2024).

¹⁵ Multilateral Investment Guarantee Agency (MIGA), *Products Overview* (Washington, DC: World Bank Group, 2023). MIGA guarantees generally extend up to 15 years with possible 5-year extensions.

decisive in enabling financial close. Between fiscal years 2002 and 2012, MIGA provided political risk insurance for 81 PPP projects worth \$5.1 billion, representing nearly half of its total guarantee volume and 95% of its infrastructure guarantee volume during that period.¹⁶

A concrete illustration is the Elazig Hospital PPP in Turkey. In 2016, MIGA provided a 20-year political risk guarantee supporting a €288 million bond issue for a greenfield integrated hospital campus including general, pediatric, psychiatric, and dental facilities. Combined with a liquidity facility from the EBRD, the MIGA guarantee enabled Moody's to assign an investment-grade rating of Baa2 to the bond—a rating that exceeded Turkey's sovereign credit rating at the time. This structure attracted long-term institutional investors who would not otherwise have participated in a Turkish infrastructure project.¹⁷ The example demonstrates how MDB participation can materially alter the risk profile and financing cost of a PPP, rather than merely providing technical advice from the sidelines.

Beyond MIGA, other risk-mitigating instruments play important roles in the PPP ecosystem. The U.S. International Development Finance Corporation (DFC), successor to OPIC, offers political risk insurance covering currency inconvertibility, expropriation, and political violence, with coverage up to \$1 billion per project.¹⁸ Partial risk guarantees from the World Bank and regional MDBs cover specific government performance obligations. The Currency Exchange Fund (TCX), established in 2007 by a consortium of development finance institutions including FMO, KfW, and the African Development Bank, provides cross-currency swaps and forward contracts that convert hard-currency lending obligations into local-currency terms. TCX is managed by Cardano Development and maintains a \$1.8 billion capital base supporting a \$5 billion balance sheet. It has assisted clients in obtaining more than \$10 billion in local-currency funding across over 140 currencies, addressing one of the most persistent barriers to infrastructure finance in emerging markets.¹⁹

The policy implication is that a functioning PPP program requires more than a contract between a government and a private company. It requires an ecosystem of institutions that can

¹⁶ Independent Evaluation Group, World Bank Group Support to Public-Private Partnerships, 2014.

¹⁷ MIGA, "Building Health Resilience: How MIGA Enabled Turkey's Elazig Hospital PPP," Case Study, 2019.

¹⁸ U.S. International Development Finance Corporation (DFC), Political Risk Insurance Product Overview, 2024.

¹⁹ The Currency Exchange Fund (TCX), Annual Report 2023. TCX is capitalized by donor governments and DFIs and operates as a specialized hedging counterparty for development lending.

share, price, and mitigate the risks that neither party can efficiently bear alone. Where that ecosystem is absent or underdeveloped, the range of bankable PPP projects narrows considerably, and the projects that do proceed tend to concentrate risk on whichever party has the weakest negotiating position.

III. When PPPs Work: The Conditions That Matter

A. Governance Quality as the Primary Determinant

The literature on PPP performance returns consistently to one finding: governance quality, more than contract design, payment structure, or sector choice, is the primary determinant of whether a PPP produces good outcomes.²⁰ The IMF's analysis of PPP programs across low- and middle-income countries finds that programs operating within strong institutional environments, where governments can appraise projects honestly, procure competitively, and manage contracts over time, achieve substantially better results than structurally similar programs in weaker institutional environments.²¹ This is not a surprising conclusion in isolation. What makes it important is the implication it carries: deploying PPPs in settings where the governance preconditions are absent does not substitute for institutional capacity. It exposes those institutional gaps in the costliest possible way.

The category "emerging market" can itself obscure more than it reveals. The institutional distance between a middle-income country with deep domestic capital markets and an established project-finance bar and a frontier economy with neither is large, and it maps directly onto PPP outcomes. Most of the widely cited PPP success stories—India, Chile, South Africa—are emerging markets with functioning institutions rather than frontier markets, and the honest assessment is that the standard PPP toolkit works least well precisely where the infrastructure need is greatest. A central reason is government technical capacity. Structuring, tendering, and enforcing a complex long-term concession requires in-house legal, financial, and engineering expertise that many frontier governments do not have, and the absence of a credible public-sector counterpart is frequently a more binding constraint than the absence of capital.²²

²⁰ Graeme Hodge, Carsten Greve, and Mhamed Biygautane, "Do PPPs Work? What and How Have We Been Learning So Far?" *Public Management Review* 20, no. 8 (2018): 1105-1121.

²¹ Mona Hammami, Jean-Francois Ruhashyankiko, and Etienne B. Yehoue, "Determinants of Public-Private Partnerships in Infrastructure," IMF Working Paper WP/06/99 (2006).

²² These observations, and several that follow, draw on the Global Lessons in Public-Private Partnerships roundtable convened by the Georgetown Psaros Center for Financial Markets and Policy at the 2026 IMF–World Bank Spring Meetings. Participating

A related constraint operates even earlier in the project cycle. In many markets the binding problem is not that capital is unavailable for bankable projects but that too few projects are ever made bankable in the first place. Turning an infrastructure concept into an investable asset requires feasibility studies, environmental and social assessment, demand analysis, and the legal and financial structuring that together typically consume roughly five to ten percent of total project cost and two to three years of work before financial close.²³ This pre-development stage is chronically underfunded: host governments often lack the technical capacity or budget appetite to carry it, commercial sponsors prefer to enter once an asset is already structured, and multilateral project-preparation facilities fund only a fraction of the need. The result is a shortage of bankable projects that no amount of available financing can resolve on its own.

What governance quality means in this context is specific. The most important dimension is honest project appraisal. PPP decisions made on the basis of biased cost estimates and optimistic demand projections produce concession contracts premised on revenue streams that do not materialize, financing structures that cannot be sustained, and renegotiation cycles that consume the public resources they were supposed to save. The research literature on major infrastructure projects documents a systematic tendency toward cost underestimation and benefit overestimation that is far more severe in the absence of independent review and reference-class benchmarking against comparable historical projects. Governments that have built PPP programs with strong independent appraisal requirements, including the use of external reviewers who are not invested in project approval, produce substantially fewer distressed concessions than those that allow sponsoring ministries to conduct their own appraisals without oversight.

Competitive procurement integrity is a second essential dimension. The efficiency advantage of PPPs over negotiated contracts depends on competition forcing private bidders to reveal their true costs and capabilities rather than exploiting information asymmetries. A PPP process that is rushed, whether due to fiscal pressure or political timeline, or that is structured in ways that deter capable bidders from participating, fails to capture this advantage. The resulting contract reflects neither competitive pricing nor credible performance commitments. Several of

organizations included the International Finance Corporation, Global Infrastructure Partners, Actis, the Ministry of Economy and Finance of the Republic of Uzbekistan, Goldman Sachs, Bechtel, the Ontario Teachers' Pension Plan, Wells Fargo, the International Forum of Sovereign Wealth Funds, and Caravanserai Partners.

