

Primary Credit Analyst:

Robert Bain CEng MICE
London
(44) 20-7176-3520
robert_bain@
standardandpoors.com

Secondary Credit Analyst:

Jan Willem Plantagie
Frankfurt
(49) 69-33-999-132
jan_plantagie@
standardandpoors.com

Additional Contact: Infrastructure
Finance Ratings Europe
InfrastructureEurope@
standardandpoors.com

The Anatomy Of Construction Risk: Lessons From A Millennium Of PPP Experience

Although public-private partnerships (PPP) are widely acknowledged to have a better record of asset delivery than conventional approaches to public-sector procurement, a major survey of construction risk by Standard & Poor's Ratings Services suggests that their successful delivery remains dependent on a number of critical prerequisites. The survey indicates that, absent these prerequisites, the construction-phase performance differential between PPPs and conventional procurement methods can narrow considerably.

PPPs are increasingly employed globally for the procurement of essential public-sector infrastructure assets. Financing needs are dominated by substantial upfront capital-expenditure requirements for asset refurbishment, enhancement, extension, or new build. The attendant multiyear construction works programs are often the most challenging stage in any PPP project's life cycle. There is, however, limited published empirical evidence from which lenders can gauge the true nature, extent, and prevalence of construction risk associated with PPPs. Accordingly, late in 2006, Standard & Poor's launched the PPP construction risk survey to begin to address this.

The survey drew 161 responses from bankers, construction contractors, procuring agencies, technical and financial advisors, insurers, and project companies. Reflecting the global nature of PPPs, survey responses were received from market participants in 22 countries. On average, respondents reported between six and seven years' experience of PPP projects—representing an aggregate experience base of nearly 1,000 years.

This article presents the initial survey results of our PPP construction-risk research.

A key output of the construction-risk survey is the first version of Standard & Poor's PPP Construction Risk Index (see "Enhancing Credit Quality Analysis: the Construction Risk Index," below). The Index is an empirically-derived template, against which lenders and their technical advisors can map PPP projects and their associated risk mitigants and

Publication Date

April 5, 2007

contractual protections, in order to identify potential areas of residual PPP construction-risk exposure.

Project Characteristics And Political Concerns Dominate The Agenda

Risk cuts across asset classes

Although PPPs are generally acknowledged as more effective at asset delivery than conventional procurement methods, survey respondents indicate that exposure to construction risk remains highly contingent on the specific characteristics of a project, its contractual provisions, and its associated transaction structuring. Critically, market experience suggests that, in the absence of a number of the elements outlined below, the performance gap between PPPs and alternative procurement approaches narrows considerably.

Assessments of credit quality based simply on the “acceptability” of certain asset classes (conventionally regarded as being at the conservative end of the credit-risk spectrum), and the “unacceptability” of others, are not supported by our findings. Indeed, market experience suggests weak, if any, correlation between investor exposure to construction risk and the type of project to be financed. Rather, respondents look to the particular attributes of a construction mandate, and the specific contexts of works that have previously exposed lenders to PPP construction risk. Many of these attributes cut across all asset classes.

Public-sector shortcomings and political risk cited as key concerns

Construction risk typically finds expression in a departure from expectations about the outturn cost of works, their specification, or associated schedule. Survey respondents were asked to identify the main reasons behind such departures from expectations.

Major failures by private sector partners are often headline grabbing in this regard, and they certainly feature in our survey responses. However, by far the most frequently reported cause of distress affecting PPP construction works relates to the inexperience, lack of commitment, lack of engagement, bureaucracy, and interference of public-sector project participants; and associated scope changes and enforced delays. It is reported that “partnership” is not always the spirit with which the public sector enters these long-term, collaborative contracting arrangements. The survey responses indicate that PPP lenders should continue to pay close attention to political risk.

