



General Project Finance Rating Methodology

Project Finance

16 November 2023

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1 Introduction

This document provides the latest update to Scope Ratings' General Project Finance Rating Methodology. Updates to the document only concern editorial changes, clarifications and structural reorganisation to improve understanding and readability.

2 Areas of application

This document describes our methodology for the rating of all types of infrastructure and project finance debt instruments, referred to generally throughout this document as *project finance credit exposures*. Project finance instruments are typically issued by a special-purpose vehicle (SPV) or dedicated corporate to finance the construction, purchase, or exploitation of a specific real asset.

This methodology is not applicable to asset-based financing transactions where credit losses primarily depend on the value of the underlying asset in a relatively liquid market, a condition generally not applicable to project finance. For example, this methodology does not cover aviation finance or real estate asset finance (i.e. real estate development and real estate investment activities).

We focus primarily on European project finance, but this methodology can also be applied to other non-European or global project finance credit exposures.

This methodology may be applied in conjunction with our [General Structured Finance Rating Methodology](#) when portfolios of credit exposures to several different project finance transactions are securitised in a SPV and with our [Rating Methodology for Counterparty Risk](#) for details on the assessment of financial counterparties.

3 Rating definitions

Our project finance credit ratings constitute a forward-looking opinion on relative credit risk. See our rating definitions available on our [website](#). A project finance rating reflects the expected loss associated with payments contractually promised under debt instruments with a credit exposure to project finance, by its legal maturity, accounting for the time value of money at the rate promised to the investor.

The expected loss reflects, in turn: i) the likelihood of a credit-impairment event reducing payments promised to the investor; and ii) the loss severity expected upon a credit-impairment event. We assess the likelihood of default and will limit the rating if an instrument has a very low expected loss and a very high default likelihood. We apply the timely payment standards highlighted in Appendix III when assigning expected loss ratings under this methodology. For more details, refer to the technical notes on the expected loss framework and timely payment under Appendix II and Appendix III.

For our quantitative analysis, we calculate an instrument's expected loss over an expected risk horizon, with the result benchmarked against our [idealised expected loss table](#).

4 Methodology highlights

Expected loss. Our project finance ratings reflect the expected loss on a project finance debt instrument. This rating methodology pays special attention to the analysis of the severity to the investor by estimating recovery rates under diverse credit-impairment events.

Any level of seniority. We can analyse exposures to project finance of any level of seniority which can be attached to a contractual promise to investors (i.e. senior, mezzanine, and even first-loss tranches – provided a contractual promise is available).

Transparent and comprehensive framework. We systematically analyse the five risk areas of project finance. These areas comprise 23 risk factors and four recovery risk factors that contribute to credit losses in addition to the characteristics of the promise to the investor.

Credit differentiation. Our analysis relies on input assumptions which are instrument- specific. We use a fundamental bottom-up approach to capture the credit and market risks of the specific project debt instrument(s) being rated, all of which are considered in the context of the sponsor and the relevant jurisdiction. We assess the elements of credit risk in our analysis of legal and counterparty considerations. This approach allows for larger rating and project differentiation, even when considering projects in the same sector and country.

No mechanistic link to sovereign credit quality. We do not mechanistically limit the maximum rating that a credit exposure to project finance can achieve as a function of the credit quality of the country in which the project is located. Instead, we assess,

where relevant, convertibility risk and the risk of institutional meltdown in the context of the tenor of the rated debt instrument and incorporate macroeconomic risks into the ratings.

Economic fundamentals. We analyse the economic fundamentals of the project and the competitiveness of its output, as these, together with the strength of the financial structure, are often the key drivers of credit performance.

Alignment of interests. We analyse the relationships and incentives of the relevant stakeholders of a project to build a view on the ‘soft’ components of the contractual framework. We also analyse how and to what extent the interests of the sponsor and other stakeholders of the project are aligned with those of the investor. The sponsor’s interest in the project is an important driver of the sponsor’s expected performance.

5 Overview of analytical framework

The analytical framework comprises six building blocks: i) understanding of the project and its economic fundamentals; ii) counterparty analysis; iii) legal analysis; iv) analysis of the likelihood of credit-impairment events; v) analysis of recovery after credit-impairment events; and finally, vi) calculation of total expected loss to an investor. The fundamental understanding of the project supports the entire analysis; the counterparty and legal analyses overarch the analysis of credit-impairment events and their severity. All analytical blocks are equally important.

We derive assumptions on the likelihood of credit-impairment events by scoring 23 risk factors covering five areas of risk. We derive recovery assumptions from sector- and event-specific recovery data, which is then adjusted for the specific project finance debt instrument being rated, and accounting for stressed, country-specific resolution times.

We analyse the severity of credit-impairment events assuming a Beta distribution of project-level recoveries. We adjust project-level recovery rates for: i) seniority of the rated debt instrument; ii) specific project and instrument characteristics; iii) time value of money at the rate promised to the investor; and iv) amortisation. Additionally, we cap the future value of debt instrument-level recoveries at 95%.

We then calculate the contributions to total expected loss by combining the likelihood of credit-impairment events with their severity. Total expected loss is the sum of the contributions from all credit-impairment events.

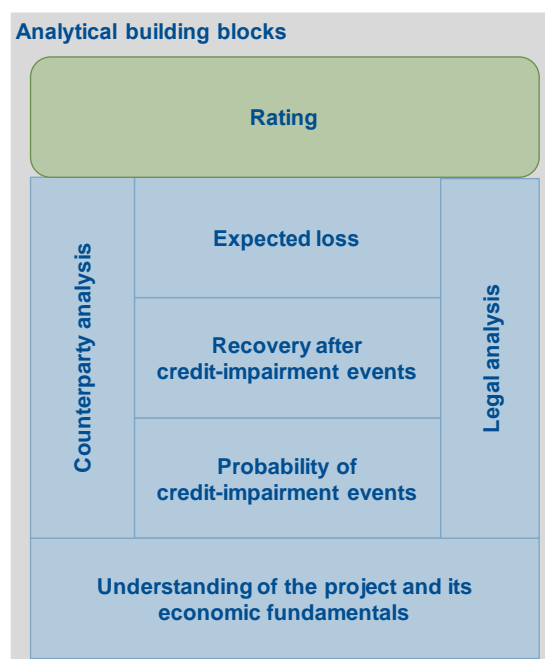
We consider a project’s construction phase separately from its operational phase. Generally, a project must survive the construction phase before risks from the operational phase can crystallise. Our analytical framework for project finance reflects the typical reduction of credit risk resulting from the completion of the construction phase.

We use qualitative and quantitative inputs to analyse the transaction and derive the rating, considering its sensitivity to key analytical assumptions. Quantitative analysis alone does not dictate the final rating assigned to a debt instrument but rather forms an input to the analytical framework presented in this methodology, which also incorporates qualitative and fundamental credit views on the key risks affecting the project finance obligations. For the avoidance of doubt, qualitative considerations could lead us to assign a rating that differs from the quantitative result. As an example, we can consider the probability of one or more specific credit impairment events to be higher than reflected in the methodology or apply a project-specific recovery rate assumption to all credit impairment events.

We present in this document the blocks of our analytical framework, ordered in its natural sequence and starting with the information we expect, with references to the counterparty and legal analyses where relevant.

6 Expected information and its adequacy

We perform our credit analysis by working with the conventional information elements used in project finance. Figure 1 and Figure 2 detail the typical documentation and data needed – when applicable – for our rating analysis, both upon and after financial



closing as well as during monitoring. We are flexible with respect to the elements and format of information used to produce a rating (i.e. we do not impose proprietary templates).

We assess the adequacy and completeness of the information received for the rating process. We will explain any limitation observed in available information and may ask for more detail when documentation proves insufficient to rate a transaction.

6.1 Historical information

We rely on historical information that represents the key risks of a project (e.g. demand, traffic, wind yield), which might or might not be publicly available.

6.2 Information checks

We judge the plausibility of information received for the rating process, even if we consider the sources to be reliable and accurate. We might need additional information or clarifications if the information conflicts with our understanding. These 'sanity checks' do not, however, constitute an audit nor comprehensively verify the reliability and accuracy of the information and data we use during our rating analysis.

We believe the reliability of information increases with the degree of the sponsor's alignment of interests, or the independence, experience and financial strength of parties providing the information. For example, independent legal opinions generally support our legal assumptions or audit reports backing the accuracy of the financial cash flow model projections.

Conference calls and operational review visits can help us to better understand the project's fundamentals and to get further insight into the information received. Figure 3 lists the themes covered during meetings with sponsors or independent directors.

Figure 1. Typical financial-close documentation

Information elements expected for the initial rating analysis upon financial close
Information memorandum
Financial cash flow model (project's cash flow projections by the lender or the sponsor)
Project agreement (e.g. concession agreement, offtake contract, usage agreement)
Project material contracts and subcontracts (e.g. construction, O&M, supply)
Financial agreements (e.g. loan agreement, bond indenture, intercreditor agreement, trust deeds, security documentation, direct agreements, hedging documentation, insurance)
Financial and audit reports of material contractual parties
Corporate approvals and documents (e.g. articles of association, shareholders, register extracts, resolutions, representations & warranties)
Authorisations, licences, permits, confirmations, certifications
Due diligence reports and expert opinions (e.g. technical, legal, insurance, tax, market)
Internal credit application
Internal rating assessment documentation (if available)

Source: Scope Ratings.

Figure 2. Typical post financial-close documentation

Information elements expected for the initial rating analysis after financial close and during monitoring
(Information elements listed under Figure 1)
Material variations since financial close documentation
Latest technical advisor report or SPV operational report
Latest financial model
Filed financial and audit reports
Covenant compliance certificates
Latest internal credit review
Latest internal rating assessment documentation (if available)

Source: Scope Ratings.

7 Understanding the project and its economic fundamentals

The economic fundamentals of a project over its entire life are a critical element in our analysis. Weak underlying economic fundamentals are a sign of higher credit risk and thus the techniques of strategic competitive analysis provide a strong foundation for credit risk analysis. Strong economic fundamentals can provide significant incentives to sponsors and other project participants to keep the project in good condition and preserve its value.