²³ Global Infrastructure Hub, "Investing in Project Preparation Is Crucial to Delivering Bankable and Sustainable Infrastructure," Infrastructure Monitor; and Inter-American Development Bank, *Filling the Infrastructure Investment Gap: The Role of Project Preparation and Structuring Facilities* (Washington, DC: IDB).

the most widely cited PPP failures in the empirical record trace directly to procurement processes that were compressed to the point where independent analysis was impossible, and the public sector had no basis for evaluating whether the terms it was accepting represented reasonable value.

Contract management over the life of the concession is the third governance dimension and the one most frequently neglected. A PPP that is well-designed and competitively procured can still underperform if the public sector loses the technical capacity to monitor performance, enforce standards, and manage the contract changes that are inevitable over a multi-decade concession period. This capacity tends to erode in a predictable way: the public sector team that negotiated the contract often disperses following financial close, and the officials responsible for ongoing contract management may lack the legal and technical knowledge to challenge private partners effectively. Governments that have built sustainable PPP programs have typically invested in specialist contract management units with continuity of expertise across the full concession period.

B. Risk Allocation as a Design Choice

The theory of sound PPP design holds that risks should be allocated to the party best positioned to manage them.²⁴ This principle is easier to state than to implement, but its consistent violation is the proximate cause of a large share of PPP failures. The private sector is generally better positioned to manage construction risk, maintenance risk, and operational efficiency risk, because these are domains where competitive pressure, technical expertise, and management focus provide genuine advantages. The public sector is generally better positioned to manage demand risk, regulatory risk, and macroeconomic risk, because these risks are driven by government decisions, economic conditions, and political dynamics that the private sector cannot meaningfully predict or control. Note the distinction: this does not mean demand risk is unmanageable—it means it is better managed by the party (government) that controls the policy levers affecting demand.

²⁴ Eduardo Engel, Ronald Fischer, and Alexander Galetovic, *The Economics of Public-Private Partnerships: A Basic Guide* (Cambridge: Cambridge University Press, 2014).

User-fee concessions that transfer full demand risk to private partners in volatile or uncertain markets have produced distress across a wide range of national contexts. In Spain, the radial toll highways around Madrid opened in 2004 at the height of a construction boom; actual traffic reached only 16% of forecast levels, and by 2012, multiple concession companies had entered insolvency proceedings.²⁵ In Chile, despite one of the most sophisticated PPP governance frameworks in Latin America, transport concession renegotiations were common, and their additional costs averaged roughly a third of original project cost estimates.²⁶ In India, the scale of demand risk misallocation in national highway concessions was large enough to generate a nonperforming asset crisis in the banking system that required systemic policy reform. These are not isolated failures attributable to individual project missteps. They reflect a structural mismatch between the theory that private partners are better positioned to bear traffic risk and the reality that neither party can forecast long-run demand in infrastructure markets that are subject to economic cycles, regulatory change, and competitive disruption.

The COVID-19 pandemic provided a dramatic natural experiment: toll road traffic volumes globally dropped 40–85% in the spring of 2020, with U.S. toll facility receipts falling from \$1.7 billion per month pre-pandemic to approximately \$400 million per month during lockdowns. Concessionaires that bore full demand risk faced immediate financial distress; those under availability-payment structures, by contrast, continued to receive government payments for maintaining road availability regardless of traffic, demonstrating precisely the structural advantage of proper risk allocation.²⁷

Availability-payment structures address this mismatch by separating the private partner's revenue from demand outcomes. The concessionaire is paid for delivering a service that is available and meets performance standards, regardless of whether users choose to use it. This structure preserves the private sector's advantages in construction, maintenance, and operations while transferring demand exposure to the public budget, where it is properly classified as a long-term commitment that must be disclosed and managed. The downside is that availability-payment obligations are real fiscal commitments that the public sector must budget

²⁵ Phys.org, "Spain's Empty Highways Lead to Bankruptcy," October 2012. The state ultimately assumed debts exceeding €5 billion by 2016.

²⁶ J. Luis Guasch, *Granting and Renegotiating Infrastructure Concessions: Doing It Right* (Washington, DC: World Bank, 2004).

²⁷ S&P Global Ratings, "Infrastructure: Global Toll Roads' Steep Climb Out of COVID," June 2020; Eno Center for Transportation, "Coronavirus Threatens Viability of Toll-Based PPPs," April 2020.

for, stress-test, and disclose. This is not a weakness of the model. It is a feature: the obligation exists whether or not it is made visible, and making it visible is what enables responsible governance.

Beyond demand risk, several additional categories of risk deserve explicit attention in PPP design, particularly for projects in emerging and frontier markets.

Foreign exchange risk arises when a PPP project's revenues are denominated in local currency, but its debt obligations, imported equipment costs, or repatriation commitments are denominated in hard currency. This mismatch is endemic in emerging-market infrastructure. A currency depreciation that is modest by macroeconomic standards can render an otherwise well-performing concession financially unviable if the project's revenue stream cannot absorb the increased cost of servicing hard-currency debt. The Global Infrastructure Hub has documented this as one of the most persistent barriers to private infrastructure investment in developing countries.²⁸ Hedging instruments exist but remain limited in practice. Long-tenor currency swaps and forwards are generally unavailable in the thinnest emerging-market currencies, and where they are available, the cost of hedging often exceeds the financial model's capacity to absorb it. The Currency Exchange Fund (TCX) has assisted in arranging over \$10 billion in local-currency funding, and Chile established public insurance for cross-border infrastructure financing in the late 1990s—essentially a government-backed hedging facility that absorbs currency risk on behalf of infrastructure concessionaires, funded through premiums charged to project sponsors. Few countries have replicated this model.

The practical weight of this risk is easy to understate on paper. In the structuring of emerging-market infrastructure, currency is frequently the single most-cited reason that otherwise viable projects do not reach financial close. The difficulty is not only that hedging is expensive but that no participant in the capital stack will willingly absorb long-dated currency risk: sponsors want their returns to turn on operational execution rather than on a twenty-year exchange-rate path; commercial banks, constrained by post-crisis capital rules, can no longer warehouse the exposure as they once did; and frontier-market governments lack the balance sheet to carry it themselves. The risk therefore tends to sit in the middle of the transaction, unpriced and unallocated, and the deal does not happen. This also helps explain why dollar-revenue

²⁸ Global Infrastructure Hub, "How Can We Mitigate Foreign Exchange Risk for Infrastructure Investments?" Policy Brief, 2021.

sectors—power generation sold under dollar-indexed purchase agreements—attract private capital more readily than demand-risk sectors whose revenues are unavoidably local-currency.

