

## SECTOR IN-DEPTH

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## Infrastructure and Project Finance – Global

# Public-private partnerships are resilient to a wide range of construction problems

Of the more than 100 availability payment public-private partnerships (PPPs) that we have rated globally over the last two decades, just over 80 have completed construction and entered the operating phase. We derive the following high-level conclusions from the events that have affected projects during their construction phase:

- » **No rated project has defaulted during the construction phase and very few were downgraded.** Of the approximately 80 rated projects that have been completed, only six were downgraded during the construction phase: in half of these cases, the downgrade was not linked to a construction issue.
- » **However, the asset class is not risk-free:** construction issues such as unexpected geological conditions can arise and result in stress for the construction company and ultimately, but more rarely, the project company. For rated projects, around 10 types of issues account for about three quarters of documented difficulties in the construction phase. Many may be either a shared risk with the authority<sup>1</sup> or fully the authority's risk.
- » **Many potential construction risks can be identified upfront but surprises occur,** affecting either the construction company or the project itself.
- » **Very large projects (approximately \$1 billion or more) tend to be more prone to delays and cost overruns than smaller projects.** Of the rated projects that were materially late, several were large projects. In addition, **projects built by construction companies entering a new market tend to be more prone to problems.**
- » **In several problematic cases, the authority worked with the private sector to find a solution for the benefit of the project and its lenders.** However, this is by no means automatic nor timely.
- » **Ultimately, there is evidence that PPPs in construction have a 15%-30% likelihood of being delayed beyond their completion target date.** Nevertheless, construction companies generally pay the required delay liquidated damages and there is evidence they also absorb material construction losses on projects.
- » **The limited credit impact of construction issues underscores the importance of a number of structural and contractual elements in PPPs that protect the project company and its lenders from the impact of most such issues.** They include a clear risk allocation, an adequate price and a schedule that can be accelerated, as well as commitments by the construction company to pay delay liquidated damages.

### How do we define a public-private partnership?

No standard definition of what constitutes a public-private partnership (PPP) exists globally. We define a PPP as a long-term contractual agreement between a public sector governmental entity and a private developer to design, build, finance, operate or maintain an infrastructure asset for a specific period of time. The governmental entity generally maintains ownership of the asset throughout the contract term, but shares long-term rehabilitation and life cycle risks with the private developer. At the end of the contract, the asset often reverts back to the government in the condition the government has specified in the contract.

A PPP project is undertaken by a special purpose vehicle (SPV) that can only engage in the business of the project with a project scope defined in the project agreement. The SPV often raises project finance debt to finance upfront construction works, which is then repaid solely or primarily from the project's cash flow. During the design and construction phases, the public entity may make certain milestone payments contingent on the private entity's progress toward construction completion. Regardless of the asset type, our consideration as to whether a project constitutes a PPP depends solely on the contractual structure established around the SPV and the nature of the project agreement with the governmental entity.

There are three broad types of PPPs: availability payment, demand risk and a hybrid form which has characteristics of both:

- » **Availability payment PPP:** Following construction, the private developer is entitled to payments from the government as long as the contract conditions are fulfilled. Availability payments are sized to cover operating, maintenance, rehabilitation and debt service costs, as well as equity returns while the private entity operates the project. They are not subject to fluctuations in demand and are typically only adjusted for lack of performance or lack of availability of the asset to the public.
- » **Demand-risk PPP or concessions:** Under a concession or demand-risk PPP, the project is largely financed by user fees and the government assumes no or only limited demand risk. This model is often used for toll roads, airports, water, gas and electricity PPPs. Monetizations of existing publicly owned assets under a long-term concession agreement are demand-risk PPPs. A pure user-funded demand-risk PPP does not create a financial obligation for the government owner.
- » **Hybrid PPPs:** PPPs can have characteristics of both an availability payment PPP and a demand-risk PPP. A hybrid PPP can include explicit government obligations such as availability payments or may include contingent obligations such as financial guarantees, termination payments or subsidies if demand falls below certain thresholds. There may be remote contingent obligations such as the risk of contract renegotiations or a takeover of the project in case of default.

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## PPP projects are generally resilient to many issues during construction

While a wide range of issues can arise during the construction of an availability payment PPP, in most cases the consequences for the project company (Project Co) and its lenders are immaterial to very limited. Of the just over 100 PPPs that we either rate or have rated, and for which the ratings were withdrawn but construction was completed at the time of the withdrawal, none<sup>2</sup> have defaulted during construction. However, several have experienced periods of stress and on occasion incurred very material delays.

In the great majority of cases, projects encountering construction issues may have a period with a negative outlook or the ratings can be put on review for downgrade, but the ratings are usually affirmed/confirmed. This reflects the fact that, at the time of the initial rating assignment, we incorporate the likelihood of a delay and/or an issue occurring during construction. We also assess the strength of the mitigating factors if such a delay or event occurs, so that a downgrade should only occur if it appears that the delay and/or issue is materially more problematic than anticipated or if the mitigating factors do not work as expected.

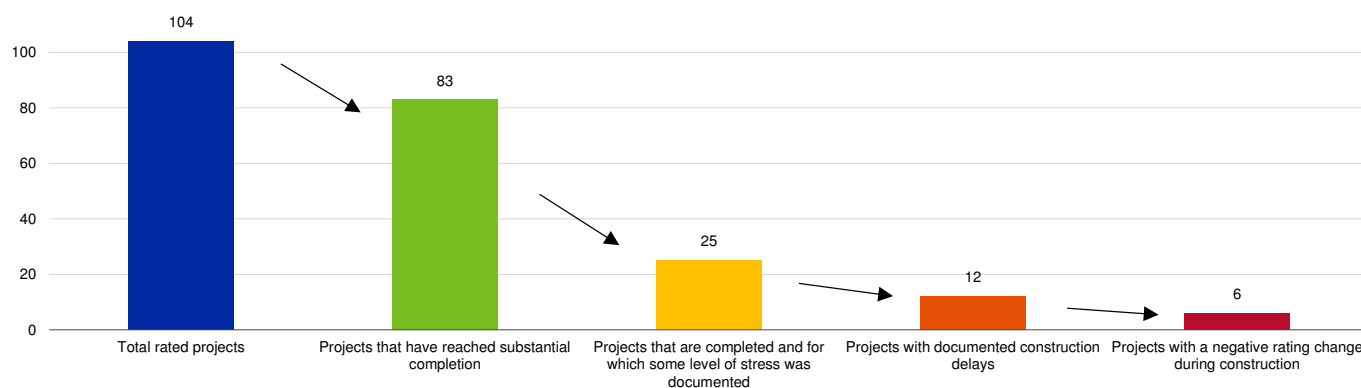
For example, we put [Collectif Sante Montreal S.E.C](#) (Baa2 negative), a large hospital project in Canada, on review for downgrade in August 2016 when it appeared not only that Phase 1 of the project was going to be very late but that the cost overrun was such that, combined with other issues, it resulted in the financial weakening of the construction companies building the project. However, we confirmed the ratings in November 2016 in anticipation of a settlement between the authority and the Project Co that would help resolve various issues.