We study the incentives and interest alignment of counterparties to assess their respective contractual obligations. The failure or unwillingness of counterparties (e.g. construction and operational contractors, offtakers, suppliers and sponsors) to perform their obligations can put a project’s viability at risk. Incentives may include strong project fundamentals, an investment of capital and time, the strategic importance for the business model and reputation, a reasonable return on equity, or contract price. Strong incentives can increase a sponsor’s willingness to protect their investment if needed, even if project financings are structured on a non-recourse basis.

Strong economic fundamentals are particularly relevant for uncontracted projects that rely exclusively on the competitiveness of their output. In such cases, we check for factors that help against the deterioration of economic fundamentals. Examples include strong demand or market position; low cost of production; an industry with sustainable macroeconomic trends; or advantageous positions in relation to contracts or regulations.

This analysis is also important for projects benefiting from long-term revenue contracts. Revenue counterparties are incentivised to look for ‘contract outs’ and alternatives when a project’s output is uncompetitive, increasing contract abrogation and default risk.

Other sector specialists may contribute their credit assessments of certain project parties (e.g. contractor, offtaker) that fulfil a key role in the project and are difficult to replace. They may also provide their knowledge on a project’s business model and competitive environment. Furthermore, our sovereign and public finance analysts contribute with their forward-looking view on the macroeconomic conditions in which the project is expected to operate. The joint effort of our analysts from different analytical teams results in more robust inputs for the analysis of a project’s credit risk.

Figure 3. Common themes during sponsor or independent director meetings

Theme	Interest
Economic fundamentals	<ul style="list-style-type: none"> Project rationale, strategic positioning, competitive analysis Market for product, commodity or service, and marketing strategy Historical and projected market growth Nature of competition, price and volumes as well as an overview of major competitors Sources, availability and cost of raw materials Transportation of product to market Industry and country’s business environment overview
Historical financial information and its projections	<ul style="list-style-type: none"> Summary of SPV’s recent cash flow, balance sheets and income statements Key assumptions of the financial cash flow model and updated financial projections Plans for major changes in the organisation, governance, management or operating policies
Update on relevant project’s phase	<ul style="list-style-type: none"> Construction phase (e.g. construction timing and cost vs plan, key milestones, budget and timeline to completion) Start-up phase (e.g. actual operating costs, economies of production and volumes versus financial plan) Operating phase (e.g. operational costs and budgets, availability, efficiencies, performance, capital requirements and plans for financing such requirements)
Counterparties	<ul style="list-style-type: none"> Key counterparties, projects management and personnel

Source: Scope Ratings.

8 Determination of the expected loss for the investor

Our analytical framework for project finance credit risk is structured to estimate the expected loss to the investor and the expected risk horizon of the debt instrument. Expected loss requires a thorough analysis of both default and severity. The following sections present our methodology for estimating the likelihood that credit-impairment events impact a project’s credit performance; the severity associated with such events; and, finally, the calculation of expected loss.

8.1 Project-default definition

This methodology uses a broad definition of default. In the credit analysis we estimate the likelihood of *credit-impairment events* with the potential to disrupt the credit performance of any liability in a project. This is because our central expectation upon credit disruption is that the project would be restructured and continue as a going concern. This soft probability-of-default framework is consequently consistent with our recovery framework for project finance, which reflects the bar-belled (i.e. bimodal) nature of recoveries and the possibility of the full performance of senior exposures throughout a resolution process.

Scope's general definitions for ratings in default¹ also apply for project finance debt instruments. A project finance debt instrument's rating can be placed in default but at the same time still be rated at the lower end of the rating scale, depending on the amount and degree of certainty of expected recoveries.

8.2 Project credit-impairment events

We consider five areas of risk which could result in credit losses to investors exposed to a project. Each risk area can be associated with a few, idealised, credit-impairment events which represent the scenarios for which expected loss must be estimated (see Figure 4). The five areas of risk are: construction, operation, revenue, financial strength, and project structure and other risks.

The decomposition of a project into several, mutually exclusive credit-impairment events facilitates the calculation of expected loss, which is the sum of each event's contribution to total expected loss. Additionally, this approach also provides valuable insight into the credit weakness or strength of a project.

Figure 4. Project credit-impairment events

Risk area (source of losses)	Event potentially contributing to project losses (credit-impairment events)
Construction	Construction delay Cost overrun Other issues (e.g. technology, counterparty) Sponsor equity contribution or credit risk
Operation	Operational performance, budget and schedule issues Lifecycle issues Operations and maintenance (O&M) counterparty issues
Revenue risk	Revenue counterparty issues (financial or technical performance) Revenue deterioration Supply interruptions or reserve issues
Financial strength	Inflation, interest or currency issues Refinancing issues Debt repayment or cash flow liquidity issues
Project structure and other	Country or political issues Force majeure or events issues Legal, environmental or compliance issues

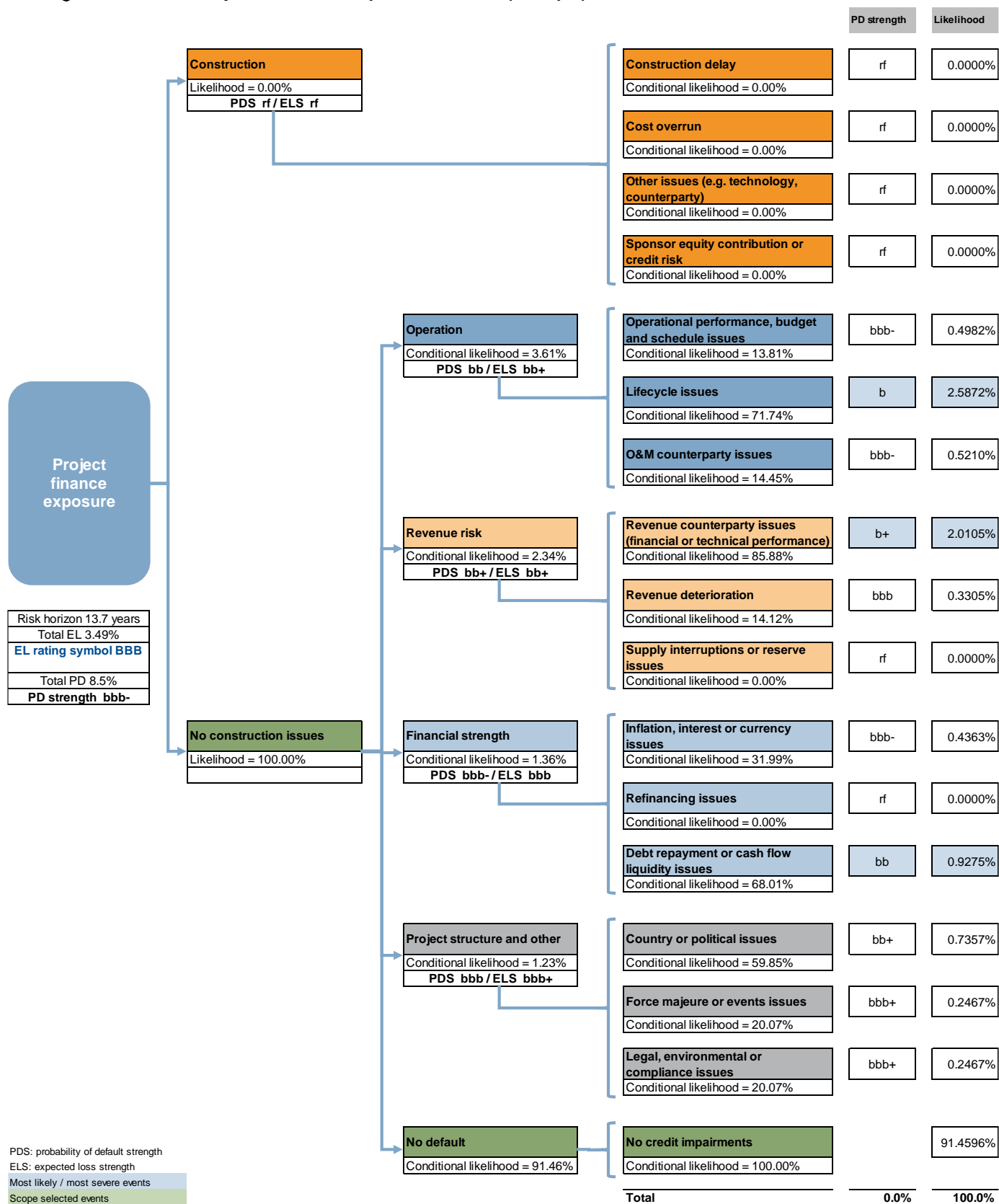
Source: Scope Ratings.

We present project risk using a tree diagram that denotes the likelihood and severity of all credit-impairment events. A project must survive the construction phase before it becomes exposed to risks associated with the operational phase. This subordination of the operational phase to the construction phase influences the likelihood of operational-phase credit-impairment events (i.e. the unconditional probability of such events decreases when the likelihood of construction issues increases).

The tree diagram in Figure 5 provides an example of a simplified visual representation of the sources of risk in a project, providing valuable insight for investors.

¹ See Scope's Rating Definitions available [here](#)

Figure 5. Probability tree of credit-impairment events (example)



Note: The tree represented here is for a project in the operational phase, not exposed to construction risk (i.e. 0% likelihood of construction events). All numbers are for illustrative purposes only.

Source: Scope Ratings.

8.3 Likelihood of credit-impairment events

This methodology analyses the likelihood of 16 possible events associated with the five areas of risk capturing 23 risk factors. These events represent default-like situations which could impair the project's credit performance in relation to the rated debt instrument.

8.3.1 Risk factors contributing to project risk

We consider the 23 risk factors that contribute to a project's total credit risk and derive the likelihood of credit-impairment events based on a scoring assessment using the tables in Appendix V. These risk factors are categorised in the same five risk areas that group credit-impairment events, with the risk contribution from sponsors impacting all five areas of risk. Figure 6 summarises the list of factors and areas of risk, which are described in more detail in the following subsections.