Survey Scope And Objectives

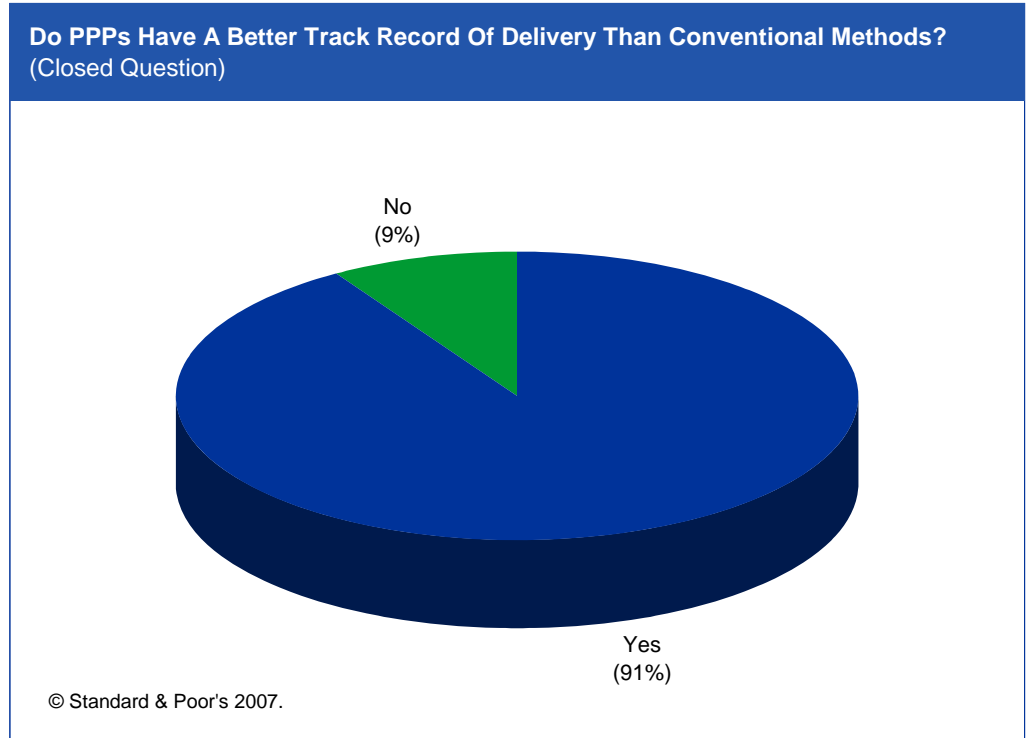
Our survey asked respondents to provide information based on their general experience of PPPs, and additionally asked a series of more detailed questions about specific PPP projects known to them. In this article, we focus on general PPP experience. Our general questions covered three main, related areas of interest:

- What is the experience of PPP project delivery?
- In terms of delivery, are some asset classes more reliable than others?
- What are the main reasons behind construction phase distress?

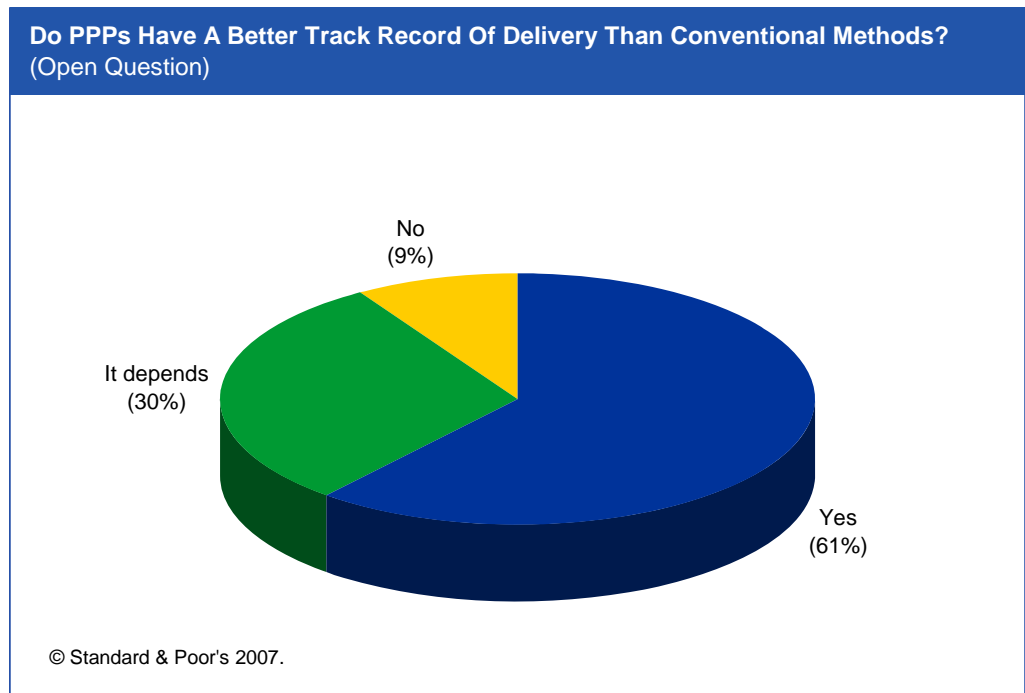
Each of these questions is now considered in turn.