Exhibit 1 shows that downgrades of rated projects in the construction phase (defined as the period ending with substantial completion) are infrequent, even when there are construction phase issues and delays.

Exhibit 1

### Downgrades of rated projects in the construction phase are infrequent

Number of rated availability payment projects, projects that reached substantial completion, projects that encountered some level of construction stress, projects that had documented delays and projects with a rating downgrade during construction



Source: Moody's Investors Service

### Rating downgrades are not always linked to construction issues

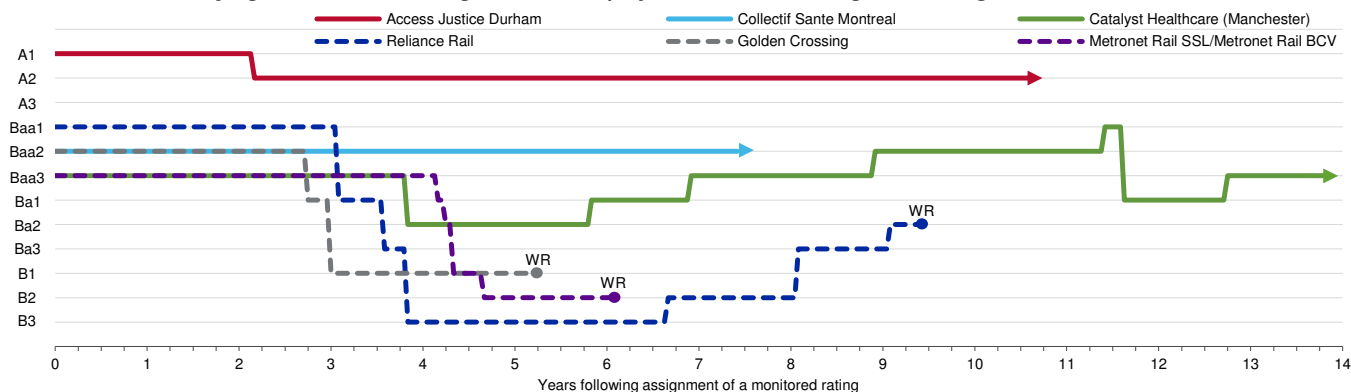
For projects with a public rating, there have been only six instances of rating downgrades during the construction phase (albeit some projects had multiple downgrade events). In three of these instances ([Golden Crossing Finance Inc.](#) (WR), a bridge project in British Columbia, Canada, [Access Justice Durham Ltd.](#) (A2 stable), a courthouse project in Ontario, Canada, and [Catalyst Healthcare \(Manchester\) Financing](#) (Baa3 negative), a hospital project in the UK), the downgrade was not connected to construction issues but rather issues related to taxation (Access Justice Durham), financial structure and possible liquidity risk (Golden Crossing) and performance on components of the project that were operated during construction (Catalyst).

In the case of [Reliance Rail Finance Pty Ltd.](#) (WR), a rail project in Australia, the downgrades reflected fundamental construction and performance issues, but more importantly a heightened risk of a funding shortfall triggered by the demise of the monoline insurance companies that had wrapped the debt issued by Reliance. Similarly, for [Metronet Rail SSL Finance Plc](#) (WR) and [Metronet Rail BCV Finance Plc](#) (WR), two public transit refurbishment projects in London, UK, while the projects were complex and there were performance issues, there was also a heightened risk of a funding shortfall.

Exhibit 2 shows the evolution of the ratings for the six projects that were downgraded, compared with a typical project that encounters construction issues which are mitigated and where the rating remains unchanged (Collectif Sante Montreal).

Exhibit 2

### Evolution of our underlying senior secured rating for the rated projects that were downgraded during construction



Source: Moody's Investors Service

The examples above in which the downgrade was triggered either fully or in part by a potential funding shortfall reinforce our view that most PPP projects can withstand material issues during the construction phase as long as there is adequate funding to allow the Project Co to meet all its obligations and continue to pay debt service during a construction delay or the replacement of a construction company. Collectif Sante Montreal illustrates the importance of liquidity: the project experienced a number of problems during the construction of Phase 1 but had no material risk of a liquidity shortfall under most possible downside scenarios.

### However, examples of project agreement termination and debt losses exist

Anecdotally, we know of some availability payment PPP projects that encountered issues in the construction phase that were so severe that the project agreement was terminated. However, even in these cases, losses to lenders were not automatic.

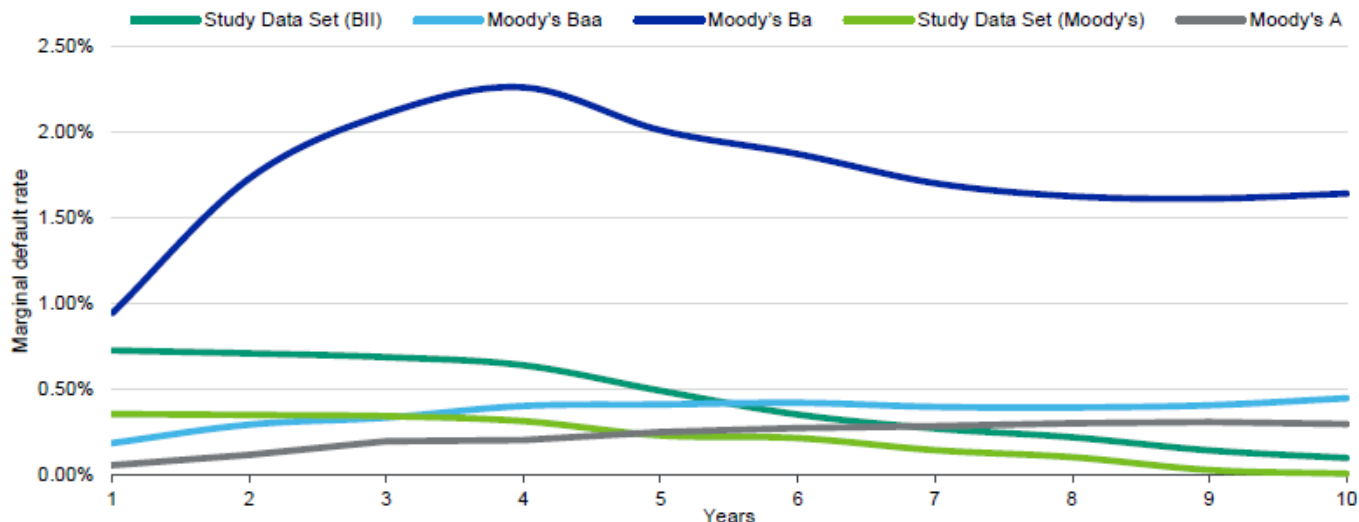
The National Physical Laboratory in the UK, a case from 2004, resulted in losses for lenders. More recently, in September 2018, the National Health Service trust responsible for the Royal Liverpool University Hospital in the UK opted to terminate its PPP contract following construction cost issues, leaving debt and equity investors at risk of losing their investment in the project.

Conversely, in the two Metronet Rail issuers in the UK noted above, we understand that lenders were repaid with minimal to no loss in 2009. Similarly, in the I-69 Section 5 road project in Indiana, US, lenders were repaid in full in 2017 because the state terminated for convenience despite material construction problems.