We assess the risk contribution of each risk factor using a scoring model, in the context of the debt instrument being considered. The scores range from 'very low (contribution to credit risk)' to 'very high (contribution to credit risk)'. This enables us to differentiate between projects. Appendix IV contains analytical guidelines designed to ensure consistency when assessing the contribution of the different risk factors to total risk. The risk factor assessments are then converted into numerical scores representing the likelihood of occurrence of a given risk factor in accordance with Appendix VI. The likelihood of a given risk area triggering a credit-impairment event is derived from the blending of the numerical scores of the different risk factors, using the weights shown in Appendix VI. In this way, the probability calculated for each risk area takes into account the risk horizon of the instrument. The total likelihood of a credit impairment in any risk area is split among the corresponding credit-impairment events also on the basis of the score values of the risk factors.

In addition to the 23 risk factors, we also consider various forms of timely and full credit enhancement (such as government support, sponsored liquidity lines, monoline wraps) to adjust the likelihood of project events and their severity.

Figure 6. List of risk factors and risk areas

Risk area	Risk factors
(All areas)	Sponsors
Construction	Construction complexity, permits, design and technology Construction contracts, budget and schedule Construction funding and liquidity package Counterparty risk Equity contribution risk
Operation	Operational complexity, technology and standing O&M contracts, budget and planning Lifecycle risk Counterparty risk
Revenue risk	Revenue contract Economic fundamentals Supply/reserve risk Supplier risk Offtaker risk
Financial strength	Debt repayment Sensitivity to cash flow stress scenarios Inflation, interest rate and forex risk Refinancing risk Counterparty risk
Project structure and other	Financing and legal framework, compliance Country risk Event and force majeure risk

Note: Figure 35 in Appendix VI shows the values of the scores used for each risk factor, and Figure 36 shows the weights used to blend them for each risk area. Source: Scope Ratings.

8.3.1.1 Risk from sponsors

Sponsors influence the credit risk of the overall project and consequently all five areas of risk. Figure 7 shows the risk factors we analyse to assess sponsors' contribution to risk from all areas.

We assess the risk contribution from sponsors by analysing: their experience and market reputation; the project's importance in the context of the sponsors' overall business; and the sponsors' credit quality. When considering risk from sponsors, we complement the analysis of a project's standalone economic viability, which remains the central focus of the analysis.

We judge the likelihood that sponsors will support the project at times of stress, even if project finance is typically non-recourse to the sponsor. We also capture the risk of sponsors abandoning the project if it were to become uneconomic.

Figure 7. Sponsor risk factor driving risk from all areas

Risk factor	Key considerations
Sponsor risk	Sponsor's credit quality, technical capabilities, experience and track record, economic incentives, commitment to the project and share in maintenance provisions

Source: Scope Ratings.

8.3.1.2 Risk from construction

The construction risk area focuses on the ability of the project company to execute the construction programme on time and within budget. The project company typically passes through construction obligations to third counterparties. Figure 8 shows the risk factors we analyse to assess the risk from construction.

We recognise that construction risk varies among the different technologies and designs employed, complexity of works, counterparties involved as well as contractual provisions.

Problems during the construction phase of a project may result in the following key credit-impairment events:

- Construction delay (delay in scheduled completion date past the contractual long stop date, construction delay resulting in increase in the debt expense on financing and delay in contemplated project's revenues);
- Cost overrun (construction budget overrun);
- Other issues (technology or design failures, construction counterparty financial or performance failure);
- Sponsor equity contribution shortfall (construction funding shortfall).

Figure 8. Risk factors driving risk from construction

Risk factor	Key considerations
Construction complexity, permits, design and technology	Scope and size of construction works, complexity and track record of technology and design, construction dependencies and interface risks, permits, licenses, rights, title and access to the project's site, site conditions, possibility of regulatory and public opposition
Construction contracts, budgets and schedule	The strength of construction contract provisions, credibility of budget and schedule, cost and time contingencies, defects liability period and warranties, construction progress
Construction funding and liquidity package	Funding sources, contingent sources, liquidated damages, security package
Counterparty risk	Ability and willingness of the construction counterparties to fulfil their contractual obligations; we measure the ability aspect by the credit quality and experience of the counterparties, while factors influencing sponsors' willingness include economic incentives, business relationships, reputation and market position. We generally consider the availability of viable alternative contractors a key mitigating factor
Equity contribution risk	Sponsor's financial strength in relation to the equity contribution required and / or sponsor's additional financial support (e.g. contingent equity) over the relevant timeframe. We generally consider guarantees, letters of credit, performance and adjudication bonds, and other credit enhancements to be important mitigating factors.

Source: Scope Ratings.

8.3.1.3 Risk from operations

We analyse the risks related to operations and maintenance (Figure 9 shows the risk factors), through which we estimate the likelihood of the following credit-impairment events:

- Operational performance failures, and budgeting and scheduling issues (e.g. poor operational management, breach of contractual performance obligations, increased costs, technical obsolescence);
- Lifecycle issues (e.g. increased costs and delays of the lifecycle programme);
- Counterparty issues (e.g. an operator's financial or performance failure, or poor management by project company if self-operated).

Figure 9. Risk factors driving risk from operations

Risk factor	Key considerations
Operational complexity, technology and standing	Nature of operating activities, complexity and track record of technology and design, historical and projected operational status, O&M contract strength, budget and planning robustness
Operations and maintenance (O&M) contracts, budgets and planning	O&M agreements including the level of pass-through of the O&M tasks, contract pricing and term, level of the performance standards and deductions. O&M budget and assumptions, reserve accounts and cash flow break-even level of the operating costs
Lifecycle risk	Lifecycle programme, budget and schedule assumptions, availability of dedicated cash reserves
Counterparty risk	Same as for the construction counterparties

Source: Scope Ratings.

8.3.1.4 Risk from revenues

The revenue risk area covers the range of commercial contracts underpinning a project's revenue profile (such as concession agreements, build-own-operate-transfer contracts, and offtake and supply agreements). We assess the degree of risk pass-through, level of protection from market and operating environments, and conditions imposed by each relevant contract. We supplement this analysis with an evaluation of the contracting parties' ability and willingness to fulfil their obligations.

The evaluation of the project's underlying economic fundamentals is critical for merchant projects that sell their output in a competitive market. However, we consider these factors important, even if revenues are fully contracted, because they influence the long-term viability of the project's contractual position.

Figure 10 shows the risk factors we analyse to assess the risk from revenues.

The key project credit-impairment events for this risk area include:

- Revenue deterioration (e.g. impairment of competitive position, deterioration of project rationale, changes in price or volume, weak contractual provisions);
- Counterparty issues (e.g. weakened ability or willingness of offtakers, concession providers, suppliers to honour their contractual obligations);
- Supply or reserve issues (e.g. increased raw materials price, shortages and interruptions of reserves or raw materials, weak contractual provisions).

Figure 10. Risk factors driving risk from revenues

Risk factor	Key considerations
Revenue contracts	Contract term, price, volume risk protection, contract-outs and termination clauses, contract mismatch, dispute resolution mechanism, adverse regulatory or political changes, strength of regulatory framework (if applicable)
Economic fundamentals	Competitive advantage, demand-and-supply balance, barriers to entry, long-term market outlook, project rationale, participants' alignment of interests
Supply or reserve risk	Contract term, price, volume, quality and delivery risk protections, supply interruption and force majeure cover, contract-outs and termination clauses, revenue contract mismatch, dispute resolution mechanism, supply availability, resource quality and reliability, and reserve availability



Counterparty risk
(includes revenue counterparties
such as offtakers and concession
grantors and suppliers)

Credit quality, track record, strategic value of the project and economic incentives

Source: Scope Ratings.

8.3.1.5 Risk from financial strength

The analysis of this risk area focuses on the quality and variability of the project's cash flows to cover its debt instrument obligations. Figure 11 shows the risk factors we analyse to assess the risk from financial strength.

Project revenues must be enough to cover debt obligations after meeting necessary operating and maintenance expenses, capital expenditures, taxes, and the replenishment of necessary reserve accounts. Cash flows available for debt service may fluctuate significantly. Hence, we assess the variability of all key cash flow components, considering any existing cash flow cushions.

We evaluate a project's financial strength by assessing certain credit metrics (e.g. debt service coverage ratios). We typically use the project's financial cash flow model, challenging and sometimes modifying key assumptions (e.g. P90 volume, haircuts to merchant prices) to create our own analytical base case. We also calculate metrics and perform sensitivity and scenario analyses.

The key project credit-impairment events for this risk area include:

- Debt repayment or cash flow liquidity issues (e.g. breach of default covenants, shortage of cash);
- Refinancing issues (e.g. failure to refinance the project);
- Inflation, interest or currency issues (e.g. volatility in interest, inflation or foreign exchange rates negatively impacting the project's cash flows).

Figure 11. Risk factors driving risk from financial strength

Risk factor	Key considerations
Debt repayment	Minimum and average debt service coverage ratios (DSCR) for projects with contracted revenues or exposed to market risk , leverage ratios such as debt to equity, loan life coverage ratio (LLCR), liquidity reserves such as debt service reserve account (DSRA)
Cash flow stress scenarios	Resilience of cash flow to various shocks (such as price and volume fluctuations)
Inflation, interest rate and foreign exchange risks	Project's sensitivity to inflation, interest rate, foreign exchange variability
Refinancing risk	Credit strength, cashflow projections and leverage at the point of refinancing, debt payback period after refinancing, financial covenants, track record and lending appetite of similar project refinancings, expected financial market conditions
Counterparty risk (includes account banks, parties to interest rate, inflation and currency swaps, other hedging instruments and derivative product providers)	Credit quality and track record

Source: Scope Ratings.

8.3.1.6 Risk from project structure and other sources

We evaluate the project's legal and financial structure, its compliance with applicable laws and regulations, as well as force majeure, event and country risks.

