FROMEQUATIONSTOCAPITAL·WORKINGPAPER07

Infrastructure Finance Risk Sharing Framework

Mourad E. Mazouni, PhD, PMP

From Equations to Capital Research

February 2026 | Source: Volume I, Infrastructure Finance

ABSTRACT

A framework for funded and unfunded risk participation in infrastructure finance and policy-aligned capital formation. The paper decomposes risk sharing across construction, operation, and refinancing phases, with explicit governance mapping for institutional allocators evaluating public-private partnership opportunities. Risk transfer pricing reflects expected loss, the liquidity premium for long-dated illiquid participation, and the governance cost of monitoring complex contractual structures.

Keywords: Infrastructure Finance · PPP Structures · Risk Allocation · Project Finance · Concessions

Table of Contents

Abstract

A framework for funded and unfunded risk participation in infrastructure finance and policy-aligned capital formation. The paper decomposes risk sharing across construction, operation, and refinancing phases, with explicit governance mapping for institutional allocators evaluating public-private partnership opportunities. Risk transfer pricing reflects expected loss, the liquidity premium for long-dated illiquid participation, and the governance cost of monitoring complex contractual structures.

SECTION 1

Executive Insight

Infrastructure investment requires mobilizing institutional capital for long-lived, illiquid projects. The structural mismatch between infrastructure project lifecycles (20-50 years) and institutional investment horizons (3-10 years for performance measurement) creates a risk allocation problem that cannot be solved by standard financial instruments alone.

This framework decomposes infrastructure investment into distinct risk phases: construction, ramp-up, steady-state operation, and refinancing. Each phase has different risk characteristics and different optimal risk-bearing parties. The phase-based decomposition enables allocators to select risk exposures matching their governance capacity and liability profile.

SECTION 2

Risk Decomposition by Phase

Infrastructure risk is decomposed into five primary categories: construction risk (cost overruns, schedule delays), operational risk (O&M; performance, technology), demand risk (usage volumes, revenue uncertainty), regulatory risk (tariff changes, permit stability), and refinancing risk (interest rate, credit spread, rollover).

Each risk type maps to different risk-sharing instruments: performance guarantees, first-loss tranches, minimum revenue guarantees, regulatory put options, and interest rate hedging structures. The

framework provides pricing anchors for each instrument based on actuarial loss data from comparable projects.

Risk transfer pricing must reflect expected loss, the liquidity premium for long-dated illiquid participation, and the governance cost of monitoring complex contractual structures. Institutional allocators require transparent risk budgets that separate project economics from financing structure economics.

SECTION 3

Construction Phase Risk Transfer

Construction risk is concentrated in years 1-3 and is optimally transferred to EPC contractors through fixed-price, date-certain contracts with completion guarantees backed by performance bonds. The residual risk retained by equity investors is primarily schedule risk, which is bounded and diversifiable across a portfolio of infrastructure investments.

Key metrics for construction risk assessment: cost overrun rates by sector (transport 20-45%, energy 10-25%, social infrastructure 5-15%), schedule delay distributions, and political force majeure probabilities. Historical data from the Global Infrastructure Hub provides calibration for each metric.

SECTION 4

Demand and Revenue Risk

Demand risk is long-dated and partially hedgeable through minimum revenue guarantees from the concession authority. The guarantee pricing reflects the public sector's comparative advantage in bearing demand risk: the government captures tax revenue from economic activity generated by the infrastructure, partially offsetting guarantee payments during low-demand states.

For toll roads, demand risk follows a characteristic lifecycle: initial ramp-up (years 1-5) with high uncertainty, stabilization (years 5-15), and mature operation (years 15+) with traffic volumes tracking GDP growth. Revenue guarantees should be structured to cover the ramp-up phase where demand uncertainty is greatest and institutional investors are most price-sensitive.

SECTION 5

Risk Allocation Matrix

The framework produces a risk allocation matrix mapping each risk type to the party best equipped to bear it, with explicit pricing anchors. Construction risk: EPC contractor (performance bonds, liquidated damages). Demand ramp-up risk: public sector (minimum revenue guarantee). Steady-state demand risk: equity investors (residual claimant). Refinancing risk: shared between debt providers and sponsors (interest rate hedging, step-up mechanisms).

This matrix serves as both a structuring tool for project finance teams and an evaluation framework for institutional investment committees. The explicit mapping prevents the common failure mode of undefined risk allocation in bilateral concession agreements.

SECTION 6

Regulatory and Political Risk

Regulatory risk, particularly tariff adjustment mechanisms and permit stability, represents the most challenging risk category for institutional investors. Unlike construction and demand risk, regulatory risk

is driven by political processes that resist probabilistic modeling.

The framework addresses regulatory risk through contractual mechanisms: tariff indexation formulas, regulatory put options (at pre-agreed multiples of invested capital), bilateral investment treaty protections, and political risk insurance from multilateral agencies (MIGA, OPIC). These mechanisms do not eliminate regulatory risk but transform it into quantifiable, priceable parameters.

SECTION 7

Institutional Implications

For institutional allocators: the phase-based decomposition allows selective participation in the risk phases that match the institution's governance capacity. Pension funds with long-dated liabilities are natural holders of steady-state operational risk; construction risk is better suited to specialist infrastructure funds with project management expertise.

For policy makers: targeted risk sharing, rather than blanket guarantees, mobilizes institutional capital while preserving fiscal discipline. Risk quantification and transparent pricing are prerequisites for efficient public-private risk sharing. Without these, guarantee programs tend toward adverse selection and fiscal risk accumulation that undermines political support for infrastructure programs.

SECTION 8

Methodology and Citations

Risk decomposition follows the framework established by the Global Infrastructure Hub and the OECD Principles for Public Governance of PPPs. Demand risk modeling uses the traffic forecasting methodology of the UK National Infrastructure Commission. Political risk pricing benchmarks from MIGA and regional development banks.

The framework integrates project finance structuring principles from Yescombe (Public-Private Partnerships, Butterworth-Heinemann) with institutional allocation principles from CEM Benchmarking and the EDHEC Infrastructure Institute.

From Equations to Capital

A Two-Volume Professional System

The definitive professional system bridging quantitative methods and capital markets. 27 chapters spanning corporate finance, derivatives, risk management, and portfolio optimization.

equationstocapital.com

Working Paper 07 · February 2026