In addition, through our study "[Default and recovery rates for project finance bank loans, 1983-2016](#)", the data appears to indicate that PPPs<sup>3</sup> have a slightly higher marginal rate of debt default in the early years of construction than in the operational phase. As such, the asset class is clearly not without risk, even though termination scenarios and losses to lenders are relatively rare.

Exhibit 3

**Marginal annual default rates for PPP projects show higher default rates in the early years in which the debt coincides with construction**

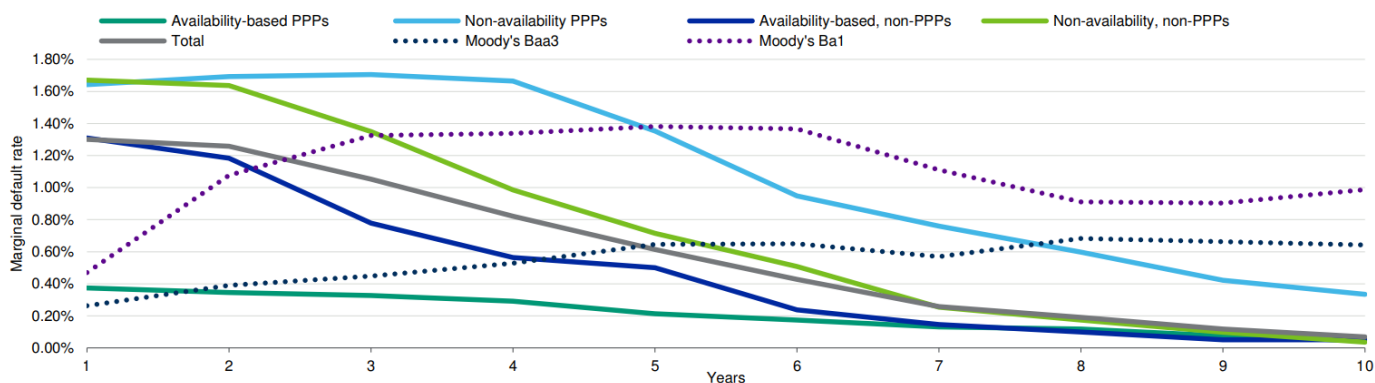


Note: The dark green line uses the Basel II definition of default and the light green line uses the Moody's definition of default. Sources: Moody's Analytics, Project Finance Data Consortium

Our more recent (September 2018) study, [Default and recovery rates for project finance bank loans, 1983-2016: Green projects demonstrate lower default risk](#), further divides PPPs into availability-based PPPs and non-availability based PPPs with respect to their marginal default rates. The study illustrates that, as Exhibit 4 shows, availability-based projects lie at the low end of the risk spectrum for project finance because of their lack of demand risk, but still have a somewhat higher risk in the early years, broadly corresponding to the construction period.

Exhibit 4

**Marginal annual default rates by subsets with different revenue resilience characteristics**



Sources: Moody's Analytics, Project Finance Data Consortium

While the project finance bank loan default study and information on the terminated projects give a high-level sense of the likelihood of stress in PPPs during the construction phase that ultimately affects the Project Co and its lenders, they provide limited information on the events that led to the debt default and/or the termination of the project agreement. Such events usually start with some level of stress during construction that cannot be properly mitigated. The research examines what causes that stress and what happens before there is any termination of the project agreement and/or debt default.

### Information-gathering methodology

For all rated availability payment PPP projects, we researched previous Moody's publications (rating actions, issuer comments and credit opinions) to determine whether one or more types of construction period issue was identified, whether a construction delay was noted, and how the issues and delays were resolved. In many cases, particularly for older projects, the information is sparse and not necessarily complete. Where possible, we complemented it with institutional knowledge, public information or other publications.

The resulting information is statistically insignificant: some is incomplete and the sample size is still small, with 38 projects (25 completed and 13 in construction) in which construction phase issues were noted as being material. However, information thus collected indicates some high-level trends that are very informative. It should be noted that rated projects may have encountered issues during the construction phase but these may have been sufficiently benign or well mitigated for us not to have mentioned them in our publications.

We complemented the above with available public information on some high-profile unrated projects that are known to have experienced construction phase issues. These additional projects provided additional colour by confirming our observations on the rated projects or nuancing the conclusions we reached on rated projects. This covered 12 projects.

We identified around two dozen broad categories of sources of construction stress, for example government scope changes, weather events, strikes and work stoppages. For each rated project, we tried to identify material occurrences of each of the main broad categories of sources of construction stress.<sup>4</sup> The 38 projects for which construction stress was identified and the 12 unrated projects for which construction stress is known from public information experienced around 125 reported different instances of stress types.

The projects are located in Europe, North America and Australia, the key international markets that have used PPPs extensively.

## Construction issues can arise at any point and for a wide range of reasons, but supervening events are among the most common issues

Construction issues can arise at any point of project construction:

- » *At the beginning of a project*, with permits and third-party approvals (for example [KentuckyWired Infrastructure Company, Inc.](#) (Baa2 stable), a fiber optic network project in the US which experienced delays in signing pole attachment agreements;), utility relocation ([Crosslinx Transit Solutions General Partnership](#) (Baa2 stable), a light rail transit (LRT) project in Toronto, Ontario, Canada) or earthworks and excavation ([AHV Access Health Vancouver Ltd.](#), (A1 stable), a health care facility in Vancouver, BC, Canada). At the beginning of construction, there is enough schedule contingency left to allow the construction contractor to mitigate some of these early delays. However, sometimes it is not possible to fully catch up and the delay extends through the construction period.
- » *Through the construction phase*, for example [Civic Nexus Finance Pty Ltd.](#) (A1 stable), which was responsible for the Spencer Street, Melbourne (Victoria, Australia) train station redevelopment project. The project was delayed by more than a year due to a number of issues, most prominently that the redevelopment was taking place while the existing station was still operating, limiting access to construction areas.
- » *Towards the end*, with the commissioning of complex systems. A good example is [Denver Transit Partners, LLC](#) (Baa3 under review for downgrade), a train project in Colorado, US, that encountered technical issues related to at-grade crossings. These late delays, which have been more prominent in respect of assets with complex systems and equipment, are more difficult to mitigate for the construction company because, presumably, a large part of the schedule contingency has been used.