Construction-Phase Delivery: PPP Finds Favor Over Conventional Procurement, But Concerns Remain

Survey respondents were asked if PPPs had a better track record of delivery than conventional public-sector procurement methods. When constrained to answering either “yes” or “no”, more than 90% responded affirmatively (see chart 1).



However, a significant number of those surveyed qualified their answer to this question—many stating that PPPs’ comparative success depends on wider considerations. When contingent qualifications such as “it depends...” are factored in, the results look somewhat different (see chart 2).



PPP's relative superiority depends on a number of factors

One-third of respondents whose experience suggests that PPPs have a better track record of delivery qualified this assertion—stressing that the comparative success of PPPs depends on:

- Adequate and accurate definition of the technical solution required;
- Adequate and accurate definition of contractual obligations, responsibilities, and risk allocation;
- Appropriate equity commitment, performance incentives, and penalty regimes;
- The objectives, commitment, engagement, experience, and sophistication of the public-sector partner or partners;
- Adequate protection against political interference and current position in the election cycle;
- The experience and capacity of the private-sector partners;
- The quality of project management and the extent of day-to-day, hands-on project supervision;
- The limitation of scope for claims and changes, and contractual clarity regarding the processes for accommodating change orders and variations;
- The implementation of policies and practices to avoid extended negotiations;
- The efficiency of existing public-sector procurement practices; and
- The caliber of the individuals involved.

Several qualifications underscored the fact that this question was asked in a relative context (Are PPPs better than conventional procurement?). Generally, respondents pointed to particularly poor experience with conventional public-sector procurement practices in terms of timely project delivery within budget and to specification. In this context, PPPs are reported to perform very well.

On the other hand, some respondents benchmarked PPP performance against already efficient international public-sector procurement processes, incorporating stringent performance standards and penalty regimes. In this regard, PPPs are reported to perform less well, or to offer equivalent performance.

A general note of caution is sounded by a couple of respondents who replied that it was too soon to say whether PPPs offer a better track record of delivery than conventional approaches. This reflects an important limitation of any PPP research—namely that PPPs are a relatively recent development. Globally, many PPP projects remain in the planning or construction phase. Furthermore, most of those postconstruction are only in their earliest years of operations, when the assets are still new (possibly still in their warranty or latent defects periods) and there is limited visibility of whole-life experiences and costs.

Finally, in response to this question, a number of those surveyed identify—and in some cases name—individuals that have contributed to the success of PPPs; principally through their project management and leadership skills. This appears to be overlooked or commonly given a low ranking in most analyses of construction risk. Knowing more about key personnel, their background, experience, involvement, and certainty of retention, would appear to offer potential for better understanding and containing construction risk.