In reality, this foreign exchange gridlock acts as a primary market filter that quietly reroutes global investment desks away from vital public utilities toward insulated, dollarized enclaves. When international project developers are forced to choose between absorbing twenty years of local currency volatility or stepping away from a deal, they almost universally choose the latter, leaving a vast majority of regional transport and urban infrastructure assets completely unbankable. This structural paralysis underscores the reality that capital itself is not scarce; rather, the specialized financial "plumbing" required to synthesize long-term local debt or manage synthetic currency swaps is fundamentally missing. Because commercial financial institutions face intense regulatory pressure under post-crisis capital frameworks like Dodd-Frank that penalize holding volatile cross-border balance-sheet exposure, the inability to safely hedge currency behaves as an absolute deterrent rather than a priced risk premium. It fundamentally kills otherwise viable project pipelines before they ever reach a bidding floor.

Compounding this financial engineering breakdown is a severe institutional hurdle occurring long before a project ever reaches commercial financing: the pre-development gap. Real-world experience demonstrates that the primary constraint stifling private investment flows is a stark deficit of actually bankable, ready-to-finance project pipelines. Host governments frequently lack the upfront capital and specialized technical expertise required to manage early-stage feasibility studies, legal permitting, and sophisticated contract structuring. Private commercial sponsors, by contrast, are fiercely risk-averse and generally refuse to deploy capital during these volatile, un-de-risked initial phases, preferring to step in only after an asset has been formally fully structured. To bridge this severe systemic fracture, a novel institutional model has emerged utilizing the hybrid mechanism of strategic sovereign wealth funds (SWFs). Unlike pure financial investors that seek maximum short-term returns, strategic SWFs leverage their state-aligned risk tolerances and deep local networks to step directly into the pre-development seat. By absorbing early-stage preparation costs and leveraging their public-private dual identities, these strategic funds can effectively de-risk and curate raw infrastructure concepts into bankable assets, establishing the vital connective tissue required to attract global commercial capital.

Political risk encompasses government actions that undermine the contractual or regulatory foundations on which a PPP was structured. This ranges from outright expropriation, which remains rare but not without occasion, to more common forms of creeping interference: unilateral tariff freezes, retroactive regulatory changes, failure to honor contractual payment obligations, and land acquisition delays caused by political unwillingness to enforce eminent domain. MIGA's coverage of expropriation, breach of contract, currency transfer restrictions, and war and civil disturbance addresses the most severe manifestations, but the more typical forms of political risk, the incremental erosion of the concession's economic terms through regulatory or administrative action, are harder to insure against and must be managed through contract design, dispute resolution mechanisms, and the credibility of the host country's legal system.

Regulatory risk is closely related, yet distinct. Long-term infrastructure concessions must coexist with evolving regulatory frameworks. Environmental standards, safety requirements, tariff regulations, and competition rules all change over 20- or 30-year concession periods, and those changes can materially affect the concessionaire's cost structure and revenue assumptions.²⁹ The World Economic Forum's analysis of infrastructure risk mitigation emphasizes that regulatory frameworks must remain stable enough to provide investor confidence while retaining sufficient flexibility to accommodate legitimate public interest evolution. PPP contracts that attempt to freeze the regulatory environment at the time of financial close create their own problems, as they may prevent governments from implementing necessary policy reforms without triggering compensation claims.

Legal risk concerns the enforceability of PPP contracts and the reliability of dispute resolution mechanisms. International arbitration under the International Centre for Settlement of Investment Disputes (ICSID) has become the preferred mechanism for cross-border infrastructure disputes, and the 1958 New York Convention on the Recognition and Enforcement of Foreign Arbitral Awards provides a framework for enforcement across signatory states. However, arbitration is slow, expensive, and imperfect. Cases can take years to resolve, and enforcement of awards against sovereign governments remains uncertain in practice. Domestic courts in many jurisdictions lack the specialized expertise needed to adjudicate infrastructure

²⁹ World Economic Forum, *Mitigation of Political and Regulatory Risk in Infrastructure Projects* (Geneva: WEF, 2015).

concession disputes. The legal risk profile of a PPP transaction is therefore shaped not only by the contract terms but by the institutional quality of the dispute resolution infrastructure available to both parties.

Ultimately, navigating these regulatory and legal complexities requires a level of sovereign institutional capacity that highlights a severe structural divergence between emerging markets and true frontier markets. While larger emerging economies often possess functional legal frameworks and strong project fundamentals, their progress is routinely choked by severe resource and capability constraints inside internal public ministries. However, in true frontier markets, this lack of technical knowledge escalates from an administrative bottleneck into an absolute barrier to project survival. Frontier governments rarely possess the internal technical bandwidth or specialized legal expertise required to champion, structure, and negotiate highly sophisticated twenty-year concession agreements. This capacity deficit creates a profound temporal mismatch, forcing a short-term, two-to-five-year government policy visibility window to collide directly with the rigid long-duration requirements of a multi-decade private infrastructure asset. When public authorities cannot reliably project policy continuity across changing election cycles, or lack the sophisticated legal literacy to enforce contracts predictably, the traditional PPP toolkit breaks down entirely. Consequently, the deep institutional chasm separating frontier states from established emerging markets dictates that public sector capacity building is not merely an optional project output, but an absolute structural precondition for any successful private infrastructure transaction.

Environmental, social, and governance (ESG) risk has become increasingly material for infrastructure PPPs, driven by both investor expectations and the physical realities of climate change. Long-lived infrastructure assets are exposed to physical climate risks, including flooding, extreme heat, and sea-level rise, that were not fully anticipated at the time many existing concessions were structured. Community opposition and resettlement failures have delayed or derailed infrastructure projects across multiple regions.³⁰ The World Bank's Environmental and Social Framework now requires comprehensive stakeholder engagement and environmental assessment for projects receiving Bank support, and private investors increasingly apply ESG screening criteria that can affect the bankability of projects perceived as carrying high

³⁰ World Bank, Environmental and Social Framework (Washington, DC: World Bank Group, 2018).

environmental or social risk. For PPPs structured on a thirty-year horizon, ignoring these risks creates exposure that materializes long after the financial model has been approved.

C. Sector Suitability

Not all sectors lend themselves equally to PPP structures. The World Bank's data on private participation in infrastructure reflects this unevenness, with energy attracting by far the largest share of private investment commitment in low- and middle-income countries, followed by transportation, and with water and sanitation attracting comparatively little.³¹

The pattern reflects the underlying characteristics of each sector. Energy generation is conducive to PPP-like arrangements because the technology is relatively standardized, revenue can be anchored in long-term power purchase agreements with regulated utilities or creditworthy offtakers, and service quality is measurable in quantitative terms. Crucially, this technical standardization enables forward-thinking host governments to move beyond isolated, ad-hoc transactions and run systematic, repeatable auction frameworks. As demonstrated by regional successes like Chile's electricity sector and South Africa's renewable energy auctions, deploying highly programmatic pipelines allows the public sector to consistently aggregate capital, compress procurement timelines, and continuously drive down its long-term cost of capital through standardized risk allocations.