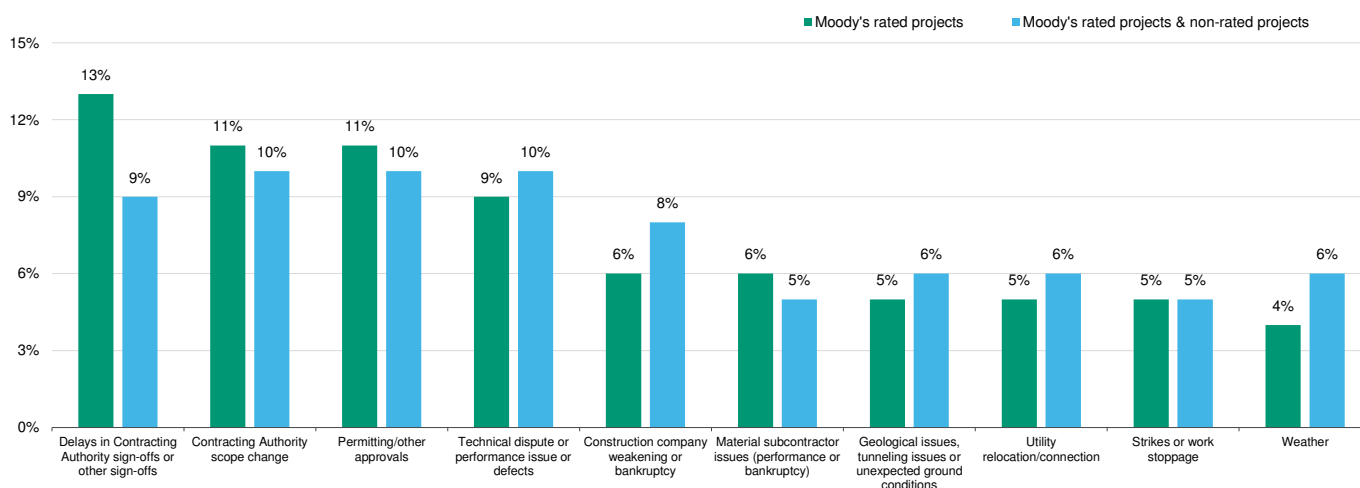
» *Post-completion*, as in the case of the Wonthaggi (Victoria) desalination plant project in Australia, which was completed in 2012, put in standby mode until needed, and had water production issues in late 2016 when it was called on to produce water. The issues related to equipment failures that were fully addressed in 2017. As a matter of course, we assume there will be transition issues, particularly in projects that rely heavily on complex equipment and systems. Most project agreements for projects that have complex systems contemplate a bedding-in period with reduced failure points and/or deductions for a few months post substantial completion. In most cases, this is sufficient to ensure the project can reach stable operating performance, but sometimes it is not, and there are recurring defects or performance issues for longer periods.

Most projects experience multiple stress events. So, for example, [Access Prairies Partnership](#) (A3 negative), an integrated mental health and correctional complex in Saskatchewan, Canada, encountered “construction company bankruptcy/weakening” and “subcontractor issues” for a total of two stress counts.

While there is a wide range of construction stress categories, some as arcane and unusual as two contractors on a project arguing over who is responsible for a specific obligation ([S4B \(Issuer\) Plc](#) (Baa3 stable), a dwelling refurbishment project in the UK), the data shows that around 10 of approximately two dozen broad construction stress categories explain almost three quarters of the total stress events, as the exhibit below shows:

Exhibit 5

**Frequency of the top 10 construction stress categories seen in the rated projects (green bars) and combined rated projects and sample of unrated projects (blue bars)**

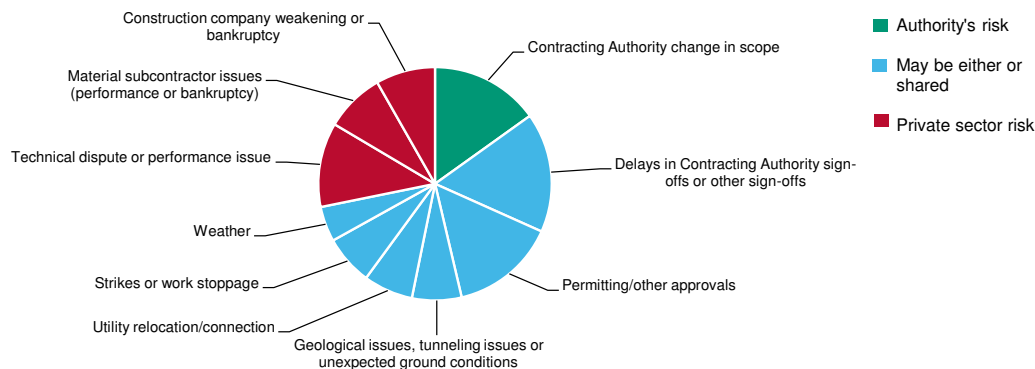


Sources: Moody's Investors Service; public information

In addition, as Exhibit 6 shows, the construction risk (and thus its cost and schedule consequences) in many cases can be (but not necessarily because it is project-specific) either fully borne by or at least partly shared by the authority, thereby providing additional time and/or compensation for additional cost to the Project Co and its construction company. A good example is KentuckyWired, discussed above, where delays in obtaining pole attachment agreements resulted in multiple supervening events, as a result of which the authority is expected to provide additional time and compensation per the project agreement.<sup>5</sup>

Exhibit 6

### For the top 10 construction issues, risk allocation can mitigate the impact of such issues on the private sector



Source: Moody's Investors Service

It is very difficult to establish the exact "root cause" of a difficult construction period and ultimately a delay. Often, there are multiple causes, and while any one of them could have been mitigated if nothing else had occurred, the combination of issues can result in major delays or additional costs for the construction company.

Furthermore, what may be problematic on one project, such as utility relocation, may not be as critical on another if the construction company can implement successful mitigation measures. As a result, it is not possible to conclude that utility relocations are always problematic and with material consequences. In other words, the nature of the construction stress is not a good indicator of the ultimate impact on the project schedule and cost. In fact, the impact of an issue is highly project-specific and depends on a number of the project's attributes, such as the seriousness of the issue, when it occurs and whether there is the ability to catch up. Even a construction company's bankruptcy does not automatically lead to material stress for the Project Co and its lenders, as evidenced by Access Prairies Partnership.

However, there is evidence that potential funding or liquidity issues are always relatively problematic, as shown by the projects that were downgraded during the construction phase: many experienced some level of funding or liquidity uncertainty at some point.

In addition, what on the surface may just be a subcontractor performance issue or a permitting issue, for example, could ultimately reflect that a construction company is new to a market and not as familiar as local companies with the subcontractor market or the permitting process and requirements.

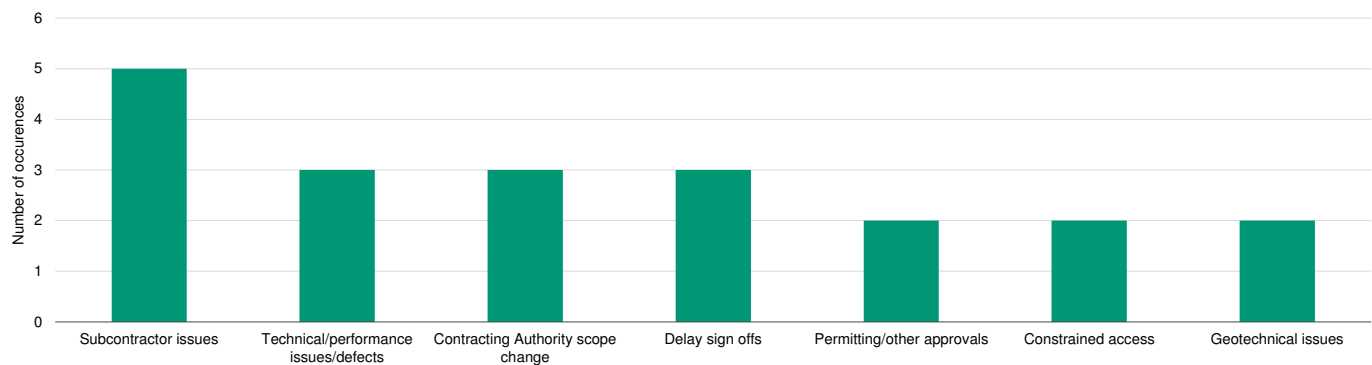
Finally, if an issue becomes very problematic and expensive to deal with in a specific project, it can in turn result in the credit weakening of the construction company, further reducing its ability to support its project(s).