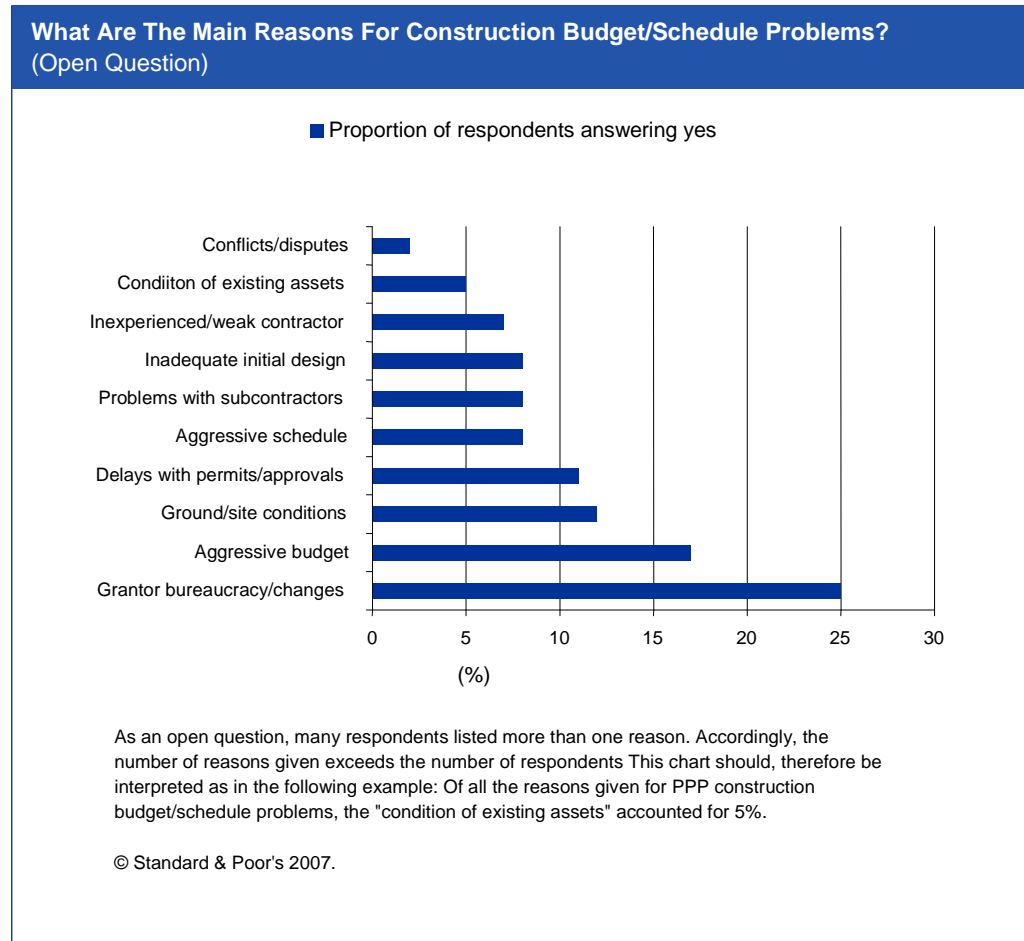
Are Some Asset Classes Better than Others?

Our survey asked respondents to identify the type of PPP project most likely to encounter construction-related budgetary or scheduling distress. Our expectation was that specific asset classes would be identified as more or less exposed to risks through this question. Asset-specific responses were, however, the exception. Although a number of those surveyed specifically mentioned IT projects, subsurface and demolition works (especially those with an asbestos presence), and refurbishment and renovation projects, most respondents failed to identify any correlation between asset class and construction-risk exposure. In fact, most respondents either inferred or stated that, in their experience, there was little correlation between asset class and construction risk. Rather, respondents focused on the nature of the construction obligation itself. A number of recurring themes arose in the survey returns, highlighting key areas of concern. These were:

- New, untested or unproven technologies, technical standards, and process innovation;
- Poor performance definitions that are open to interpretation;
- Very large, complex, specialized, or highly technical requirements with a lengthy construction phase;
- Changing legislative, regulatory, and best-practice environments;
- Aggressive scheduling with little contingency, often to meet politically sensitive deadlines (for example, hosting a high-profile international sports event);
- Limited or late detailed design;
- Multisite construction programs on operational sites with access constraints, especially those in densely-developed urban areas with decant requirements;
- Long, linear—rather than concentrated—construction sites, such as new-build tramways;
- Weak or inexperienced contractors (especially if there is limited contractor default protection);
- Heavy reliance on skilled trades or specialist subcontractors, or specific materials with supply chain uncertainties;
- Limited due diligence, understanding of ground conditions or investigative works, and legacy issues related to existing assets;
- Multiparty interfaces—especially if these rely on cooperation and goodwill;
- Incomplete expropriation, permits, approvals, consents or licences; and
- Complex project phasing and subphase interrelationships, dependencies and constraints.