Transportation infrastructure, particularly highways and tunnels, attracts significant private investment but also has the highest historical incidence of renegotiation and financial distress, reflecting the volatility of traffic demand and the political sensitivity of toll levels. However, real-world evidence demonstrates that this inherent sectoral volatility can be structurally managed when projects are executed within a predictable, multi-round concession blueprint rather than as standalone, one-off deals. Colombia's 4G and 5G road concession initiatives and India's extensive national highway experience underscore that pipeline programmaticity matters far more than the idiosyncratic quality of any individual deal. By guaranteeing a continuous, reliable volume of subsequent transactions, these frameworks enable global infrastructure sponsors to justify the high fixed costs of market entry. This continuous deployment allows private operators to build permanent regional platforms, retain local teams,

³¹ World Bank, Private Participation in Infrastructure (PPI) Database, Annual Report 2024.

cultivate deep relationships with regulators, and refine their bidding strategies across consecutive rounds. Water and sanitation attract less private capital because the combination of high network externalities, long asset lives, politically constrained tariff levels, and essential service characteristics creates a risk profile that is difficult to structure attractively without substantial public support. Water tariffs are almost always set below cost-recovery levels because of political sensitivity around pricing a basic human need, creating a revenue gap that makes concessions financially unviable without large government subsidies. Additionally, the network characteristics of water systems—a single pipe network serving an entire city—create natural monopoly dynamics that resist the competitive pressures PPPs are designed to harness, and the essential nature of the service means governments cannot credibly allow failure. Furthermore, because water utilities are frequently localized and fragmented, they face a severe structural disadvantage in reaching the critical mass required to form a programmatic pipeline. Lacking this institutional scale, the sector struggles to attract global asset managers who prioritize platform-level replication and capital recycling over one-off, highly customized municipal projects.

For policymakers, these patterns carry a practical implication. Sectors with weak PPP applicability are no less in need of investment. They are harder to finance through market-facing concession structures, and the gap between investment need and PPP feasibility in those sectors points toward the need for strengthened public investment capacity rather than continued attempts to attract private capital through increasingly generous risk guarantees. The goal of infrastructure finance policy is to deliver good services, not to achieve a particular ratio of private to public financing.

A further condition operates at the level of the program rather than the individual project: scale and pipeline continuity. Markets that run systematic, repeatable procurement programs—regular auction rounds in power generation or road concessions—consistently attract more private capital, and on better terms, than markets that bring projects to market as isolated transactions. A sponsor that can expect a continuous pipeline will invest in a local platform: hiring local teams, building relationships with ministries and regulators, refining its bidding across rounds, and recycling capital into follow-on projects. The fixed costs of entering a market are high enough that only the prospect of repeated deployment justifies them. Programmatic

pipelines also push governments toward standardized contracts and procurement processes, and that standardization compounds over time into a lower cost of capital. India’s highway program, Chile’s electricity auctions, Colombia’s road-concession generations, and South Africa’s renewable-energy rounds all reflect this logic.³² The corollary is less comfortable: markets that lack the scale or political commitment to sustain a programmatic pipeline are structurally disadvantaged, regardless of the merits of their individual projects.

D. Private-Sector Participants: Operators, Sponsors, and Capital Providers

The private side of a PPP transaction is not a single entity. It typically comprises a consortium of firms performing distinct functions—understanding who these participants are and what incentives they face is essential to understanding how PPPs perform in practice.³³ The principal categories are construction and operating sponsors, infrastructure fund managers and institutional investors, development finance institutions, and commercial banks providing project finance debt.

One structural shift in how this capital structure operates over the past decade deserves explicit note. Where a commercial bank once had to build its own country- and project-level risk assessment in every market it lent into—an informational cost high enough to deter participation in all but the most familiar jurisdictions—a lender today can effectively underwrite the sponsor itself, relying on a global infrastructure platform to absorb the ground-level work of originating, structuring, and de-risking the transaction. This has made cross-border infrastructure assets meaningfully more bankable. Part of what made the shift necessary, however, was regulatory. Post-crisis financial reform, including the Dodd-Frank Act and the associated Basel III capital requirements, made foreign-exchange and country risk substantially more expensive for banks to hold on their own balance sheets, pushing many institutions out of emerging-market infrastructure lending and dispersing the specialized knowledge they had accumulated over decades.³⁴ The sponsor model partly compensates for that retreat, but it also concentrates the system's de-risking capacity in a small number of global platforms: a market that cannot attract one of those sponsors is effectively cut off from the capital the sponsor aggregates.

³² Drawn from the Global Lessons in Public-Private Partnerships roundtable convened by the Georgetown Psaros Center for Financial Markets and Policy at the 2026 IMF–World Bank Spring Meetings.

³³ Infrastructure Investor, *The Global Infrastructure Investor 100, Annual Rankings*, 2024.

³⁴ Viral V. Acharya, “The Dodd-Frank Act and Basel III: Intentions, Unintended Consequences, and Lessons for Emerging Markets,” ADBI Working Paper No. 392 (Tokyo: Asian Development Bank Institute, 2012).

Construction and operating sponsors are the firms that physically build and operate the infrastructure asset. These are typically large engineering and construction conglomerates with the technical capability to deliver complex projects and the corporate balance sheets to support equity commitments during the construction phase. The global PPP market is dominated by a relatively small number of these firms. Vinci (France, publicly traded, €65 billion market capitalization, over 270,000 employees) and Ferrovial (Spain, publicly traded, approximately €38 billion market capitalization) are among the largest globally. ACCIONA (Spain) and Strabag (Austria) are major European players. Larsen & Toubro (India, publicly traded on BSE/NSE, over \$25 billion market capitalization) is the dominant PPP sponsor in the Indian market. In emerging markets, local construction firms often participate in consortia with international sponsors, contributing local knowledge and political relationships while the international partner provides technical capability and access to international capital markets. These sponsors compete for concessions, form joint ventures, and bear the construction and early-stage operating risk that are the core competencies the PPP model is designed to harness.

Sovereign wealth funds warrant separate mention, because their role in infrastructure is more varied than their standard description as passive institutional investors suggests. Many sovereign funds do participate simply as limited partners. But a distinct category—often termed strategic or development funds—exists partly to attract foreign direct investment and to de-risk projects in their home markets through local knowledge and state-aligned risk tolerance. India’s National Investment and Infrastructure Fund and the Indonesia Investment Authority are the clearest examples, both created with explicit mandates to mobilize private co-investment into domestic infrastructure.³⁵ Because such funds are simultaneously commercial and state-owned, they are well positioned to occupy the pre-development seat that commercial capital avoids—originating and structuring projects, absorbing early-stage risk, and handing bankable assets on to private investors.