In the 12 rated projects noted above that were late in their substantial completion or in critical phases, no single reason explains the extent of the delay. However, the reasons shown in Exhibit 7, below, were the most prominent:



Exhibit 7

**Most common reasons for delay in our 12 rated and completed projects that missed critical milestones or substantial completion deadlines (Most projects have multiple reasons)**



Source: Moody's Investors Service

Similar risks have been identified as leading to delays in some other projects that we do not rate, such as permitting issues (407 Highway Extension Phase 1 in Ontario, Canada); subcontractor issues (John Hart hydroelectric power project in British Columbia, Canada); geological issues (Ottawa LRT in Ontario, Canada and John Hart project); performance issues and post-completion defects (Royal Hospital in Australia); and weather and labour strikes (Victoria desalination plant in Australia).

### Change orders, supervening events and the duty to mitigate

In the project agreement for an availability payment PPP, there is usually a concept of change orders that allows the authority to request changes to the asset that is being built, for example an additional overpass on a road project. The project agreement is typically very clear on the process that change orders must follow and what the protection for the project company is (normally there should be minimal to no negative consequence for the Project Co as a result of implementing a change order).

However, the authority and the private sector occasionally do not agree straight away on the consequences of the change order on schedule and costs. As a result, the change orders are implemented before an agreement is reached and, if there is a consequent material delay, it can lead to stress, as in the case of [Via Solutions Nord GmbH & Co. KG](#) (A3 under review for downgrade), a road project in Germany.

In respect of supervening events and change in law (where the authority may offer additional time and/or compensation for additional costs), the benefit of such protection for the Project Co and its construction contractor is often subject to the Project Co demonstrating that it has implemented mitigation measures ("duty to mitigate"). This obligation to mitigate, as well as the exact interpretation of the definition and thresholds for supervening events and change in law provisions, can be fraught with disagreements and potential disputes, which weaken the benefit of such supervening event/change in law clauses for the Project Co.

"Duty to mitigate" is also a tricky concept, as it is normally not a defined term in the project agreements. As a result, there can be disagreement over whether the construction company has mitigated the impact of certain events sufficiently, or whether it should do more. This explains why supervening events in several cases can lead to disputes and possible court cases that are resolved only after lengthy negotiations (for example, Crosslinx Transit Solutions), which can lead to temporary stress. However, as long as there is ultimately an acceptable agreement that results in adequate compensation and additional time to complete the project, the stress is minimized.

### A number of potential construction risks can be identified upfront, but surprises occur

Experience shows that, even with the best due diligence and analysis of potential risks, unexpected events occur that can have material consequences for the construction company's costs and schedule. One relatively recent example was the discovery of a very large concrete slab on the site of the Valley Line LRT project in Edmonton (Alberta, Canada) that was buried near and under the river bed and either was not or could not have been identified with standard testing of terrain conditions. Similarly, in 2016, a large sinkhole appeared along the alignment of the tunnel being built for a new LRT Confederation line in Ottawa (Ontario, Canada) that reportedly had consequences for the project schedule.

Exhibit 8

**Ottawa sinkhole is an example of construction issues relating to unexpected soil conditions**



Source: National Post

In our analysis of PPPs, we focus on some of the key risks that we perceive during the construction period. We rely on a number of sources, including: 1) our credit assessment of the construction company; 2) our discussions with the construction company; 3) our discussion with the lenders' technical advisor; and 4) our collective experience of having rated and monitored more than 100 PPP projects during construction. For example, on the Crosstown Eglinton project, we identified the interaction of the Project Co and its construction company with a multitude of parties as a possible risk. This risk was realized, with difficulties encountered in respect of utility works and obtaining timely permits.

We also review how the construction companies identify and mitigate some of the key perceived risks to which they will be exposed when carrying out the project. For example, if the project relies on procuring very large pieces of equipment (such as turbines or LRT vehicles), we assess the credit quality of the key suppliers that the construction company intends to work with, their track record of delivering performing equipment and the security taken by the construction company from its key subcontractors. If the construction company itself is in a weak financial position, we assess the quantity and quality of the security the company has posted that will allow the Project Co to replace it at a higher price if needs be.

### Surprises can arise from different directions and, at a high level, encompass events affecting the construction company or the project itself

#### Events affecting the construction company

Potentially crippling for the project is the unexpected<sup>6</sup> bankruptcy of a construction contractor or its weakening to the point that it can no longer perform on the project.

Surprisingly, given that few companies in the construction industry are strong investment grade, bankruptcy of the construction company has been relatively rare on the more than 100 availability payment PPPs we either rate or have rated. However, when it does occur, it can affect several projects because the majority of PPPs globally are carried out by only a few construction companies.

Several earlier PPP projects in the UK encountered periods of stress stemming from the bankruptcy of Jarvis plc after the company systematically mispriced its contracts.

The impact of a construction company bankruptcy can be dramatic, as in the case of the Ararat jail project in Australia: the bankruptcy of the St. Hilliers construction company, combined with construction issues, put substantial stress on the Project Co, leading to a restructuring. More recently, in the case of the I-69 section 5 road project in Indiana, US, the construction company, Isolux-Corsan, filed for bankruptcy following lengthy delays on the project and its failure to pay subcontractors. In this case, the state chose to terminate the contract for convenience and pay lenders in full.

In some cases, however, the impact of a contractor bankruptcy is minimal to nil. This was the case in the North Battleford project (Access Prairies Partnership) in Canada, where there were two companies in the construction joint venture with a concept of acceptable remaining party, so that if one company went bankrupt the other party could complete the project. When Carillion plc went into liquidation, Graham Business Trust was the acceptable remaining party and agreed to complete the project with no impact on the Project Co from a construction perspective.

This latter case highlights the benefit of having a construction joint venture with more than one company doing the work for the Project Co, particularly if each remaining party in the joint venture could complete the project if the other went bankrupt.

#### **Events affecting the project**

Other surprises can be more benign in respect of their consequence but still lead to potential delays and cost overruns for the construction company. For example, in the case of the Champlain bridge project ([SSL Finance Inc./SSL Financement Inc.](#), A3 stable) in Montreal (Quebec, Canada), the very tight delivery timelines for the new bridge depended on the construction company's ability to fabricate many of the large component pieces in several locations and transport them to the site for assembly, as opposed to fabricating all the pieces on site. However, it quickly became apparent that the authorities responsible for granting the necessary road transportation permits for such large pieces were not going to do so to the extent needed. Instead, a complex network of trucking, rail and shipping/barging had to be put in place to get the pieces to the site.