Main Reasons for Construction Budget And Schedule Problems

Respondents were asked to draw from their PPP-related experience and list the main reasons they had encountered for problems with construction budgets and schedules. The top ten responses are presented in chart 3.



Conflicts and disputes

It is, perhaps, unsurprising to find conflicts and disputes at the bottom of the top ten. Conflicts and disputes—particularly those relating to claims—have traditionally been endemic in public-sector procurement, and experience indicates that contractors have used them as a major contributor to profitability. PPPs were developed specifically to design-out the potential for claim-related cost escalation through refocused risk allocation, tight legal terms, and contractual clarity regarding change orders and variations. According to market participants, this appears to be working. The incentive for contractors to complete has replaced the incentive to claim.

Condition of existing assets

A number of PPP projects bundle new-build obligations with operational and maintenance responsibilities for existing assets. Inadequate due diligence or investigative works—often blamed on unrealistically tight public-sector timescales—was frequently cited by respondents as the cause of defects going unidentified, overestimation of the remaining life of existing assets, or underestimation of their maintenance requirements and costs.

Inexperienced or weak contractors

Weak construction contractors are mentioned by a number of our survey respondents, although they remain toward the bottom of the top ten. Comments suggest that this is because the scale of most PPP projects limits participation to the larger, more established firms in a sector; because company capabilities and their financial standing are subjected to multiparty scrutiny; and because a number of contractors have actively sought a foothold in the PPP sector and have reputational issues at stake.

Survey respondents linked contractor-related problems to:

- A focus on short-term construction profits (at the expense of long-term project commitment),
- Inadequate incentives (limited penalties or equity participation),
- Optimism in terms of unfamiliar work, sectors or jurisdictions,
- Poor project and/or subcontractor management,
- Inappropriate risk allocation, and
- Bad labor relations.

A number of those surveyed state that they had little insight into a contractor's responsibilities beyond the PPP project until external workflow commitments started to affect the contractor's performance.

Contractor replaceability was a key concern for many respondents, a number of whom sought adequate contractor default protection provisions and project liquidity to enable them to replace a failing construction contractor at a cost premium.

Inadequate initial design

Our survey responses suggest a negative correlation between the extent of detailed design work completed by financial close and subsequent project exposure to variations and cost overruns.

The amount of upfront design is reported to vary significantly between projects, ranging in scope from conceptual drawings with ill-defined technical specifications through to detailed final design (1:50 plans).

The survey results indicate that the potential for inadequate initial design to affect the delivery and operation of projects is exacerbated by the life-cycle design philosophy central to PPPs—a philosophy that seeks to integrate design, build, and operations; ideally with the operator or facilities-management contractor involved from the outset. Additional detail provided by some respondents suggests that inadequate design symptomizes the existence of a public sector that fails to understand PPPs, or that regards conventional design and build contracts as sufficient to achieve the wider risk transfer and long-term partnership objectives of PPPs.

Problems with subcontractors

Survey respondents cite subcontractor issues as more common causes for construction-phase distress than problems with the main construction contractors. This is noteworthy as, in our experience, independent assessments of construction risk often focus on the primary contractors and stop short of any detailed evaluation of subcontractors and their subcontracts.

Subcontractor-related issues raised by survey respondents include replaceability concerns (particularly for specialist subcontractors from a limited pool of expertise, or those working in highly competitive markets attracting premium rates); dispute potential between the primary contractor and their subcontractors, or between subcontractors; and the sheer number of

subcontractors used by some primary contractors causing problems with project management and works coordination.

Aggressive scheduling

Tight works programing with aggressive milestones, delivery, or long-stop dates, is highlighted in a number of survey responses as a key reason for construction-phase distress. Respondents were wary of aggressive scheduling on projects where site access is constrained (limited to certain times of the day or months of the year) or restricted by, for example, weather or tidal conditions—absent relief from contractual performance. Politically-driven (or sensitive) timescales with little contingency or “float” are a particular concern among those surveyed.