Infrastructure fund managers and institutional investors represent the second major category of private participants. The infrastructure investment management industry has grown substantially over the past two decades, with dedicated infrastructure assets under management

³⁵ International Forum of Sovereign Wealth Funds, “Strategic Funds” and “Sovereign Development Funds”; and IFSWF Annual Review 2024.

now exceeding several hundred billion dollars globally. Why do investors like infrastructure? The asset class offers several distinctive characteristics: long-duration cash flows that match the liabilities of pension funds and insurers; revenues that are often linked to inflation through contractual escalation clauses or regulated tariff formulas (meaning payments rise with price levels, providing a natural hedge against purchasing-power erosion); low correlation with equity markets during normal periods; and relatively predictable returns underpinned by essential-service demand. Brookfield Infrastructure Partners (approximately \$104 billion raised 2020–2024), Global Infrastructure Partners (now part of BlackRock’s combined \$150 billion infrastructure platform), and Macquarie Infrastructure and Real Assets (approximately \$140 billion AUM) are the three largest dedicated managers.³⁶ These firms raise capital from pension funds, sovereign wealth funds, insurance companies, and endowments, and deploy it as equity in infrastructure concessions, often acquiring stakes from construction sponsors after the construction phase is complete and the project has entered stable operations. The distinction matters because these financial investors have different risk appetites and time horizons than construction sponsors. They seek stable, long-term cash flows and are willing to accept lower returns in exchange for reduced volatility, making them well-suited to the operational phase of availability-payment PPPs but poorly suited to early-stage construction risk.

Pension funds deserve specific mention because their participation has been one of the most significant structural developments in infrastructure finance. Canadian pension funds—including the Canada Pension Plan Investment Board (CPPIB, C\$780 billion AUM), OMERS, and the Caisse de dépôt et placement du Québec (CDPQ)—have been pioneers in direct infrastructure investment, building in-house teams that evaluate and manage concession assets directly rather than through intermediary fund managers. Australian superannuation funds have followed a similar path through vehicles like IFM Investors (€151 billion AUM, over 800 institutional clients).³⁷ The appeal of infrastructure to pension funds is the alignment between the long duration of pension liabilities and the long-lived, inflation-linked cash flows that well-structured infrastructure concessions produce. “Inflation-linked” means that the revenue the infrastructure asset generates rises with general price levels, either through contractual escalation

³⁶ IPE Real Assets, Top 100 Infrastructure Investment Managers Survey, 2025; BlackRock acquisition of GIP completed in 2024.

³⁷ CPPIB Annual Report 2025; IFM Investors Annual Report 2025.

clauses, regulated tariff adjustments, or direct exposure to real economic activity—providing a natural hedge for pension obligations that also grow with inflation. However, the suitability of this match depends critically on the quality of the underlying concession: pension funds that invested in demand-risk toll concessions that subsequently entered financial distress discovered that the asset class was less stable than the label suggested.

Development finance institutions (DFIs) and commercial banks complete the capital structure. DFIs—including the IFC, Germany’s DEG, the Netherlands’ FMO, France’s Proparco, and the UK’s British International Investment (formerly CDC Group)—provide both debt and equity to PPP projects in developing countries, often on terms that are concessional or that accept risks that commercial lenders will not. Given their stringent governance standards and due diligence requirements, their participation frequently serves as a signal of project quality and governance standards that attracts additional private capital. Commercial banks provide the senior project finance debt that typically constitutes 60–80% of a PPP project’s capital structure. This debt is structured as non-recourse or limited-recourse to the sponsors, secured against the project’s assets and cash flows rather than the sponsors’ corporate balance sheets. Major project finance banks include MUFG, Société Générale, Crédit Agricole, HSBC, Standard Chartered, and State Bank of India. Syndicated lending across multiple banks and jurisdictions serves a secondary function as informal political risk mitigation: governments are less likely to take actions that would harm a project financed by banks from multiple allied countries.³⁸

Exhibit: Best Practices and Common Mistakes in PPP Design and Governance

Area	Best Practice	Common Mistake
Project Appraisal	Independent review with reference-class forecasting and external benchmarking	Sponsoring ministry conducts own appraisal without independent oversight
Demand Forecasting	Anchor to historical outcomes of comparable projects; stress-test scenarios	Accept sponsor traffic projections at face value; assume base-case growth
Risk Allocation	Demand risk to government (availability payments); construction/operating risk to private sector	Transfer all risks to private partner; assume risk transfer is complete
Procurement	Competitive, transparent bidding with adequate due diligence time for qualified bidders	Rush procurement to meet political timelines; compress evaluation period

³⁸ Thomson Reuters/Refinitiv, Global Project Finance Review, 2024; Deutsche Bank, "Project Finance Explained," 2023.

Fiscal Accounting	Full lifecycle disclosure via PFRAM; include contingent liabilities in debt sustainability analysis	Keep PPP obligations off-budget; treat as costless because they appear on private balance sheet
Contract Design	Controlled renegotiation mechanisms; predefined compensation formulas; binding dispute resolution	Rigid contracts with no adaptation mechanism; treat renegotiation as unplanned exception
Contract Management	Dedicated unit with expertise continuity across full concession period	Disperse negotiation team after financial close; rely on generalist officials
FX Risk	Structure revenues and debt in same currency; use TCX or public hedging where available	Denominate debt in hard currency against local-currency revenues without hedging
Political Risk	Obtain MIGA or DFC political risk insurance; engage MDBs as co-lenders for implicit protection	Assume government will honor commitments without institutional safeguards
ESG Due Diligence	Conduct environmental and social impact assessment; engage affected communities early	Defer community engagement; underestimate resettlement and environmental compliance costs
MDB Engagement	Leverage MDB technical assistance for project preparation and institutional capacity building	Structure PPPs without MDB input; rely solely on bilateral negotiation

IV. Why PPPs Fail: The Recurring Patterns

A. Fiscal Illusion

The most fundamental failure mode is the use of PPPs not to deliver better public services but to defer the recognition of public costs.³⁹ The IMF has documented this pattern across multiple country contexts and treats it as a primary reason why PPP programs require independent fiscal oversight. When a government faces binding budget constraints or debt ceiling rules, a PPP offers an appealing maneuver: the private sector builds the asset, the obligation appears on the private partner’s balance sheet rather than the government’s, and the public budget shows neither capital expenditure nor associated debt. Future availability payments, minimum revenue guarantees, or termination indemnity obligations remain off-budget until they come due.

This accounting arrangement is often economically misleading. The government has committed to paying for infrastructure services over the contract period regardless of what its balance sheet records. Analysts who understand PPP structures treat these obligations as

³⁹ Manal Fouad, Niko Rial, and Erik Sakrak, "Mastering the Risky Business of Public-Private Partnerships in Infrastructure," IMF Departmental Paper No. 2021/010 (2021).

economically equivalent to public debt even when they are not formally classified that way. The formal treatment, however, affects the political incentives that drive PPP decisions by making a project appear costless at inception and displacing the fiscal reckoning to future administrations that must honor commitments they did not negotiate. Research on Latin American concession programs found that governments with weaker fiscal institutions and binding deficit constraints were systematically more likely to choose PPP structures over traditional procurement, a pattern that is consistent with the fiscal illusion hypothesis rather than with any efficiency rationale.