The issue is now mostly resolved but the schedule remains tight and delays may still occur. In April 2018, the authority and SSL reached a settlement under which the authority committed to help defray some of the costs incurred by SSL in respect of the transportation issues.

#### **Projects with construction companies in a new market tend to be more prone to problems**

Of the projects we rate or know about, two<sup>7</sup> (Collectif Sante Montreal and I-69 Section 5) stand out as featuring a construction company that was new to the market in which the project was located and experiencing major construction issues, including material delays and even termination in the case of I-69 Section 5. Market participants are well aware that some risks may not always be adequately identified or assessed by the construction company when it enters a new market.

In the case of Collectif Sante Montreal, OHL, a Spanish company, and Laing O'Rourke, a UK-based company, had limited or no experience of operating in Canada. For their first major project, they undertook a CAD2 billion "super hospital" project in Quebec, which has its own culture and language, as well as a construction industry distinct from the rest of Canada. The construction companies did not partner with a local construction company at the joint venture level. If they had, it would have improved their knowledge of local suppliers and subcontractors, helped diffuse some technical disagreements and smoothed relationships with the authority. A number of difficulties arose and made the construction period very difficult. For example, being new to the market, neither construction company knew which subcontractors were reliable or not. Moreover, the fact that neither entity had any other large project in Quebec after the project was completed meant that the suppliers and subcontractors had little incentive to perform well to be rehired on subsequent projects. Ultimately, the delay was material (almost one year on Phase 1) and, as indicated below, the two construction companies incurred major losses.

In the case of I-69 Section 5, Isolux-Corsan, a Spanish company, had limited experience with respect to roads and bridges and it appears that it underbid for the contract compared with other bidders with greater local knowledge. In addition, Isolux Corsan's financial situation deteriorated rapidly, which most likely made it more difficult for the company to support project. Ultimately, the project agreement was terminated – one of a few examples of such a termination.

## Very large projects tend to be more prone to substantial delays and stresses than smaller ones

The data shows that construction issues can arise on projects of any size, even, surprisingly, on small and relatively simple ones, but that large projects can experience a combination of issues that tend to lead to material delays and/or cost overruns (whether borne by the constructor or the authority).<sup>8</sup>

We do not have enough information to determine the proportion of large to very large projects that are late versus the proportion of small projects that are late. However, it appears that of the 10 rated projects that were completed with a material delay to the substantial completion date (not just phase delays), at least four were large to very large projects with budgets in excess of around \$1 billion (excluding the two Metronet projects that were terminated before completion).

Examples of large projects that have encountered material issues include:

- » The CAD2 billion **Collectif Sante Montreal** project
- » The AUD1.8 billion **Reliance Rail** project
- » **Metronet Rail SSL/BCV**, a multibillion British pound project, encountered a multitude of issues and were ultimately terminated
- » **Aquasure**, a Victoria desalination plant with a budget of several billion Australian dollars which encountered material delays
- » The c. AUD2 billion **Royal Adelaide Hospital project**, which was delayed by several months.

The reasons for some level of correlation between the size of project and likelihood of delay/cost overruns include:

1. Size is usually accompanied by complexity: This can take many forms, including more complex and larger systems and equipment; bridges or tunnels pushing the envelope in terms of length or size or location; projects requiring multiple complex utility relocation; and projects requiring several subcontractors, each with its own constraints in terms of availability and resources.
2. However, while complexity is an obvious source of potential risk in large projects, there are many other possible explanations:
  - a. *Project parties routinely underestimate the human scale-up that large projects require*, whether this be finding a project manager that has already successfully overseen a similarly large project (by definition, very few) and can keep track of all the many components of the project; finding and retaining enough personnel (designers, etc.), labour (masons, carpenters, electricians) with the required qualifications; or understanding that many permit-granting entities are not staffed to accommodate the material surges in permit requests typically associated with a large project.
  - b. *Restrictions on the transportation of very large components*, such as a bridge components.
  - c. *Issues concerning access to necessary supplies* in jurisdictions that may not have a large pool of certain commodity supplies.
  - d. *The need for large pieces of equipment* (e.g. LRT cars, rail cars, tunnel-boring machines) that can expose the construction company to very large subcontractors that may go bankrupt or not perform. Replacing such a subcontractor can be time-consuming.
  - e. *More physical constraints due to the sheer size of the project and proximity to other working assets*. A site's physical constraints can mean that it is difficult to efficiently add teams to the site and catch up on the works.
  - f. *Need to coordinate with multiple parties*, each with its own constraints.
  - g. *Political backlash*, which typically means that it becomes politically difficult to help find a solution that may involve additional costs to the government to address a construction issue, whereas the government may find it easier to help a smaller project that "flies under the radar".
  - h. *A large project that experiences difficulties can have a ripple effect through the construction industry*. Large unpaid subcontractors can become bankrupt, creating a widening circle of pain around a project (and possibly several projects) and making it progressively more difficult to get the project back on track.

## In several problematic cases, the authority has worked with the private sector to find a solution to complete the project

In several cases where a construction issue arises that could jeopardize the completion of a project by its target date or at the latest by the long-stop date, the parties find a solution over and beyond the strict application of the risk allocation under the project agreement. The solution helps avoid a possible lengthy delay or, in a worst-case scenario, the project agreement's termination. The construction company and the equity sponsors in the project may still incur a loss, but the Project Co's lenders are usually not at risk.

This was the case on the Windsor-Essex Parkway project ([Windsor Essex Mobility Group GP](#), A2 stable), a road project in Ontario, Canada when girder defects were identified, and on AHV Access Health Vancouver, when geological issues caused some delays.

In several other cases, we believe that substantial completion was declared even though the project was most likely not strictly meeting each test for substantial completion. While declaring early substantial completion is credit positive because it triggers the start of availability payments for the Project Co, it also weakens the position of the Project Co and lenders vis-à-vis the construction company. This is because substantial completion usually triggers the release of most of the third-party security that the construction company has posted, just when there may still be material deferred works or defects to address.

This demonstrated ability to work through construction issues in some selected cases is by no means universal. It depends on the quality of the relationships between the parties, whether the potential delay is short enough and would not detract materially from the use of the facility, and whether there is an easy solution that does not mean the authority incurs material additional costs.

## Project Co and lenders are insulated from most construction issues

Given the range of issues that can be encountered during construction, the question arises as to why there are so few rating downgrades and defaults in the universe of availability PPPs in construction. The answer lies in the fact that, under the typical PPP contractual structure, the project company subcontracts its obligations to a construction company under a fixed-price date-certain contract. As a result, the construction company absorbs most of the risk of delays and cost overruns, except in respect of risks borne by the authority.<sup>9</sup> Without diminishing the gravity of the potential credit risk to lenders, their risk only arises when liquidity runs out, when contractual deadlines for completion could be exceeded, or when the construction company needs to be replaced but there are insufficient funds to do so.

## Construction delays on PPPs are not unusual and should be expected

Of the projects we rate, several were completed with material delays. Some, such as [I-4 Mobility Partners Opco LLC](#) (Baa1 negative), a road project in Orlando (Florida, US), are still in construction and likely to be completed with some delays unless mitigation measures are put in place that eliminate the delay.