Delays with permits and approvals

More than 10% of the reasons cited by respondents as causing construction-phase problems relate to delays with outstanding permits, approvals, consents, and licences. Several respondents warned that public-sector reassurances at financial close that these would be quickly secured should not be relied upon.

Particular circumstances reported as having caused delays include allocating responsibility for securing permits and approvals to private-sector partners and the involvement of multiple tiers of government or numerous statutory agencies or third parties in the granting of permits—particularly where there is no legal or commercial incentive for those parties to act. Respondents specifically noted that the issuing of permits typically takes longer than any desk-top study of the law in a particular jurisdiction would suggest.

Site conditions

Unforeseen ground conditions are a key reason cited for construction delays. Some respondents pointed to circumstances under which preliminary subsurface investigations were rushed or incomplete, or where poor location of bore holes and trial pits resulted in deficient soil or rock sampling. Others highlighted the fact that, as geologic investigative techniques rely on sampling, the possibility for different ground conditions to be present between exploratory points always exists. In such cases—as with unexpected archaeological or mining discoveries—respondents were keen to emphasize that these risks should remain entirely with the public sector or should, at least, be shared between the private- and public-sector partners.

Aggressive budgeting

Given competitive tendering, it is perhaps unsurprising that so many survey respondents identified aggressive budgeting as a key reason for construction-phase distress. Comments about insufficient liquidity, reserves, and contingency funds; and an inability to absorb (sometimes relatively minor) cost overruns were frequently noted in the survey responses.

A number of respondents point to the fact that the public sector remains fixated with lowest price, and that—given affordability pressures—it takes a strong, sophisticated, and politically courageous grantor to identify and eliminate potentially winning bids that have been strategically underpriced. In the absence of benchmarking against observed cost ranges, it seems that bid-evaluation criteria that consistently and transparently score value above price could be an important contributor to the subsequent credit quality of a PPP project.

Grantor bureaucracy and changes

Nearly 25% of all responses about the causes of construction-phase problems for PPP projects identified public-sector partners, either directly or indirectly. Many respondents went to some length—with illustrative examples—to point out that their comments were not restricted to countries new to PPPs or to sovereign counterparties with lower credit quality.

Examples of ways in which the public sector had frustrated the construction of PPP projects can be summarized under a number of key headings:

Capability.

The client does not possess the experience, technical skills, or resources to manage the public-sector obligations associated with a long-term, active partnership with private-sector providers.

Legacy.

The client tries to manage PPPs as they have previously managed conventional design and build contracts, including using amended design and build contracts, in an adversarial, “them-and-us” environment.

Preparation.

The client fails to define a clear output specification, to complete enabling works, to secure land, or to grant permits or approvals.

Expectations.

The public sector client’s expectations of who is responsible for what, and what has to be delivered (by when) fail to match the private sector’s understanding.

Process.

The client fails to establish streamlined, transparent procedures for day-to-day liaison with its private-sector partners. Bureaucracy is slow and resistant, and projects are dogged by extended negotiation periods and delays in achieving sign off.

Oversight.

Existing deficiencies in the client’s project supervision and control procedures will not be cured, absent any other changes, simply by moving from traditional procurement methods to PPPs.

Change.

The client pushes for scope or specification changes, or variations, with limited regard for cost or time implications, or in the absence of contractual clarity about how such changes should be accommodated.

Importantly, it is clear from the survey results that a number of PPP problems stem from incomplete public-sector “buy-in” to the very concept of PPPs. Practical examples reported included situations where:

- A political champion is promoting PPPs, with limited support from colleagues in their own political party;
- A government department is promoting PPPs, with limited support from its sister departments or other tiers of government;
- A municipality is promoting PPPs, with limited support from neighboring municipalities;
- A political party is promoting PPPs, with limited support (or, indeed, outright hostility) from opposition parties;
- Politicians are promoting PPPs, with limited support or considerable skepticism from civil servants.

The survey results appear to reinforce the notion that the large scale and highly visible, essential public-service nature of most PPP projects makes them easy targets for factions with explicit or

implicit political agendas, that may be hostile to the concept of private-sector participation in public-sector infrastructure projects.