Despite the relatively low likelihood, such risks can materially affect a project's performance and cash flows, particularly given the single-asset nature of most project finance transactions. Hence, these risks can contribute significantly to expected loss. The credit-impairment events are as follows:

- Country or political issues (e.g. financial insolvency of host government, adverse political events interrupting revenues, expropriation)
- Force majeure or other events (e.g. uninsured material losses due to natural disasters, civil unrest, war, terrorism, changes in law, government interference)
- Legal, environmental compliance issues (e.g. third parties initiating bankruptcy proceedings against the project company due to weak contractual restrictions and obligations, legal weaknesses affecting the project company's ability to service debt, environmental and compliance issues restricting the project's operations)

Figure 12 shows the risk factors we analyse to assess the risk from project structure and other sources.

Figure 12. Risk factors driving risk from project structure and other sources

Risk factor	Key considerations
Financing and legal framework, compliance	Bankruptcy remoteness, cash controlling covenants, intercreditor agreements, legal integrity of all material contracts, legal and regulatory compliance (including environmental, social and governance (ESG) factors, equator principles)
Country risk	Credit quality, political risk and business environment
Force majeure and other event risks	Force majeure and event risks (e.g. natural disasters, political risks or administrative changes) and available protections (e.g. full and timely insurance, contractual force majeure provisions, sponsor guarantees)

Source: Scope Ratings.

8.3.2 Default timing

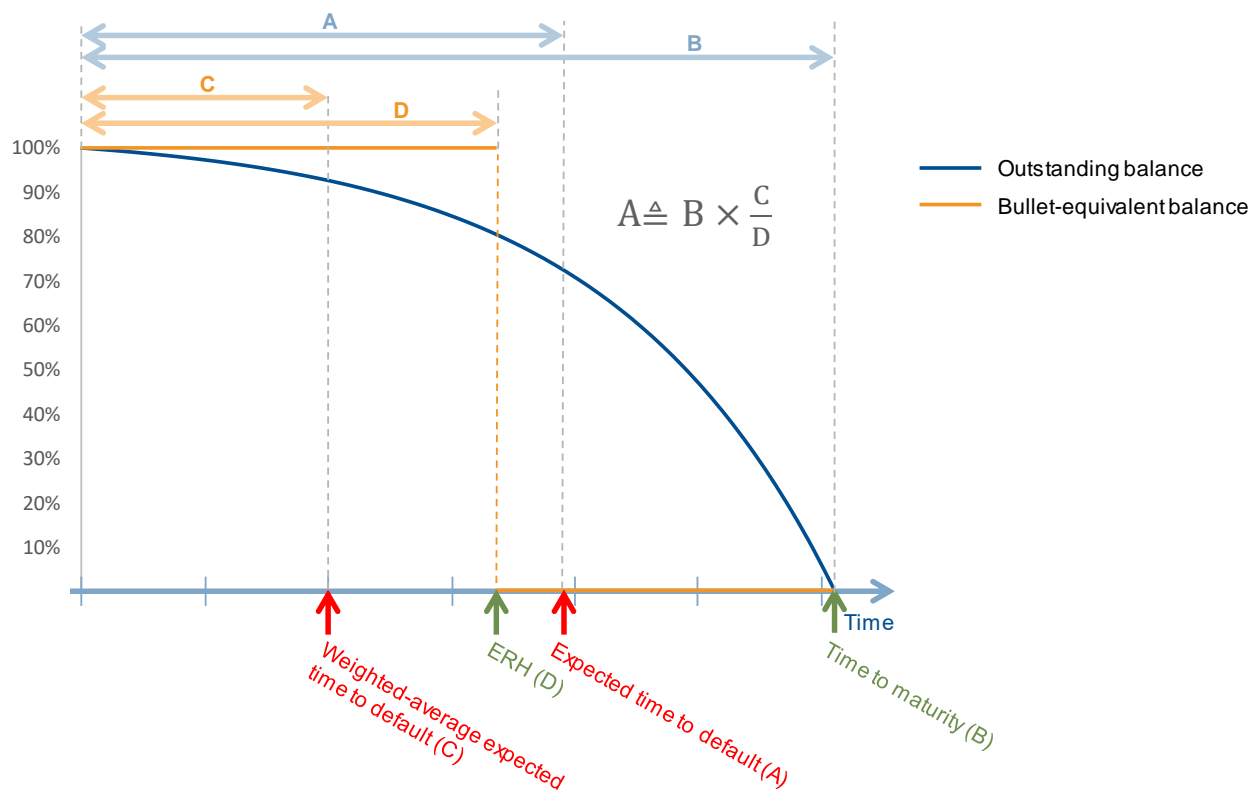
We calculate the expected time to default based on the likelihood of credit-impairment events of a risk area. The expected time to default is the probability-weighted time of default, assuming the idealised time-distribution of defaults implicit in our idealised probability of default (PD) table.

An exposure's risk horizon under any given scenario is equal to the debt instrument's duration under that scenario when assuming a 0% discount rate. The expected risk horizon (ERH) of an exposure is equal to the probability-weighted average risk horizon of

the debt instrument under all scenarios. Appendix II 'Technical note on the expected loss framework' shows how the risk horizon is calculated.

The weighted-average expected time to default (C) is to the expected time to default (A) what the expected risk horizon (D) is to the time to maturity (B) (see Figure 13). We use the ratios in Figure 14 to estimate the expected time to default and the expected weighted average time to default of the credit exposure for each of the risk areas.

Figure 13. Derivation of the expected time to default



Source: Scope Ratings.

Expected time to default is used to determine the expected balance drop of the credit exposure and to adjust the recovery rate for amortisation over the time the project is performing; the expected weighted average time to default concept is used to determine the expected time to default, given the PD strength of each risk area. Appendix I explains the definition. See section 8.4.1.6.

Figure 14. Default timing assumptions as a function of probability of default strength of a risk area

Risk area PD strength (as label of vector in our idealised PD table)	Weighted average expected time to default divided by ERH (proxy of expected time to default divided by time to maturity)
Risk free	n/a
aaa	68%
aa+	67%
aa	65%
aa-	65%
a+	63%
a	61%
a-	60%
bbb+	58%
bbb	56%
bbb-	54%
bb+	50%
bb	48%
bb-	47%
b+	43%
b	41%
b-	38%
ccc	33%
cc	23%
c	12%

Source: Scope Ratings.

8.4 Severity of credit-impairment events

This methodology uses the concept of recovery in relation to the investor's exposure (i.e. the entire project, project-level recovery; or a debt instrument, tranche-level recovery) and at the time of the analysis. The recovery rate is complementary to the severity or loss given default. We use two methods to derive the expected recovery rate used in the calculation of expected loss of a credit exposure to a project: i) standard recovery assumptions with adjustments; and ii) project-specific recovery assumptions (at project or debt instrument level, as applicable). Both methods ensure that the recovery assumptions remain linked to the specific characteristics of the project and debt instrument being rated. We typically use project-specific recovery assumptions for the three most material credit-impairment events (i.e. usually those events with either the highest likelihood or the highest severity). We use standard recovery assumptions with adjustments for all other credit-impairment events.

8.4.1 Standard recovery assumptions with adjustments

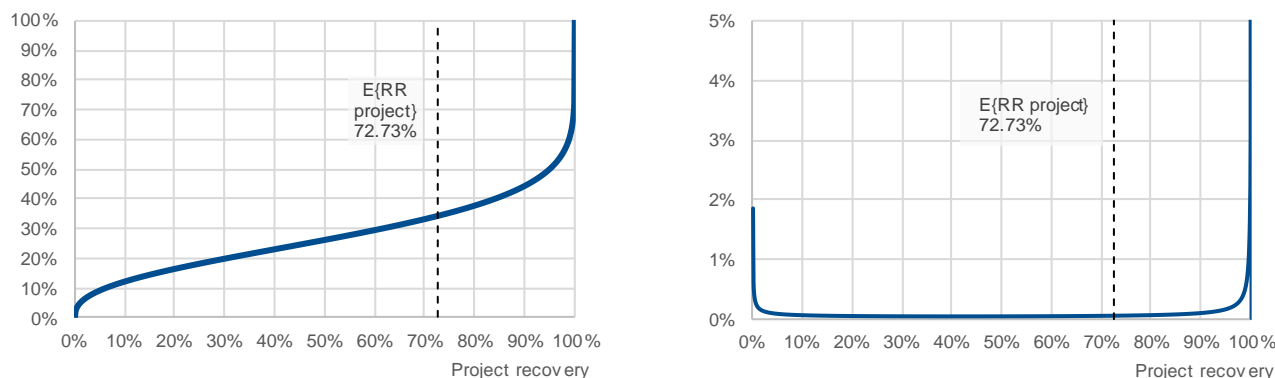
We analyse the severity of the less-material credit-impairment events using standard recovery assumptions. We adjust generic assumptions to the characteristics of the project and debt instruments at a later stage. The framework captures the seniority, the recovery characteristics of the project, the rate promised to the investor, and the repayment profile of the specific project's debt instruments.

Standard recovery assumptions take the form of recovery rate probability distributions and are specific to: i) the resilience of the asset value to stress (see Figure 16); and ii) each credit-impairment event. Recovery assumptions refer to the end of the resolution process, i.e. when the restructuring (or liquidation) is complete.

This analytical framework reflects the bar-belled nature of recoveries in project finance: bimodal with very high recovery rates being the most likely mode; and very low recovery rates being the second mode (see Figure 17 right). We assume a Beta recovery distribution, which allows for the modelling of bar-belled recoveries. For certain credit-impairment events, there is a sizeable

probability of catastrophic losses with almost zero recovery. The charts in Figure 15 show an example of a bar-belled recovery rate distribution.

Figure 15. Example of a bar-belled recovery rate distribution
Left: cumulative probability distribution (CPD). Right: probability density function (PDF).



Note: $E\{RR\ project\}$ stands for expected project-level recovery rate as of the end of the resolution process.