The United Kingdom's PFI program illustrates the scale this can reach at a national level. By 2018, the UK had signed PFI contracts with a capital value of approximately £68 billion, but the total lifetime cost to taxpayers—including financing charges, maintenance fees, and service payments over the 25–30 year contract periods—was estimated at over £200 billion. The National Audit Office concluded that PFI projects were more expensive than publicly financed alternatives, and a House of Commons inquiry found that after more than 25 years, the Treasury still had no data to show whether PFI delivered value for money. Chancellor Philip Hammond formally abolished PFI in the 2018 Budget.⁴⁰

The policy response to fiscal illusion is institutional: independent fiscal gatekeeping functions, positioned outside the ministries that benefit from starting projects, should evaluate the full lifecycle cost of PPP commitments before contracts are signed. PFRAM exists precisely to provide the analytical tool for this function. The framework requires governments to map future payment streams, stress-test them under adverse scenarios, quantify contingent liabilities including termination exposure, and incorporate those obligations into debt sustainability assessments. When these disclosures are made transparently and incorporated into budget planning, fiscal illusion becomes much harder to sustain.

⁴⁰ UK National Audit Office, "PFI and PF2," Report, January 2018; House of Commons Treasury Committee, "Private Finance Initiative," Seventeenth Report of Session 2017-19.

B. Demand Forecasting Failure

User-fee PPPs are only as sound as the demand forecasts that underpin their financial models, and the evidence on infrastructure demand forecasting is not encouraging.⁴¹ Research on major infrastructure projects across multiple countries and sectors documents a systematic tendency toward traffic and revenue overestimation that is large in magnitude, persistent across contexts, and not easily explained by honest uncertainty alone. This overestimation reflects both cognitive tendencies that cause analysts to underweight historical reference-class evidence from comparable projects and strategic incentives that cause project promoters to present favorable assumptions in order to secure approvals and financing.

The practical consequence is that concession companies that sign contracts based on optimistic projections often find themselves unable to service debt when actual revenues prove insufficient. Lenders face non-performing loan portfolios. Governments that provide minimum revenue guarantees face contingent liability claims. Genuinely useful infrastructure enters a distress cycle that typically ends in expensive renegotiation, contract extension, or public rescue. The pattern is sufficiently consistent across contexts to suggest that project-level responses focused on correcting individual forecast errors miss the underlying problem. What is needed is an institutional requirement for reference-class forecasting, independent demand review, and scenario stress-testing before contracts are signed.

The Channel Tunnel provides perhaps the most prominent global example. The project, completed in 1994 at a cost of £9 billion (80% over the original £5.5 billion estimate in 1985 prices), was premised on traffic forecasts that proved dramatically optimistic. In its first year of operation, the operating company Eurotunnel reported a loss of £925 million on revenues far below projection, weighed down by £8 billion in debt. It took until 2014 for the Tunnel to capture 60% of cross-Channel traffic. Only after a second financial restructuring in 2007, which substantially devalued original equity investors, did the project achieve financial sustainability.⁴²

Many PPP programs have resisted the adoption of reference-class forecasting, which involves anchoring demand projections to the distribution of outcomes observed in comparable

⁴¹ Bent Flyvbjerg, "What You Should Know About Megaprojects and Why: An Overview," *Project Management Journal* 45, no. 2 (2014): 6-19.

⁴² Taylor & Francis, "Digging Beneath the Iron Triangle: The Chunnel with 2020 Hindsight," *Journal of Mega Infrastructure & Policy* (2019); Global Infrastructure Hub, "The Channel Tunnel" Case Study.

historical projects rather than to the specific assumptions of the project at hand. It has been shown to produce substantially more accurate forecasts than conventional approaches. Its resistance to adoption in many PPP programs reflects the same dynamics that produce optimism bias in the first place: the officials and consultants who produce demand forecasts often have professional and financial interests in project approval, and those interests are not well served by conservative projections grounded in unflattering historical comparisons.

C. Contract Rigidity and the Cost of Governing

A thirty-year contract for infrastructure embedded in a city or a regional transportation network must coexist with decades of urban planning decisions, technology change, policy evolution, and economic restructuring that no one at the time of financial close could reasonably have anticipated. When contracts do not contain workable mechanisms for managing these changes, normal governance decisions can become contract breach events that trigger compensation claims, restrict public authority, or force the government to choose between paying large true-up sums and foregoing public interest actions it would otherwise take.

Again, the problem is structural, not incidental. Long-term infrastructure concessions create property rights in revenue streams and operational arrangements that the private partner and its lenders have valued and financed. Changes that reduce those revenue streams—whether by removing parking spaces, redesigning streets, introducing competing transit options, or responding to changed land use patterns—affect the financial model upon which the contract was built. In concession agreements that allocate these adjustment costs to the public sector, the government may find itself paying compensation for exercising authority over its own infrastructure network that it would not have expected to give up.

The theoretical framework for addressing this problem distinguishes between efficiency-improving contract adjustments, which adapt concessions to genuinely unforeseen circumstances in ways that serve both parties, and opportunistic renegotiations, in which one party exploits the other's sunk cost to extract rents. The institutional environment, particularly the availability of independent dispute resolution mechanisms and the quality of ongoing contract management, determines which type predominates. PPP programs that have built controlled renegotiation mechanisms into their contract frameworks, including predetermined compensation formulas for defined categories of change and binding dispute resolution procedures, tend to

produce lower renegotiation costs and better long-term outcomes than those that treat renegotiation as an unplanned exception.

D. The Risk Boomerang

Risk that appears to have been transferred to the private sector often returns to the public sector when circumstances deteriorate. This dynamic, which might be called the “risk boomerang,”⁴³ has both contractual and political dimensions. Contractually, PPP agreements frequently contain provisions, sometimes explicit, sometimes implicit, that shift exposure back to government when private partners cannot absorb the designated risk: minimum revenue guarantees, step-in rights that require the government to assume operational control, and termination indemnity clauses that compensate private partners and their lenders when contracts end early. Politically, governments cannot credibly commit to allowing essential services to fail, and private partners in distressed concessions understand this, bargaining with the knowledge that the government’s political exposure to service disruption limits its negotiating position.

The practical implication is that risk transfer in PPPs is contingent on the private partner’s financial resilience and on the government’s willingness to allow failure in the relevant service domain. In sectors where service failure is politically acceptable, risk transfer may be real. In sectors where it is not, the transfer is nominal, and the economic rationale for the PPP structure depends on what else it provides, namely the construction, maintenance, and operational management incentives discussed earlier, rather than on any durable shift in liability. Recognizing this constraint explicitly, rather than assuming risk transfer is complete, leads to better contract design, more realistic fiscal planning, and less shock when distressed situations require government intervention.