Given the long-term nature of the contractual relationship, which will likely span a number of administrations with different decision-makers, strong, cross-party support and engagement; and professional, non-politicized client-side management were identified by many survey respondents as important mitigants of political risk.

Enhancing Credit Quality Analysis: the Construction Risk Index

A key output from our first-cut PPP construction risk results is the derivation of Standard & Poor’s PPP Construction Risk Index (version 1.0). This version is based upon the results from our survey which, in turn, draw upon the practical experience of many seasoned market participants.

The Construction Risk Index presented here is an empirically-derived template against which lenders and/or their technical advisors can map PPP projects and their associated risk mitigants and contractual protections. This enables potential areas of residual construction-risk exposure to be highlighted when evaluating credit quality, and allows for focused consideration of further risk prevention, reduction, transference, acceptance, or contingency. Subsequent versions of the Index will evolve as we advance our PPP construction-risk research initiative.

Our Construction Risk Index register (version 1.0) is presented below. It reflects the risks identified by our PPP research to date. We are aware that in the structured world of project finance, senior creditors may be insulated from a number of these “raw” risks. The purpose of the index is to identify construction risks acknowledged to have caused problems in the past—such that the particular structural provisions and contractual protections associated with specific transactions can then be overlaid, thereby highlighting creditors’ residual construction-risk exposure. It represents a consistent, logical, and evidence-based method for identifying PPP construction-risk exposure. The Index will be extended and fine tuned as our PPP-related research program rolls forward.

PPP Construction Risk Index; Version 1.0		
Risk Category	Risk Assessment	
	Low risk	High risk
Project preparations		
Expropriation	Complete	Outstanding
Design	Detailed	Conceptual
Permits/consents	Granted in full	Granted in part
Investigations/site sampling	Rigorous	Partial
Project characteristics		
Construction challenge	Uncomplicated	Complex/highly technical
Construction skills	Standard civil engineering	Specialist engineering
Construction materials	Readily available	Supply-chain constraints
Construction scale	Small	Large
Construction duration	Short	Long
Construction technology	Proven	Innovative
Construction location	Greenfield	Brownfield (busy/operational)
Construction site	Contained	Long, linear
Number of sites	Single	Many
Site access constraints	None	Many constraints/limitations

PPP Construction Risk Index; Version 1.0 (cont. 'd)		
Risk Category	Risk Assessment	
	Low risk	High risk
Existing asset condition	Fully understood	Partially/not understood
Interfaces	Few/none	Multiparty interfaces
Works phasing	Simple/no interdependencies	Many interdependencies
Construction budget	Observed range/sufficient float	Aggressive
Concession agreement		
Technical solution	Clear	Unclear
Performance requirements	Clear	Unclear
Risk allocation	Standard	Unique/unclear
Schedule	Sufficient float/no long stop	Aggressive
Deadline	None	Fixed by asset-use requirements
Performance incentives	Strong	Weak
Variation/change procedure	Clear	Unclear
Private sector		
Experience	Highly experienced	Inexperienced
Capacity	Sufficient	Limited
Project management	Strong	Weak
Commitment	Long-term focus	Short-term focus
Personnel	Broad skills base	Reliance on key personnel
Financial standing	Strong	Weak
Contractor replacement	Straightforward	Complicated/restricted scope
Project importance (reputation)	High/strategically important	Low
Subcontractors	Few/standard	Many/specialist
Public sector		
Experience	Highly experienced	Inexperienced
Commitment	Strong	Questionable
Engagement	Active	Hands-off
Project management	Strong	Weak
Supervision	Active	Minimal
Personnel	Broad skills base	Reliance on key personnel
Practices/procedures	Simple/streamlined	Complex/ill-defined
Political/regulatory risk		
Support	Broad, cross-party	Limited
Elections	Past	Upcoming
Protestors	Uncontroversial project	Controversial project
Legal/regulatory framework	Stable	Evolving

Practical application of the Construction Risk Index requires the evidence-based risk register to be expanded to allow for transaction-specific mitigants to be incorporated, therefore highlighting any mismatch between the shape and size of the risk and those of the associated mitigant package. The steps are as follows:

- Based on the project characteristics, define a score for each of the risk categories in the Index using the low-risk/high-risk spectrum.
- Identify the transaction mitigants pertaining to each of the risk categories.