Source: Scope Ratings

8.4.1.1 Asset-value resilience to stress

We select one of two sets of recovery distributions for the analysis of a project, depending on the resilience of the asset's value to stress, i.e. either lower or higher as defined in Figure 16. Appendix VIII contains all of our standard project-level recovery assumptions, grouped by asset-value resilience, both lower and higher. The charts from Figure 37 to Figure 41 on page 47 show for a lower asset-value resilience the project-level recovery distributions for credit-impairment events related to the five risk areas of our analytical framework. The charts from Figure 42 to Figure 46 on page 49 show the distributions for a higher asset-value resilience.

Our choice of recovery assumptions can depend on many factors, both internal and external to the project. Figure 16 shows examples of internal and external factors that would drive the selection of recovery rate distributions associated with a higher asset-value resilience under stress.

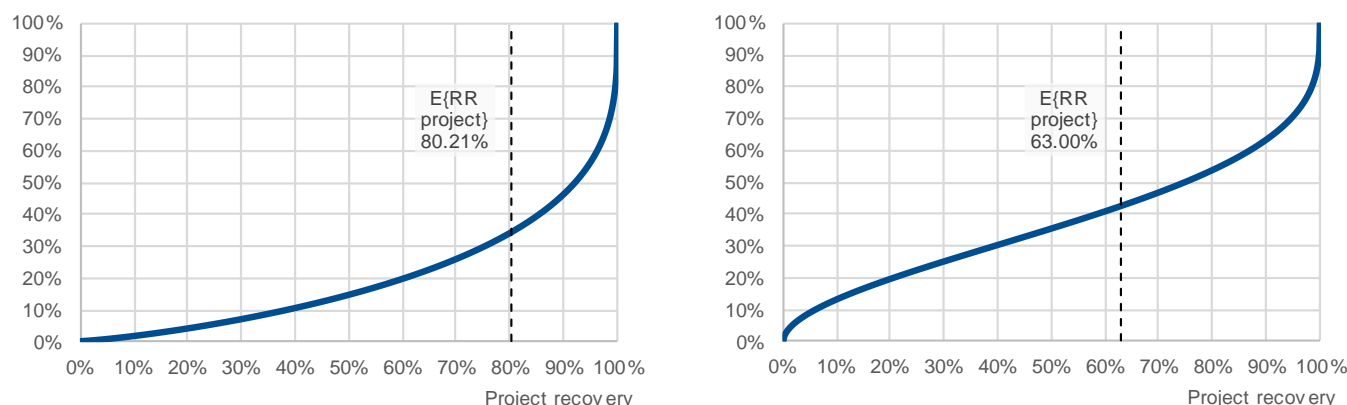
Figure 16. Recovery assumption as a function of asset-value resilience to stress

Asset-value resilience to stress assumption	Example of internal factors	Example of external factors
Higher	<ul style="list-style-type: none"> Stable and predictable cashflows, largely independent of the economic cycle (e.g. availability-based projects) Strong economic fundamentals underpinning significant overcollateralisation of debt (e.g. project life coverage ratio, "PLCR"> 3x) Termination compensation covering debt and lost interest 	<ul style="list-style-type: none"> Essential or strategic nature of the project limiting the risk of the asset being stranded (e.g. hospitals) Presence of multilateral financial institutions discouraging government interference such as expropriation or transfer restrictions (e.g. participation of EIB, EBRD, or AIIB)
Lower	(opposite)	

Source: Scope Ratings.

Figure 17 shows two examples of a cumulative probability distribution of project-level standard recovery rates. The left chart reflects an asset with a higher asset-value resilience; the chart on the right represents an asset with a lower asset-value resilience.

Figure 17. Examples of cumulative probability of Beta-distributed project-level standard recovery rates. Left: higher asset-value resilience. Right: lower asset-value resilience.



Note: $E\{RR_{project}\}$ stands for expected project-level recovery rate as of the end of the resolution process.
Source: Scope Ratings

Figure 18 shows the typical asset-value resilience to stress that we expect projects to exhibit on average in a given sector.

Figure 18. Typical asset-value resilience as a function of sectors

Sector	Typical asset-value resilience
Chemicals	Lower
Infrastructure & transportation	Higher
Manufacturing	Lower
Media & telecom	Higher
Metals & mining	Lower
Oil & gas	Lower
Power	Higher

Source: Scope Ratings

8.4.1.2 Recovery adjustment for the seniority of the exposure

This adjustment converts the project-level recovery distribution into a recovery distribution that reflects the specific seniority of the analysed debt instruments at the end of the resolution process. The credit enhancement from the tranche's seniority and thickness determines the shape of the tranche-level recovery distribution and its mean, the tranche-level expected recovery.

A senior tranche will generally only be exposed to the tail risk of the recovery distribution curve, or high severity outcomes; whereas a junior tranche will also be exposed to losses from milder scenarios, and the severity of such losses will be greater in percentage terms.

For example, Figure 19 and Figure 20 show how the same project-level recovery leads to significantly differentiated tranche-level recovery distributions. The first shows the adjustment for a senior tranche attaching at 40% and detaching at 100% of the project's capital structure². The second shows the adjustment for a mezzanine tranche attaching at 15% and detaching at 40% of the project's capital structure.

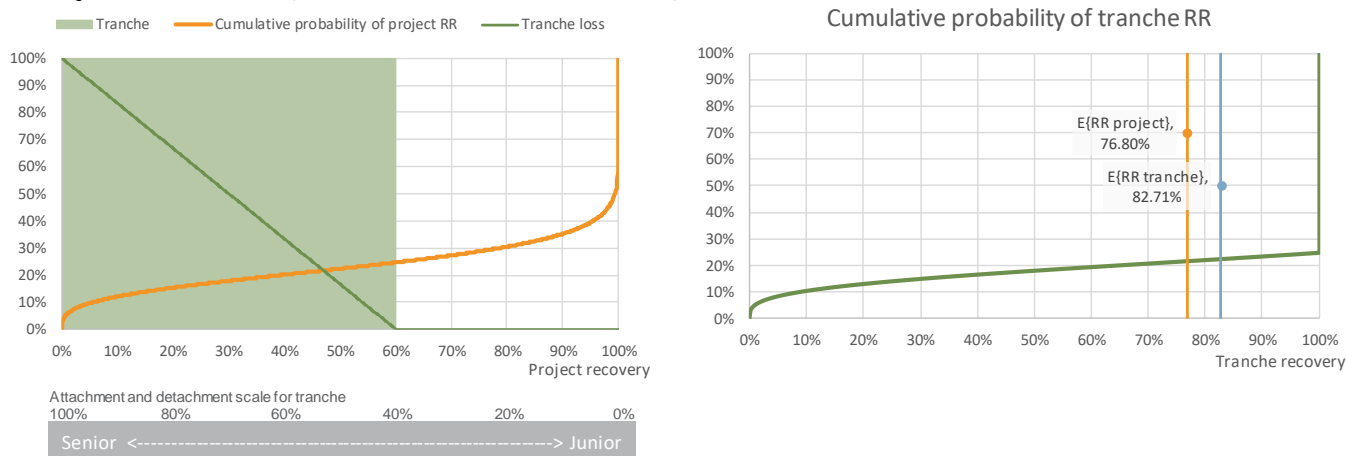
In the case of the senior tranche in Figure 19, the left chart represents the cumulative probability of project-level recovery rates (orange line). For each recovery rate value, the instrument or tranche suffers the loss indicated by the green line (in a percentage of the instrument notional). For example, there is a 25% probability that the investor in the senior tranche will suffer some level of loss (i.e. the value of the orange line when the green line is zero). The right chart represents the cumulative probability of tranche-

² A tranche attaching at 40% is senior to more junior liabilities representing 40% of the entire capital structure. A tranche detaching at 40% is junior to more senior liabilities representing 60% of the entire capital structure. Hence, a tranche attaching at 0% is the equity piece in the capital structure, whereas a tranche detaching at 100% is the most senior liability in the capital structure.

level recovery rates (green line). It also shows that there is a 25% probability that the investor in the senior tranche will suffer some level of loss (i.e. the value of the green line when it first touches 100% recovery). The expected recovery for the instrument is higher than the expected recovery for the entire project.

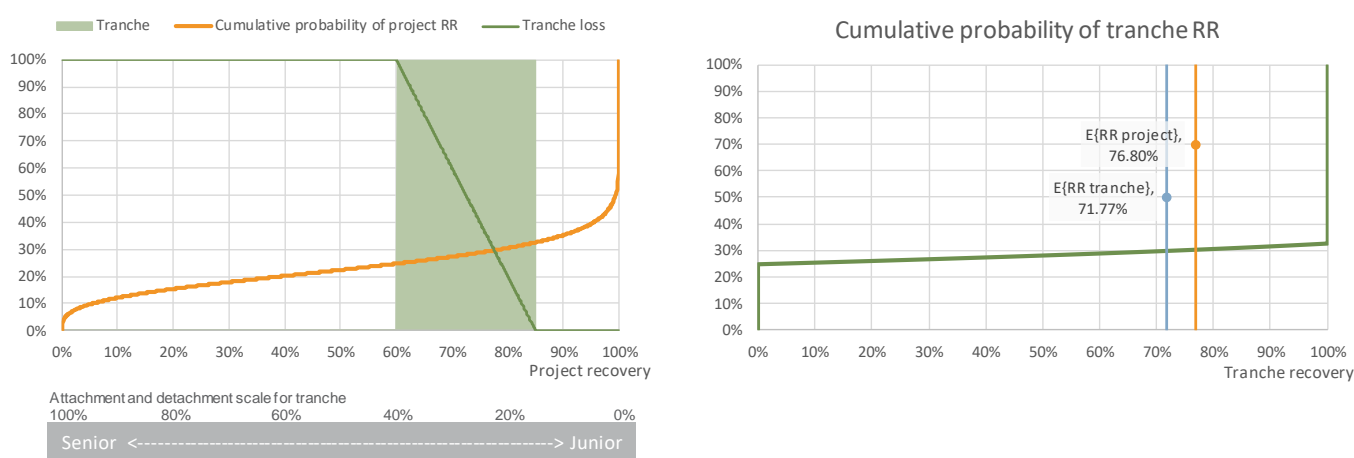
In the case of the mezzanine tranche in Figure 20, the tranche suffers a complete loss with a probability of 25% and no loss with a probability of 68%. The expected recovery for the instrument is lower than the expected recovery for the entire project.