Of the 83 rated availability payment PPP projects in operations, around 12 (excluding two where lenders exercised their put options as a result of difficulties during construction) had documented construction delays affecting either interim completion milestones and/or substantial completion. In several cases, construction delays were in excess of several months. As a result, 15%<sup>10</sup> of the completed and rated projects have to date incurred delays in achieving interim milestones and/or substantial completion (more than 17% if the two terminated projects are included).

Of those still in construction (21), several may incur a schedule overrun. This is likely to increase the percentage of rated completed projects that experience delays to 20%-25%.

To widen the universe of projects and get a better sense of the proportion of projects being delayed, we looked at a Hanscomb report, "[Infrastructure Ontario Track Record 2017 Report](#)", published in April 2018. The report indicates that 70% of the 56 completed PPP projects in Ontario have been delivered on time since inception (meaning within 30 days of the target date for substantial completion), which in turn indicates that 30% of the projects are late by 31 days or more. For the 17 projects that were late, the length of delay was as follows:

Exhibit 9

**Breakdown of construction delays by type of delay**

	All delays	Delays borne by Authority	Delays borne by private sector	Delays where risks are shared between Authority and private sector
Percentage of cases	100%	24%	29%	47%
Minimum delay (in days)	31	31	52	32
Maximum delay (in days)	925	925	283	427
Average delay (in days)	187	307*	173	135

\*101 days excluding the outlier of 925 days

Source: Adapted from "Infrastructure Ontario Track Record 2017 Report", Hanscomb Limited, April 2018

The 70% on-time performance the Hanscomb report cites is remarkably close to what the UK National Audit Office reported in a 2009 report, "[Performance of PFI Construction](#)", which noted that "sixty-nine per cent of PFI projects reported delivering to the contracted timetable" (i.e. within one month of the scheduled date) based on 117 completed projects. Of the total projects, 13% were completed between one and six months late, while 18% were delayed by more than six months.

Both our experience of rated projects and external data show that not only is there a material likelihood of project construction delays, estimated at between 15% and 30%, but also that construction delays can vary between a few weeks and several months.

We extensively analyzed the risk of construction delays for availability payment PPPs in our February 2018 report, [Construction delays do not always increase debt default risk](#).

### **Data is not as readily available for construction cost overruns as for delays, but there is evidence of construction companies completing their projects even while incurring losses**

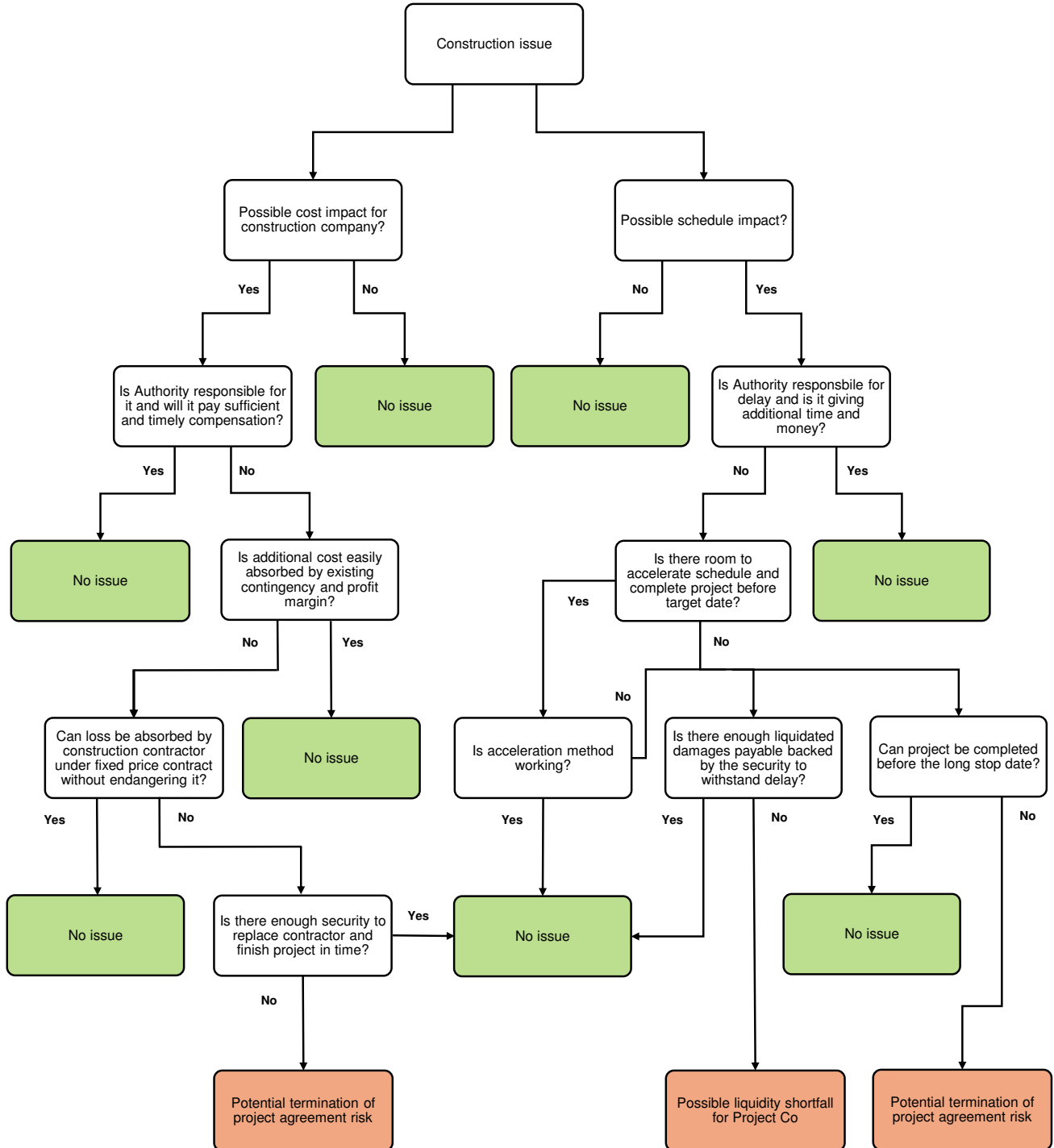
In respect of construction cost overruns, the data is not as readily available as for delays because very few construction companies disclose their profit or losses by project unless the company is publicly owned and must disclose material construction losses. Even in that case, the disclosure is usually nameless (e.g. "a \$25 million loss on a power project", rather than "a \$25 million loss of XYZ project in the US"). Nevertheless, it is fair to assume that in several of the projects that incurred material delays, the construction company is likely to have<sup>11</sup> incurred a loss on but still completed the project. In addition, to our knowledge, for the rated projects that were delayed, the construction companies paid the delay liquidated damages as contractually required.