- Employ mismatch analysis to determine creditors' residual risks. This may then become the focus for further analysis or negotiation, and can be explicitly factored into any assessment of PPP construction-phase credit quality.

A simplified example follows:

Sample PPP Construction Risk Score Card (Pertaining To Project Preparations)				
Risk category	Risk assessment		Mitigants	Residual risk exposure
	Low Risk	High Risk		
<i>Preparations</i>				
Expropriation	complete	outstanding	Relief event	None
Design	detailed	conceptual	95% complete	Negligible
Permits/consents	granted in full	granted in part	Few permits granted so far	Significant
Investigations	rigorous	partial	Further bores to be drilled.	Developing

© Standard & Poor's 2007.

Survey Methodology

In September 2006, Standard & Poor's initiated original, evidence-based research into the specific construction risks associated with PPPs. A Web-based questionnaire was selected as our primary survey instrument, in view of its global reach, convenience for survey respondents, and a successful pilot survey. Internal privacy and e-mail policies required us to promote the research (through national and specialist press) and have market participants register their interest with us by completing a short, screening survey.

By February 2007, we had received 319 expressions of interest from bankers, construction contractors, financial advisors, insurers, institutional investors, procuring agencies, project companies and technical advisors, all with PPP sector experience.

Response rate

Links to our Web-based survey were forwarded to the 319 registered market participants. By late March 2007, we had received 161 valid responses (a response rate of 50%). The average exposure of the participants to PPP projects was 6 years-7 years. Responses were received from participants in 22 countries; mainly in Europe but also representing the U.S., Canada, Latin America, Africa, and the Asia-Pacific region (mainly Australia).

Published by Standard & Poor's, a Division of The McGraw-Hill Companies, Inc. Executive offices: 1221 Avenue of the Americas, New York, NY 10020. Editorial offices: 55 Water Street, New York, NY 10041. Subscriber services: (1) 212-438-7280. Copyright 2007 by The McGraw-Hill Companies, Inc. Reproduction in whole or in part prohibited except by permission. All rights reserved. Information has been obtained by Standard & Poor's from sources believed to be reliable. However, because of the possibility of human or mechanical error by our sources, Standard & Poor's or others, Standard & Poor's does not guarantee the accuracy, adequacy, or completeness of any information and is not responsible for any errors or omissions or the result obtained from the use of such information. Ratings are statements of opinion, not statements of fact or recommendations to buy, hold, or sell any securities.

Standard & Poor's uses billing and contact data collected from subscribers for billing and order fulfillment purposes, and occasionally to inform subscribers about products or services from Standard & Poor's, our parent, The McGraw-Hill Companies, and reputable third parties that may be of interest to them. All subscriber billing and contact data collected is stored in a secure database in the U.S. and access is limited to authorized persons. If you would prefer not to have your information used as outlined in this notice, if you wish to review your information for accuracy, or for more information on our privacy practices, please call us at (1) 212-438-7280 or write us at: privacy@standardandpoors.com. For more information about The McGraw-Hill Companies Privacy Policy please visit www.mcgraw-hill.com/privacy.html.

Analytic services provided by Standard & Poor's Ratings Services ("Ratings Services") are the result of separate activities designed to preserve the independence and objectivity of ratings opinions. Credit ratings issued by Ratings Services are solely statements of opinion and not statements of fact or recommendations to purchase, hold, or sell any securities or make any other investment decisions. Accordingly, any user of credit ratings issued by Ratings Services should not rely on any such ratings or other opinion issued by Ratings Services in making any investment decision. Ratings are based on information received by Ratings Services. Other divisions of Standard & Poor's may have information that is not available to Ratings Services. Standard & Poor's has established policies and procedures to maintain the confidentiality of non-public information received during the ratings process.

Ratings Services receives compensation for its ratings. Such compensation is normally paid either by the issuers of such securities or by the underwriters participating in the distribution thereof. The fees generally vary from US\$2,000 to over US\$1,500,000. While Standard & Poor's reserves the right to disseminate the rating, it receives no payment for doing so, except for subscriptions to its publications.