Figure 19. From project-level to tranche-level recovery: senior exposures



Source: Scope Ratings.

Figure 20. From project-level to tranche-level recovery: mezzanine exposures



Source: Scope Ratings.

8.4.1.3 Expected standard recovery value

This step of the analysis converts the tranche-level recovery distributions for the different credit-impairment events into the respective expected recovery values, which can be used to calculate expected loss. We calculate 16 expected recovery values, one for each of the credit-impairment events considered in the analytical framework. Each expected recovery is the mean of the tranche-level recovery distribution of the corresponding 'standard' credit-impairment event, at the end of the resolution process.

8.4.1.4 Adjustment to the project's recovery strengths and weaknesses

We adjust the standard expected recovery from the previous step to reflect the project's specific recovery strength. The analyst scores the recovery strength and converts the weighted average score into a recovery haircut applicable to the standard expected recovery. Recovery haircuts can be negative when a project's recovery characteristics are stronger than average and range between +40% and -30%. The following expression shows the adjustment:

$$(1) \text{ Project-specific expected recovery}_{\text{At time of default}}^{\text{Tranche-level}} = (1 - RR\text{haircut}) \times \text{Standard expected recovery}_{\text{At time of default}}^{\text{Tranche-level}}$$

We consider four recovery-specific risk factors to assess recovery strength and facilitates the adjustment of the standard recovery assumptions to the characteristics of a specific project. Some of these factors influence the recovery distribution assumptions as well as the adjustment to the project's specific expected recovery, allowing further differentiation between projects (e.g. economic fundamentals). Figure 21 presents the recovery risk factors; detailed analytical guidelines for their assessment are provided in Appendix VII.

Figure 21. Recovery risk factors contributing to the severity of credit-impairment events

Recovery risk factor	Description
Project security	<p>Project security assessment is central to the recovery evaluation. Typically, we assume that the entire project (physical assets, contracts, accounts) is pledged as security and that creditors benefit from clear step-in rights and a strong intercreditor agreement (if applicable). Step-in provisions enable creditors to take control of the entire project's assets, with minimum disruption to its cash flow generation. A strong intercreditor agreement aligns the interests of the lenders and nominates a third party (such as the agent bank) to facilitate the project restructuring throughout resolution.</p> <p>Any limitations on security, step-in rights or weaker inter-creditor agreements (e.g. no clear mechanism for resolution) result in negative adjustments to standard recovery values.</p>
Collateral enforceability	<p>The ability of the lenders to foreclose on project collateral in an event of default influences the severity of default events. The assessment of collateral enforceability includes an evaluation of: whether foreclosure is permitted; the expected costs (and taxes); and the expected timing of enforcement. Also important are the track record of actual costs and foreclosure periods in the relevant jurisdiction, and compliance with local law formalities.</p>
Recovery enhancements, termination provisions	<p>We may consider structural or third-party enhancements to the security of a debt instrument. Such enhancements reduce the expected severity upon default. For example, favourable termination provisions in a concession agreement, the presence of multilateral lenders, certain types of insurance provisions, etc.</p>
Fundamental economic value of the project	<p>The fundamental economic value of a project in respect to its capital structure also drives default severity. It is important to analyse the fundamental characteristics of the underlying project asset within its economic life (e.g. predictability of revenue stream, country risk) against the project's total leverage in relation to the credit exposure (i.e. leverage considering all claims ranking senior or pari passu, including financial debt and negative market values of swaps or other derivatives).</p> <p>This recovery risk factor also considers the PLCR as a proxy of the ability of future cash flows to service outstanding debt.</p>

Source: Scope Ratings.

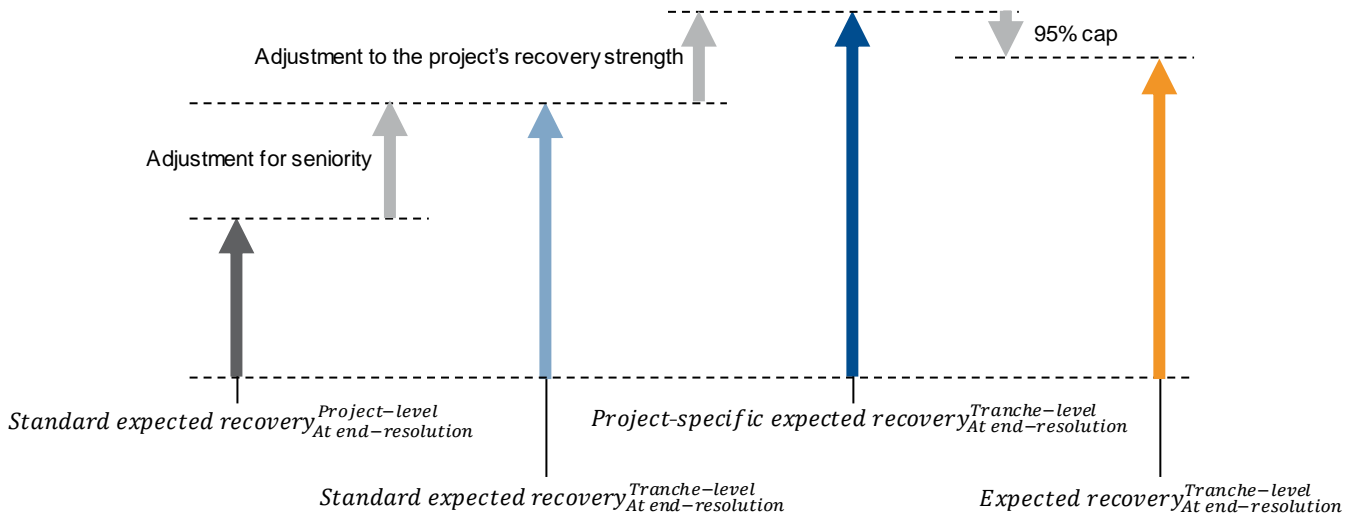
8.4.1.5 Limit to the highest expected recovery (recovery cap)

We will generally not consider recovery rates higher than 95%. This limit or *cap* is applied to the expected recovery rate calculated for the tranche after applying the haircut specific to the project. This limit represents the maximum tranche-level expected recovery which we consider at the time of default. The following expression shows the cap:

$$(2) \text{ Expected recovery}_{\text{At end-resolution}}^{\text{Tranche-level}} = \min(95\%, \text{Project-specific expected recovery}_{\text{At end-resolution}}^{\text{Tranche-level}})$$

This cap increases the confidence level of the expected loss calculation for the highest rating categories, and also addresses the mathematical impossibility of seeing an expected recovery rate that is equal to 100%.

Figure 22. Adjustments to recovery rates at the time of default



Source: Scope Ratings.

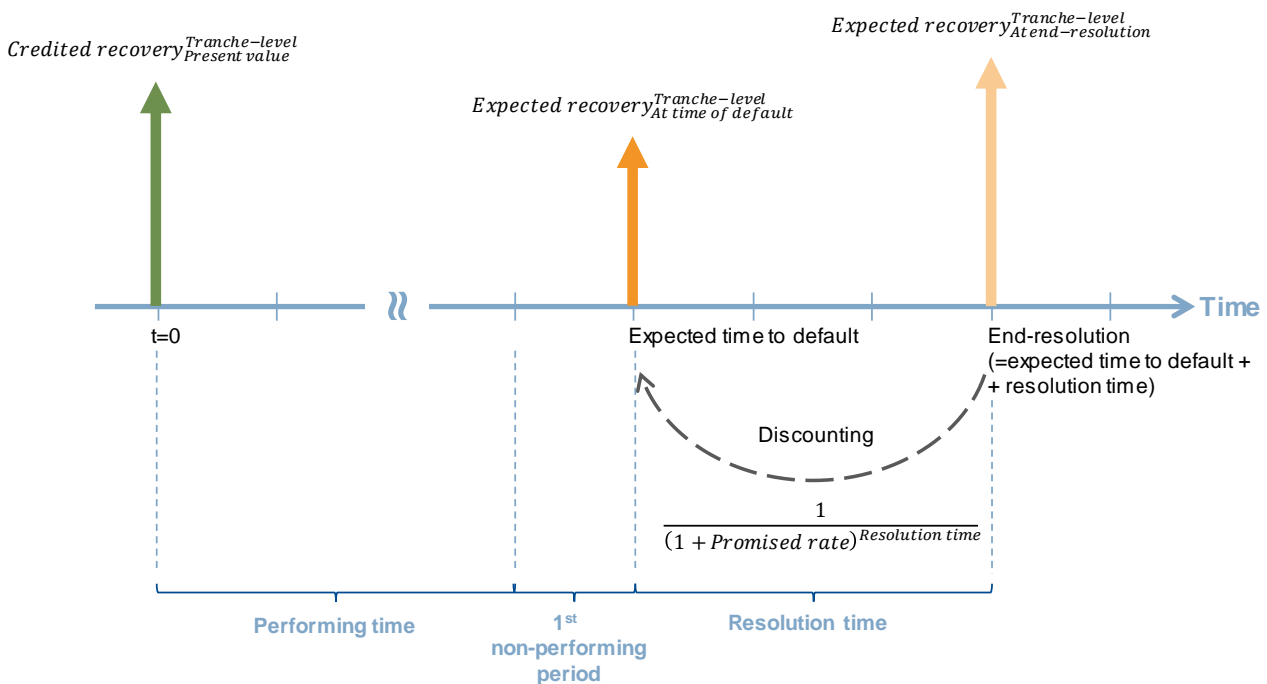
8.4.1.6 Recovery adjustment for time value of money: rating to the promise

This adjustment reduces the recovery rate at the end of the resolution process to produce the expected recovery rate at the expected time to default. We discount the expected recovery at the rate contractually promised to the investor, and over the resolution time (see Figure 23). Additionally, we also account for the coupons received during the time the project is performing. This makes the rating methodology sensitive to the rate promised to the investor. The following expression shows the adjustment:

$$(3) \text{ Expected recovery}_{\text{At time of default}}^{\text{Tranche-level}} = \frac{\text{Expected recovery}_{\text{At end-resolution}}^{\text{Tranche-level}}}{(1 + \text{Promised rate})^{\text{Resolution time}}}$$

It is important to note that the above recovery rate refers to the total debt outstanding at the time of default, which includes the interest accrued over the last payment period before default (i.e. the period for which interest and coupon are not received). We assume a complete default occurs on the payment date when the project becomes impaired.