There is some evidence that construction companies can absorb relatively large cost overruns and still complete their projects. For example, [Obrascon Huarte Lain S.A.](#) (B3 stable) in 2016 reported a loss of €149.4 million on construction projects, mainly related to its 50% share<sup>12</sup> of the Collectif Sante Montreal project. This potentially implies an approximate loss of more than CAD400 million on a CAD2 billion project, or over 20%, though accurate calculations are not feasible. However, the construction joint venture completed Phase 1 of the project in 2017 without requiring the Project Co to draw down the security it had posted. Similarly, in fiscal 2011, Leighton Holdings Limited in Australia incurred a material loss of more than AUD400 million relating to projects such as the PPP Victoria desalination plant, which faced major issues due to weather and poor productivity and was delayed by several months.

Conversely, there is evidence of companies trying to "cut their losses", as illustrated by the case of John Laing plc, which renegotiated its fixed-price date-certain contract for the National Physical Laboratory in the UK when actual and potential losses on the project began to put its own survival at risk. At that point, according to a report by the UK's National Audit Office published in May 2006, additional costs to complete the project were estimated at over 50% of the contract price. The authority ultimately terminated the project agreement for the National Physical Laboratory and paid a termination sum that translated into some losses for the lenders, a rare example of known termination and losses for lenders in the PPP space.

The exhibit below summarizes the various steps that need to be taken before a construction issue may become a Project Co's issue and thus a possible default for lenders. As can be seen, and as illustrated by the fact that, by and large, most projects reach substantial completion, there are only a few instances in which lenders face any real risk after a number of possible mitigating factors are triggered and fail.

Exhibit 10  
 The PPP structure mitigates many of the construction risks for the Project Co



Source: Moody's Investors Service

## Structural and contractual elements in PPPs in construction protect the project company and its lenders from the impact of most construction issues

Construction issues and delays will occur in many PPPs. However, experience has shown that their impact can be mitigated or reduced for the Project Co and its lenders by a number of contractual or structural elements, over and above the basic allocation of construction risk to a construction company under a date-certain fixed-price contract. They include:

- » A clear risk allocation negotiated between the authority and the ProjectCo under which major unexpected events outside the control of the Project Co are the authority's risk. For large projects, the authority can assume responsibility for some of the work, thereby reducing the scope of the responsibility for the Project Co. This was the case in the Eglinton Crosstown LRT project, where the authorities kept the risk of tunneling and vehicle procurement. For projects with complex aspects, the authority can agree to share more risks, as on the Regina Bypass in Saskatchewan, Canada, where utility risk was shared ([SGTP Highway Bypass Limited Partnership](#) (A3 stable)) and/or grant a longer long-stop date before the project agreement can be terminated (for example, 18 months past substantial completion target date versus a standard 12 months, as in the Eglinton Crosstown project).
- » Solid risk identification and risk management by the construction companies including, for new entrants, starting with smaller projects and/or partnering with local construction companies.
- » The Project Co selecting experienced construction companies to work with and the ones with the financial strength and willingness to absorb material construction cost overruns. This is particularly important in large complex projects and where the construction company is a new entrant to the market.
- » The construction company building solid and conservative construction schedules and construction budgets with adequate contingencies in both cases. The schedule is built in a such a way that acceleration measures can be implemented, such as adding work teams, adding shifts to the day or adding days to the work week. This is the first line of defense if a project experiences delays and often provides good results. For example, the construction company engaged by [Blackbird Infrastructure 407 General Partnership](#) (A3 stable), a road project in Ontario, Canada put acceleration measures in place to deal with delays encountered in utilities relocation. The measures were successful and the project is back on track.
- » In case of delays, the construction company committing to pay delay liquidated damages for a material period, usually to the long-stop date (for a period of 12-18 months), and to back that obligation with high-quality and adequate liquidity. This ensures that the lenders continue to be paid while the project is being completed post the initial target date for completion. Furthermore, in respect of shared risks or risks fully borne by the authority, the Project Co should have clear access to liquidity, either through the authority's compensation events and/or a construction company's delay liquidated damages obligation if the authority only gives additional time but no compensation or if the authority's compensation payment is delayed.
- » The construction company posting sufficient security to allow the Project Co to replace the bankrupt construction company at a higher cost if needs be.



## Moody's related publications

### Methodologies:

- » [Construction Risk in Privately-Financed Public Infrastructure \(PFI/PPP/P3\) Projects, June 2016 \(190464\)](#)
- » [Operational Privately Financed Public Infrastructure \(PFI/PPP/P3\) Projects, March 2015 \(176194\)](#)

### PPP Research:

- » [Project Finance - PPP: Projects resilient to Carillion's failure when supportive features were present, October 2018 \(1139222\)](#)
- » [Public-private partnerships — Global: Construction delays do not always increase debt default risk, February 2018 \(1110217\)](#)

### Project Finance Research:

- » [Default and recovery rates for project finance bank loans, 1983-2016, March 2018 \(1114036\)](#)

To access any of these reports, click on the entry above. Note that these references are current as of the date of publication of this report and that more recent reports may be available. All research may not be available to all clients.

## Endnotes

- [1](#) In this document, "authority" is used as a generic term to describe a government entity that contracts a project under a project agreement and could be any government level such as a state or a municipality, a transit authority, a health authority, a university or similar quasi-government entities.
- [2](#) The ratings were withdrawn for Metronet Rail BCV Finance Plc and Metronet Rail SSL Finance Plc before construction completion after the repayment of the rated debt in full due the exercise by the issuer of a put option to the contracting authority. The rating prior to the full repayment of the bonds was B2 reflecting a high likelihood of default and a high recovery rate but, ultimately, neither defaulted. Moody's also had an insured rating on Infracore JNP Limited's bank loan facility but the information was not sufficient to determine if there was default under the bank facility.
- [3](#) The observations noted for projects identified as PPP projects should be interpreted with caution because: (1) there is some subjectivity in the classification of projects as PPPs; and (2) the number of defaults is relatively small.
- [4](#) Note that if a project encountered multiple instances of the same broad category of stress (for example, several separate labour strikes), only one instance of that occurrence was counted. The information available is not of sufficient quality to be granular to the level of the number of occurrences of the same type of event.
- [5](#) Supervening events are events that can lead to a delay and/or a cost overrun but the authority agrees to provide additional time and/or compensation to the project company.
- [6](#) We assume that no project company would in full knowledge sign a construction contract with a construction company that is known to be close to bankruptcy or insolvency. However, as demonstrated in some recent cases, such as Carillion Plc earlier in 2018, a construction company's financial health can deteriorate rapidly.
- [7](#) A third project could also possibly be counted under this category: Reliance Rail.
- [8](#) The issues encountered by very large availability payment PPPs can also be encountered in large projects at large.
- [9](#) Although some risks may remain Project Co risks, they are very limited to non-existent from a construction risk point of view.
- [10](#) This percentage likely underestimates the exact proportion of rated projects that were effectively late because for many older projects there is no longer any sufficient information available to make an accurate assessment.
- [11](#) The correlation is not necessarily 100% between a delay and a loss on the contract as the loss amount will depend on many variables such as whether the delay is a private sector borne delay or not, what the construction price margin and contingency was, what the cost of the delay is and what the costs incurred to avoid the delay are.
- [12](#) Laing O' Rourke, the other partner in the construction joint venture on the project, bore 50% of the loss.

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