E. Regulatory Governance in Utility-Type PPPs

Where PPPs operate within broader regulatory frameworks, the quality of that regulation becomes a determinant of PPP performance. The specific concern is regulatory capture, the process by which regulated entities gain disproportionate influence over the bodies responsible for overseeing them. When private concession companies know that regulators will

⁴³ The term is used here descriptively. For formal treatment of risk reversion in PPPs, see Eduardo Engel, Ronald Fischer, and Alexander Galetovic, “When and How to Use Public-Private Partnerships,” NBER Working Paper No. 26766 (2020).

accommodate revenue shortfalls through tariff adjustments rather than enforcing contract standards, the performance incentives embedded in concession agreements weaken. When complex corporate structures allow value to be extracted from regulated operating companies into unregulated holding entities, regulatory oversight that is technically adequate at the entity level may be consistently circumvented at the group level.

The governance response to this risk involves both structural and procedural elements. Regulators need institutional independence from the entities they oversee, including budget autonomy and statutory protection from political interference in individual decisions. Regulatory frameworks need transparency requirements that make corporate group structures visible, including requirements that regulated utilities disclose intragroup transactions and financial relationships with parent and affiliated entities. And concession agreements need step-in rights and intervention mechanisms that governments can deploy before a distressed situation reaches the point where the only option is an expensive public rescue.

V. India's National Highway Program: Risk Allocation, Systemic Stress, and Structural Reform

A. Context and the Scale of the Ambition

India's experience with public-private partnerships in national highway development is the most thoroughly documented case of a large-scale PPP program that generated systemic financial distress through improper risk allocation and then reformed itself through deliberate policy intervention. The scale and speed of the initial program make its subsequent problems instructive rather than anomalous. India was not experimenting cautiously with PPPs. It was trying to build a modern national highway network across a continental geography as rapidly as possible, and private capital appeared to offer a way to do that without exhausting public budgets.

The National Highways Development Programme (NHDP), launched in the early 2000s, became one of the largest infrastructure PPP programs in the world. The dominant model was the BOT toll concession. Private sponsors financed construction with substantial leverage, assumed full construction and operating responsibility, bore all of the demand risk, and expected to

recover their investment through toll collections over concession periods of 20 to 30 years.⁴⁴ The arrangement reflected a strong theoretical commitment to the principle that risk should be allocated to whoever can best manage it. Private firms, the theory held, are better equipped than governments to optimize construction quality and manage operational efficiency.

The weakness in this framework was not the principle but its application. Demand risk in an emerging economy highway network is not a risk that private sponsors can meaningfully manage. Traffic volumes depend on macroeconomic growth, on the development of adjacent land, on competing routes and modes, and on government tolling policy, none of which the concessionaire controls. Assigning this risk to the private sector did not transfer it to someone better positioned to manage it. It transferred it to someone who would price it through high leverage and aggressive revenue assumptions, creating a financial structure that was brittle in ways the theory did not anticipate.

B. The Sources of Systemic Stress

The structural weaknesses became visible by the early 2010s, and they were interconnected in ways that amplified individual project failures into a systemic problem. The first source of stress was aggressive bidding practice. Sponsors competing for concession contracts in a rapidly expanding program bid on the basis of traffic projections that consistently proved too optimistic. The incentive to win contracts by understating costs and overstating revenue was strong, and the government's capacity to evaluate the realism of these projections was limited. Contracts were signed on financial models that would have required traffic growth rates substantially above historical trends to generate the revenues needed for debt service.

The second source was land acquisition. Under Indian law, the government retains responsibility for delivering encumbrance-free land to concessionaires before construction can begin. This obligation was chronically unmet. Legal disputes, administrative delays, and the political difficulty of displacing residents and businesses meant that land was frequently unavailable on the timelines written into concession agreements. Concessionaires found themselves unable to begin construction on schedule, incurring carrying costs on debt they had

⁴⁴ Kelkar Committee, Report of the Committee on Revisiting and Revitalising Public-Private Partnership Model of Infrastructure (New Delhi: Department of Economic Affairs, 2015).

raised for construction that could not proceed. The delays generated cost overruns and cash flow pressure before a single vehicle had paid a toll.

Third, changes in tolling policy and the regulatory framework for dispute resolution increased uncertainty in ways that affected the cost of private capital for the entire program. When regulatory expectations become unstable, lenders demand higher returns to compensate, which makes otherwise viable projects unviable and raises the cost of the projects that do proceed.

Fourth, and ultimately most consequential, the infrastructure conglomerates that had accumulated large highway concession portfolios financed with heavy leverage found their balance sheets deteriorating as project failures multiplied. The problem was not confined to individual companies. Several of the largest players in Indian infrastructure finance had similar exposures, and their simultaneous distress became a material contributor to the non-performing asset crisis that affected Indian commercial banks through the mid-2010s. What had begun as a set of project-level disappointments had become a systemic financial stability problem.

By 2015, private participation in national highway PPPs had sharply declined. Experienced infrastructure developers were withdrawing from a market where the financial model had proven unworkable, and the pipeline of new projects was stalling as financial close became increasingly difficult to achieve.

C. The Reform Response: What Ultimately Happened

India's response to the crisis is what makes the case study instructive rather than merely cautionary. Rather than abandoning PPPs for highways, the government undertook a structural reform of the PPP model itself. The 2015 Kelkar Committee report provided the analytical foundation, recommending a fundamental restructuring of risk allocation, procurement processes, and institutional oversight.⁴⁵

The central reform was the introduction of the Hybrid Annuity Model (HAM) in January 2016. Under HAM, the government pays 40% of the project cost during the construction phase

⁴⁵ Kelkar Committee Report, 2015; Asian Development Bank, "The Hybrid Annuity Model for PPPs in India's Road Sector," South Asia Working Paper No. 094, 2022.

as milestone-based payments, while the private developer finances the remaining 60% and recovers it through semi-annual annuity payments from the government over the concession period. This structure fundamentally altered the risk allocation: demand risk was transferred back to the government, where the Kelkar Committee concluded it belonged, while the private sector retained construction risk, completion risk, and maintenance risk—the risks it was genuinely positioned to manage.

The results have been meaningful. By 2019, the National Highways Authority of India (NHAI) had approved approximately ₹10,000 crore (approximately \$1.2 billion) worth of projects under HAM. By fiscal year 2022, approximately 51% of the 1,900 kilometers of new road projects awarded by NHAI were structured under HAM. Private developer participation recovered, bank lending to highway projects resumed, and the pipeline of new projects stabilized. India's highway PPP reform demonstrates that the failure mode was not inherent to PPPs as an instrument but was a consequence of specific design choices—principally the misallocation of demand risk—that could be corrected through deliberate policy intervention.

VI. The Emerging Challenge: AI and Data Center Infrastructure

The infrastructure demands generated by artificial intelligence development and hyperscale data center deployment represent a capital cycle that will test the limits of every existing infrastructure governance framework. The scale is without precedent in the recent history of infrastructure investment. Major technology companies have announced capital expenditure programs in the tens of billions of dollars annually, concentrated on data centers and the power generation, transmission, and cooling infrastructure required to support them. These facilities require reliable power at scales that are straining existing grid capacity in multiple regions, water resources for cooling systems, and land and permitting approvals on timelines that are compressed relative to the pace at which infrastructure planning typically operates.