Figure 23. Adjustment for time value of money



Source: Scope Ratings.

8.4.1.6.1 Resolution time assumptions

We use country-specific resolution time assumptions when discounting the expected recovery rate at the end of the resolution process. The resolution time assumptions consider the volatility of times reported by the project finance data consortium for the different regions, and the differences in resolution processes across countries.

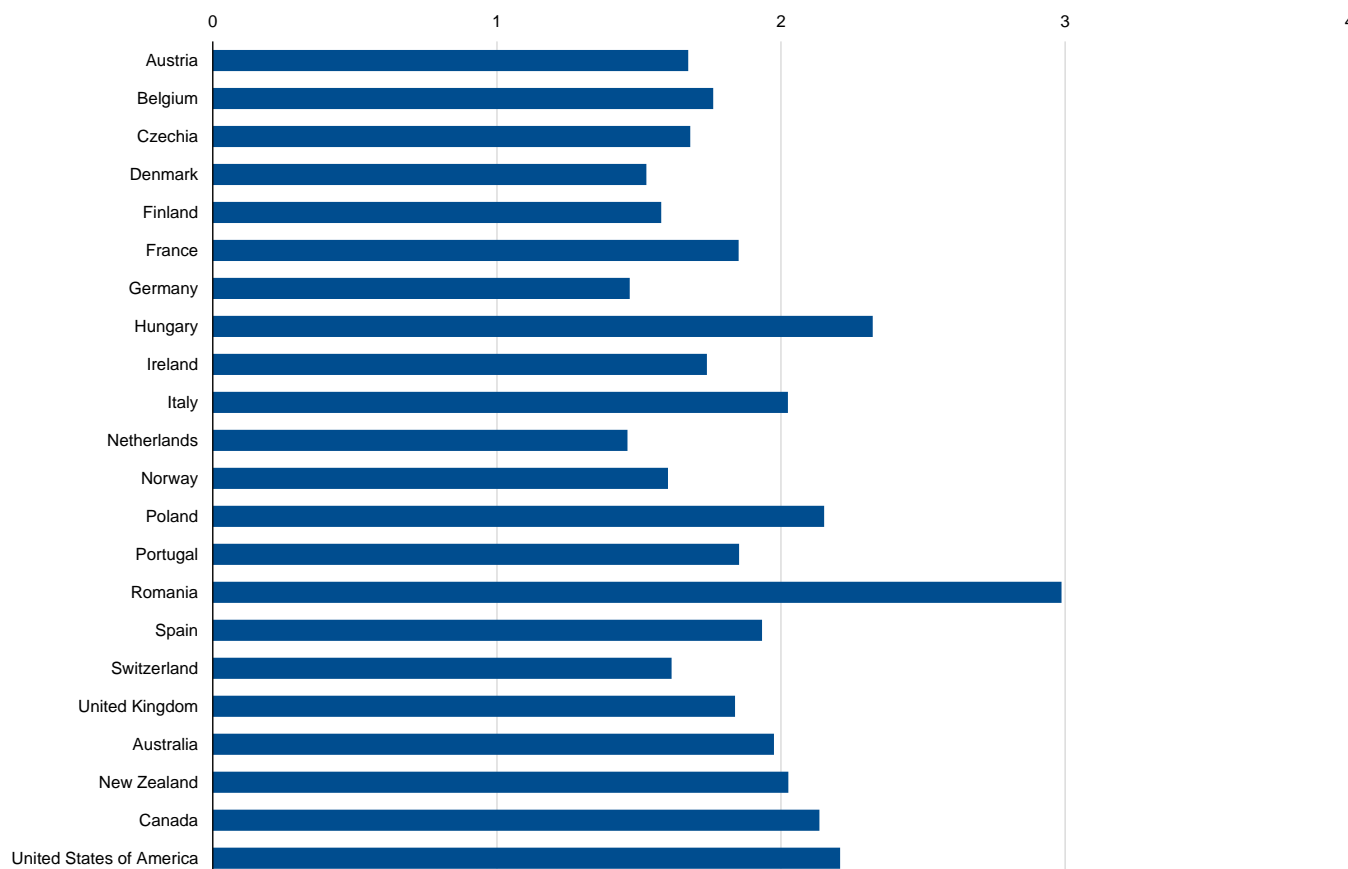
Figure 24. Stressed resolution times for project finance data consortium regions

Region	Resolution time (years)
Africa and Middle East	2.00
North America	2.50
Western Europe	2.00
Latin America	3.75
Oceania	2.00
Asia Pacific	3.75

Source: Project finance data consortium and Scope Ratings.

The resolution time of a region is then distributed across countries based on the relative fundamental strength of each legal and insolvency regime (see Figure 25). Resolution time assumptions are not expected values, but stressed assumptions because they are not rating-level conditional in our analysis.

Figure 25. Stressed resolution times for selected countries (in years)³



Source: Scope Ratings.

³ The assessment of the fundamental strength of a country's legal and insolvency regime includes the following criteria: i) sophistication of insolvency laws; ii) insolvency moratorium; iii) overreaching of the borrower's insolvency estate; iv) OECD membership; v) sovereign credit rating; vi) World Justice Report – Rule of Law Index; vii) Heritage Foundation – Freedom Index; viii) World Economic Forum – Global Competitiveness Report.

We increase the country resolution assumption by 50% for projects that present enforceability risk (i.e. 'collateral enforceability' recovery risk factor scored 'high'). Expression (4) shows the calculation of the project's resolution time assumption.

$$(4) \text{ Project resolution time} = \text{Country resolution time} \times \left(1 + \begin{matrix} 50\% \text{ if enforceability risk} \\ \text{or} \\ 0\% \text{ otherwise} \end{matrix} \right)$$

8.4.1.7 Recovery adjustment for amortisation: fast deleveraging vs refinancing risk

We give partial credit to amortisation because the coupons and principal received by the investor over the time the project is performing cannot be lost. This adjustment makes this rating methodology sensitive to the deleveraging speed of the credit exposure and possible refinancing risk.

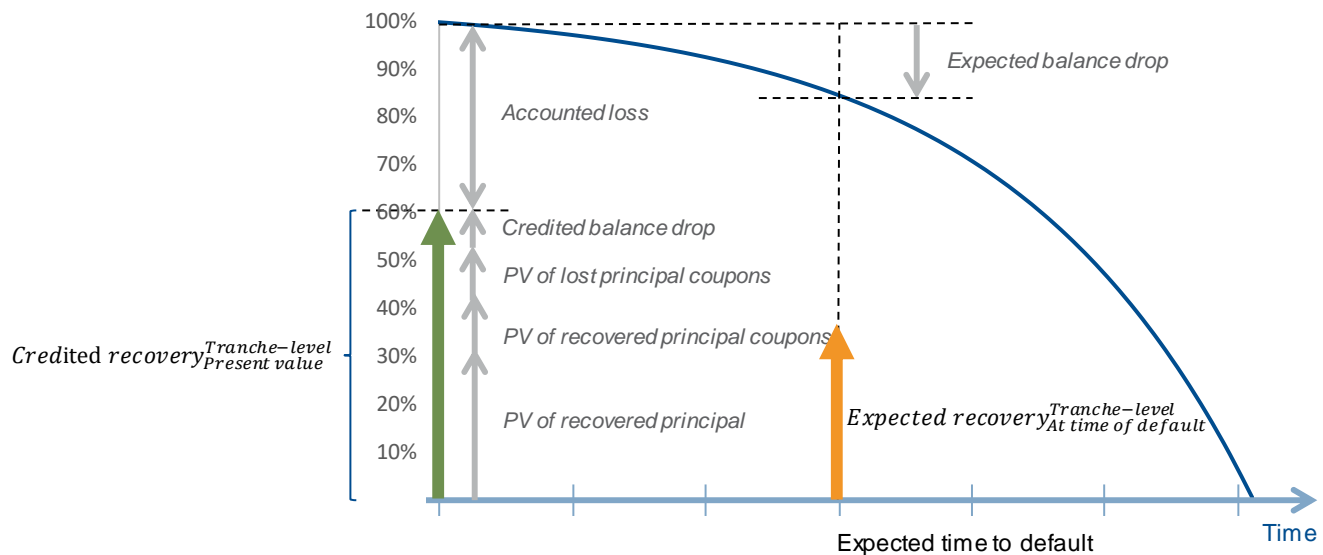
We give credit to 50% of the expected balance drop because of the uncertainty around the expected time to default. With this adjustment, the expected recovery rate at time of default is transformed so it can be applied to the exposure outstanding at the time of the analysis, rather than at the moment of default. The following expressions show the calculation of the final recovery rate we consider in our analysis. The expected performing time is equal to the expected time to default minus one payment period. Note expression (5) includes the discounting over the resolution time as explained in the previous section.

$$(5) \text{ Credited recovery}_{\text{Present value}}^{\text{Tranche-level}} = 1 - (1 - \text{Balance drop}_{\text{credited}}) \times \frac{1 - \frac{\text{Expected recovery}_{\text{At end-resolution}}^{\text{Tranche-level}}}{(1+r)^{\text{Resolution time}}}}{(1+r)^{\text{Performing time}}}$$

$$(6) \text{ Balance drop}_{\text{credited}} = 50\% \times \text{Balance drop}_{\text{expected}}$$

$$(7) \text{ Performing time} = \text{Expected time to default} - \text{Payment period}$$

Figure 26. Adjustment for amortisation



Source: Scope Ratings.

