

Risk Valuation and Allocation For Public-Private Partnerships (P3s)

The use of Public-Private Partnerships (P3s) marks a shift away from traditional ways of procuring and financing highway projects. Under the P3 model, a private partner participates in a long-term contract involving some combination of design, construction, financing, operations, and maintenance, including collection of toll revenues.

Under traditional public procurement of highway projects, the public agency retains most of the risks. Yet these risks are not usually quantified, nor are their costs always included in the project cost estimates. A key component of P3 procurement involves the sharing or transfer of certain risks from the public agency procuring the project to the private sector partner. The concept of “transferring risk” requires that the private partner be responsible for cost overruns or expenses associated with the occurrence of that risk.

Risk transfer can include, among others, construction risk (i.e., risk that the project will not be completed on time or on budget), usage or traffic demand risk (i.e., risk of lower than expected revenues from users of the project) and operation and maintenance (O&M) risk. For example, if the public agency transfers O&M risk to the private sector partner, then any unexpected O&M cost increases will be borne by the private sector partner.

In planning for and developing P3 projects, a risk register is often prepared in advance, with public officials choosing among three options for each risk:

- Retain the risk, attempt to mitigate it and/or insure against it
- Transfer the risk to the private sector partner; or
- Share the risk with the private partner

In choosing among these options, the public agency values each risk, and then evaluates which partner is better able to control the likelihood of the risk occurring or its impact if it does occur, or to absorb the risk at the lowest cost if its likelihood and impact cannot be controlled.



Risk Identification and Valuation

Risks are often identified and assessed through a series of workshops used to develop a project risk register. The risk register may include a quantitative estimate of the potential financial cost or “risk premium” based on the consequence and likelihood of a risk being realized. Risk valuation is conducted to quantify risks in terms of both cost and time impact using either formula-based analysis or Monte Carlo simulation.

Formula-based analysis uses a simple formula to calculate average risk impact using minimum, maximum, and most likely cost and schedule impacts. For example, the following formula is used by the Virginia Department of Transportation (VDOT) to calculate the risk value of each individual risk:

$$\text{Risk Value} = \text{Probability of occurrence} \times (\text{Min. cost} + \text{Max. cost} + 4 \times \text{Most likely cost}) / 6$$

Monte Carlo simulation uses specialized software for simulation of the expected cost and schedule impacts of each risk to get a range of aggregate risk values that the agency may choose from, depending on what confidence threshold is required. This is not possible with a formula-based analysis. The confidence level selected will depend on the stage of assessment, confidence in cost estimates and complexity of the project.





Risk Allocation

Risk allocation is at the core of P3s, which are structured around the sharing of risks (and rewards) between the public agency and private sector entity. It is the transfer of risks that provides incentives to the private entity to innovate in the approach it takes to deliver a project under a P3. Transferring too little risk to the private sector would constrain the “value for money” that could be achieved. Conversely, transferring too much risk (e.g., a risk that the private sector is unable to manage) will result in high-risk premiums, making the project more costly and driving down the value for money. If a risk is difficult to assess or manage, it may be appropriate to share it between the public and private sectors. Table 1 shows how risk allocation commonly differs for P3 projects (i.e., Design-Build-Finance-Operate-Maintain projects) relative to traditional procurement (including Design-Bid-Build and Design-Build).

For further Information: See FHWA's *Risk Assessment for Public-Private Partnerships: A Primer*, available at: <https://www.fhwa.dot.gov/ipd/p3/>

Table 1. Common Risk Allocation Under Traditional and P3 Procurement

Risk	Traditional (Design-Bid-Build)	Design-Build	Design-Build Finance-Operate- Maintain
Change in Scope	Public	Public	Public
NEPA Approvals	Public	Public	Public
Permits	Public	Shared	Private
Right of Way	Public	Public	Shared
Utilities	Public	Shared	Shared
Design	Public	Private	Private
Ground Conditions	Public	Public	Private
Hazmat	Public	Public	Shared
Construction	Private	Private	Private
QA / QC	Public	Shared	Private
Security	Public	Public	Shared
Final Acceptance	Public	Private	Private
O&M	Public	Public	Private
Financing	Public	Public	Private
Force Majeure	Public	Shared	Shared

Source: Virginia DOT's PPTA Risk Analysis Guidance, September 2011

Program Areas of the FHWA Center for Innovative Finance Support

The FHWA Center for Innovative Finance Support is a one-stop clearinghouse for expertise, guidance, research, decision tools, and publications on highway program delivery innovations. Our website, workshops, and myriad resources support transportation professionals in the use of innovative approaches for delivery of highway projects.

Public Private Partnerships (P3s)

The FHWA Center for Innovative Finance Support's P3 program focuses on resources and capacity building for consideration and use of design-build-finance-operate-maintain (DBFOM) concessions funded through tolls or availability payments.

Alternative Project Delivery

The FHWA Center for Innovative Finance Support's Alternative Project Delivery program provides information on contractual arrangements that allow for greater private participation in infrastructure development by transferring risk and responsibility from public project sponsors to private sector engineers, contractors and investors.

Project Finance

The FHWA Center for Innovative Finance Support's Project Finance program focuses on alternative financing, including State Infrastructure Banks (SIBs), Grant Anticipation Revenue Vehicles (GARVEEs), and Private Activity Bonds (PABs).

Tolling and Pricing

The FHWA Center for Innovative Finance Support's Federal Tolling and Pricing program focuses on the use of tolling and other road user charges as a revenue source to fund highway improvements, and the use of variably-priced tolls as a tool to manage congestion.

Value Capture

The FHWA Center for Innovative Finance Support's Value Capture program explores strategies for tapping into the added value that transportation improvements bring to nearby properties as a means to provide new funding for surface transportation improvements.