This capital cycle presents both opportunities and challenges for PPP frameworks. The opportunity is that private capital is abundant and motivated. Technology companies have both the financial resources and the operational urgency to deploy infrastructure rapidly, and they are actively seeking partnerships with governments, utilities, and landowners to secure the inputs they need. The challenge is that the governance frameworks designed for traditional

infrastructure concessions may not be well-suited to the speed, scale, and technological uncertainty of this investment cycle.

One implication follows directly. Conventional infrastructure concessions are written for twenty- to thirty-year horizons because roads, tunnels, and water systems depreciate slowly. AI-related infrastructure does not behave this way. The pace of change in chip design, rack power density, and cooling technology is fast enough that a data center built to today's specifications can approach functional obsolescence within years rather than decades; facilities designed for air cooling and rack densities under 15 kilowatts are already poorly matched to AI clusters requiring liquid cooling and densities several times higher.⁴⁶ A concession that locks the public sector into a thirty-year contract against an asset whose competitive life may be a fraction of that term imports a technology-obsolescence risk that traditional PPP design never had to price. The prudent response is to match contract duration to the technology cycle: AI- and data-center-related PPPs should generally be written with shorter concession terms, more frequent technology-refresh and re-tendering provisions, and explicit allocation of obsolescence risk.

It is worth drawing the broader lesson explicitly. The speed with which private capital has mobilized behind AI and data center infrastructure is a reminder that capital itself is rarely the binding constraint on infrastructure investment. The constraint is structural: the connective tissue—local-currency or hedged financing, credible risk allocation, a prepared pipeline of bankable projects—that allows capital to reach the projects that need it. In the advanced economies where most hyperscale investment is concentrated, that tissue largely exists. In the emerging and frontier markets where the infrastructure deficit is most severe, it does not. Closing that gap is less a question of mobilizing new capital than of building the financial structures—foreign-exchange mitigation chief among them—and the pre-development capacity that would let existing capital flow to where it is most needed.

The scale of power demand is the most immediate governance challenge. A single large data center campus can consume as much electricity as a small city. Meeting this demand requires not only generation capacity but transmission infrastructure, grid interconnection, and

⁴⁶ JLL, “Why Data Centers Could Hit Obsolescence Sooner Than You Think” (2024); and Moody's Ratings, “Data Centers: Managing Risk amid a Market Boom” (2024).

regulatory approvals that involve multiple levels of government and utility regulation. PPP structures may be relevant for the power generation component, where long-term power purchase agreements between technology companies and independent generators resemble the contractual frameworks that have worked in other energy PPPs. They are less obviously relevant for the grid infrastructure, which involves natural monopoly characteristics and regulatory oversight that do not map neatly onto concession models.

Water consumption is a second area of concern. Data centers use large volumes of water for cooling, and in regions facing water scarcity, this creates potential conflicts with agricultural, residential, and environmental water needs. The governance frameworks for allocating water resources are typically separate from those governing infrastructure finance, and coordinating between them introduces complexity that traditional PPP procurement processes are not designed to manage.

The technology risk dimension is distinctive. Traditional infrastructure PPPs involve assets with well-understood performance characteristics and long useful lives. Data center technology evolves rapidly, and the computing architecture that drives current demand may change substantially over a 10- to 15-year period, much shorter than a typical infrastructure concession. This rapid technological uncertainty makes long-term contractual commitments riskier for both parties. To mitigate this, AI-related PPPs should explicitly feature shorter contract durations, favoring flexible partnership arrangements over the rigid, multi-decade concession models traditionally used for roads and bridges.

The policy implication is not that PPP frameworks are irrelevant to AI infrastructure but that they need adaptation. The core PPP insight—that long-term contracts can align private incentives with public service delivery when properly structured—applies to data center infrastructure as much as to any other sector. But the specific contract structures, risk allocation approaches, and governance mechanisms need to be designed for the characteristics of this particular investment cycle rather than borrowed uncritically from transportation or social infrastructure templates.

VII. Conclusion

Public-private partnerships are neither inherently superior nor inherently flawed as a mechanism for delivering infrastructure compared to other approaches. They are a governance tool whose effectiveness depends on the institutional conditions in which they operate. The evidence reviewed in this paper supports several conclusions that should inform policy decisions about when and how to use them.

First, the efficiency case for PPPs is real but conditional. The lifecycle incentive that bundling creates is genuine when service quality can be specified, measured, and enforced, and when the contract period is long enough for the savings from better construction to accrue to the party bearing the maintenance obligation. These conditions are more easily met in some sectors than in others, and policymakers should be realistic about where the instrument's comparative advantages apply.

Second, the fiscal risks of PPPs are substantial and require institutional safeguards. The temptation to use PPPs as a mechanism for off-budget spending is strong, particularly in environments with binding fiscal constraints, and the consequences of yielding to that temptation are severe. The UK's PFI experience demonstrates how aggregate PPP commitments can reach hundreds of billions of pounds without delivering demonstrable value for money. Independent fiscal gatekeeping, full lifecycle cost disclosure, and the integration of PPP obligations into debt sustainability analysis are essential.

Third, risk allocation must be realistic rather than aspirational. Assigning risks to the party best positioned to manage them is the correct principle, but applying it requires honest assessment of which risks the private sector can actually bear. Demand risk in infrastructure markets subject to macroeconomic volatility, regulatory change, and long forecast horizons is generally not among them. India's highway program demonstrates both the consequences of misallocating demand risk and the effectiveness of correcting that allocation through the HAM. Availability payment structures that retain demand risk with the public sector while transferring construction, maintenance, and operating risk to the private sector represent the most defensible allocation in most contexts.

Fourth, PPPs function not as bilateral contracts in isolation but within an ecosystem of multilateral institutions, risk-mitigating instruments, and diverse capital providers. The participation of multilateral development banks as lenders, guarantors, and technical advisors; the availability of political risk insurance through MIGA and analogous agencies; and the presence of currency hedging facilities for emerging-market transactions all materially affect whether PPP projects can be structured, financed, and sustained. Developing the institutional infrastructure for this ecosystem is as important as developing the physical infrastructure it supports.

Fifth, contract management capacity is at least as important as contract design. The most carefully designed PPP will underperform if the public sector lacks the sustained institutional capacity to monitor, enforce, and adapt the contract over its full life. Building and maintaining this capacity requires dedicated investment that is easily deferred but ultimately determines program outcomes.

The emerging challenge of AI and data center infrastructure will test these principles in a new context, with different risk profiles, shorter technology cycles, and more urgent timelines. The principles themselves—honest appraisal, realistic risk allocation, fiscal transparency, institutional capacity, and multilateral risk-sharing—remain the right foundation for governance. The task is to apply them with the flexibility and speed that the current investment cycle demands.

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