8.4.1.8 Example

Error! Reference source not found. contains a full numerical example of the sequence of adjustments to calculate the expected recovery rate that applies to a given credit-impairment event impacting a specific credit exposure to a specific project.

8.4.2 Project-specific recovery assumptions

We typically perform a fundamental analysis of the expected recovery rate under certain credit-impairment events by estimating the cash flows to the investor using our own analytical base case from the third party project financial cash flow model. We usually use the three most relevant credit-impairment events for this analysis. These are often the most likely or largest contributors to

total expected loss, but may also be events that are most sensitive to certain relevant risk factors in a particular project. These events generally represent at least 40% of the total probability or expected loss of all credit-impairment events affecting the project.

We modify the project's cash flow model, when available, and use it to derive the expected recovery rate under each of the relevant credit-impairment events. We prepare our own simplified cash flow forecast in the absence of the cash flow model.

We stress the inputs to the project's financial cash flow model to reflect the conditions leading to each of the relevant credit impairments. The recovery rate we calculate is the rate applicable at the time of impairment to the exposure outstanding at that point in the life of the instrument. The recovery rate represents a calculation of the impaired PLCR at the time of impairment and requires adjustments to convert it to a recovery rate applicable to the outstanding exposure at the time of analysis. These adjustments are the same as those applied to the standard recovery rates discussed in section 8.4.1 (i.e. maximum recovery limit, time value of money adjustment, amortisation adjustment up to the date of impairment).

Generally, we consider two possible scenarios for the calculation of project-specific recovery assumptions: i) a **project sale scenario** in which the project is sold to new debt and equity investors; and ii) a **going concern scenario**, in which the senior creditors take control of the project and stay invested, either retaining or replacing the initial sponsor. Figure 27 lists the assumptions associated with each scenario, while Figure 28 and Figure 29 illustrate the loss of value and how the value is allocated in the restructuring process under these two scenarios. Assumptions listed in Figure 27 are representative of most projects, but there may be exceptional cases where we use modified assumptions, in particular when we expect that the credit impairment event fundamentally alters the project's characteristics. For example, if we were to assume that a credit impairment event leads to the loss of the project's key revenue contract and thus the project sells its output at volatile market prices, we would assume and disclose a more conservative capital structure than indicated in the table below. The recovery scenario for each relevant credit impairment event is based on the conditions laid out in Figure 27.

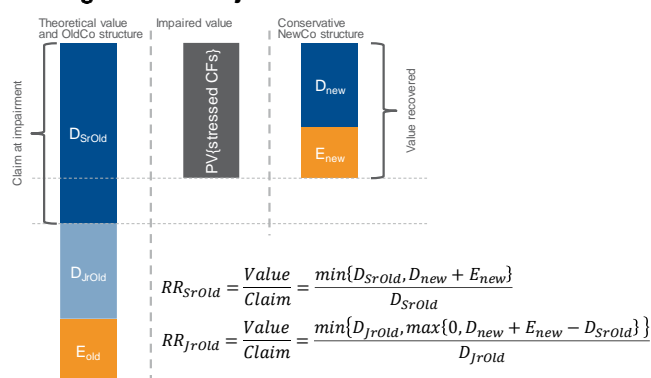
Figure 27. Summary of scenarios and assumptions for project- and credit-event-specific recovery calculations

Restructuring scenario → Element ↓	Base scenario Project sale (PSALE)	Alternative scenario Going concern (GCON)
Scenario	The project is sold in the market and proceeds are assigned to stakeholders according to priority.	The project is restructured and senior creditors take control. Stakeholders accept different levels of haircuts. The existing or a new equity/sponsor is supported by senior creditors.
Condition	(None. This is the base assumption.)	1) Senior creditors are experienced and comfortable with the project, technology and sector; 2) senior creditors are engaged in recurring business with the sponsor in other projects or the sponsor can easily be replaced for trustworthy alternatives; and 3) the circumstances of the corresponding credit impairment event do not suggest a forced project sale.
Source of recovery cash	Lump sum equal to the proceeds of project sale, considering termination provisions if applicable and discounting restructuring costs.	Impaired-asset cash flows over time. Restructuring costs are refinanced as a super-senior claim on the restructured project.
Super-senior debt and restructuring costs	Super-senior claims are paid before the rated debt (except if there is an exceptional priority of payments).	Senior creditors may take a haircut to transfer value to the new or old sponsor.
Subordinated debt	Subordinated claims remaining cash sequentially after super-senior claims, until fully redeemed.	Subordinated claims are likely to be fully wiped out.
Equity	Likely to be fully wiped out.	Equity gets whatever value the senior creditors agreed to share with the new or old sponsor.
Capital structure after restructuring	The capital structure of the NewCo is simple and defensive, with only debt and equity.	The capital structure of the NewCo is aggressive and highly leveraged, and only reflects equity in accordance with the value senior creditors share with the new sponsor.

Information available to stakeholders	Little information is available, high risk perceived by new stakeholders.	Plenty of information and long track record in similar projects, fixed risk perceived by senior creditors.
Cost of debt (Kd)	Cost of debt will carry a premium to reflect asymmetry of information: +50% stress.	No stress.
Cost of equity (Ke)	Cost of equity will carry a premium to reflect asymmetry of information: +50% stress.	Cost of equity is heavily reduced and made equal to the cost of debt. We assume the equity holder is not investing anything because its participation in the project has been granted for free by the senior creditors during the restructuring in order to incentivise its participation in the success of the restructured project.
Leverage	Conservative leverage because both new creditors and new sponsors would be very prudent when entering the project due to asymmetry of information and opportunistic bidding. Share of debt in restructured project is -16.67% lower than in the pre-restructured project (e.g. D=60% E=40% becomes D _R =50% E _R =50%).	Aggressive leverage because the value of equity will be the minimum amount that the senior creditors need to pass on to the sponsor in order to involve and incentivise the sponsor in the project. We assume a 95% share of debt.
Excess cash, reserves and non-operating assets	We assume a value of zero in all scenarios because excess cash, reserves and non-operating assets will have been consumed by the time the project fails to pay. When modelling from the financial cash flow model, the value considered will be that resulting from the stresses of the relevant credit impairment event.	
External RR enhancements	Recovery enhancements at the instrument level are applied to complement whatever recovery is achieved from the liquidation proceeds.	In the case of a going concern, the application of enhancements is decided on a case by case basis.
Terminal swap payments	Terminal payment is refinanced under the same conditions as the senior debt as a new paripassu claim on the project's value. The terminal payment is the marked-to-market value of the swap contract in the adverse scenario represented by the credit impairment event in question.	

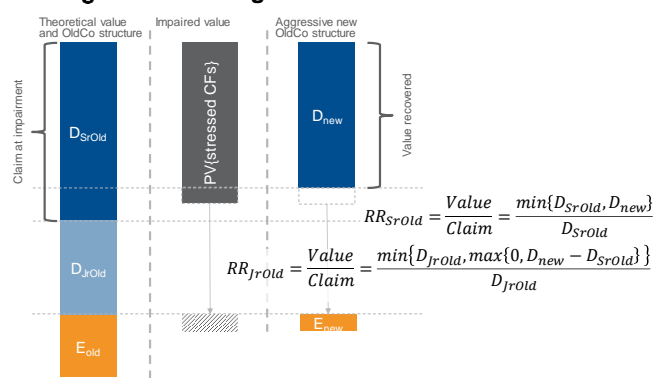
Source: Scope Ratings.

Figure 28. Project sale scenario



Source: Scope Ratings.

Figure 29. Going concern scenario



Source: Scope Ratings.

The main difference between the calculations under these scenarios is that the equity holder receives the equity as a 'gift' from the creditor under the going concern scenario – after the old equity holder has been totally wiped out. Thus, the value of the equity results from cash flows that the creditor agrees to pass on to the equity investor to incentivise his/her performance.

The recovery rate that is calculated at the time of impairment equals the stressed PLCR calculated for the rated debt.

The calculation process involves the following steps: i) the calculation of the stressed value of the project when the capital structure and cost of liabilities correspond to the assumptions provided in Figure 27 upon restructuring on the date of impairment considered for the calculation; ii) the valuation of cash flows allocated to the rated debt when discounted at the promised rate of return and on the date of impairment; iii) the assessment of the recovery rate on the date of impairment; and iv) the same adjustments described in sections 8.4.1.5 and 8.4.1.7 for the standard recovery rates, namely the limit to the maximum recovery and the adjustment for

amortisation. Notice that the adjustment described in section 8.4.1.6 for the standard recovery rates is not necessary in this case because the recovery rate calculated from the stressed valuation already considers the time value of money.

8.4.2.1 Restructuring expenses

We assume that the restructuring expenses are refinanced at the same cost and terms as any existing super-senior claims on the project. We assume a cost of 5% of the stressed project value subject to a floor of EUR 0.5m to account for all restructuring costs (e.g. arranger, structurer, placing agents, legal and technical advisers, etc).

8.4.2.2 Taxes

We perform value calculations using the capital cash flow of the stressed project. This allows us to ignore tax considerations if discounting is performed with the weighted average cost of capital before tax ($WACC_{BT}$).

8.5 Expected loss calculation and quantitative rating indication

We calculate the contribution to total expected loss of each credit-impairment event by multiplying its likelihood with its expected severity (i.e. equal to one minus the expected recovery of the event). The total expected loss for the investor in the rated debt instrument(s) is the sum of the contributions of all credit-impairment events. We compare the total expected loss to the maximum losses defined for each rating category at the project's risk horizon (i.e. the expected risk horizon) and determine the rating level that corresponds to the credit exposure under analysis. Appendix II provides additional details about the application of the expected loss framework and one simple numerical example and Appendix III provides additional details about assessing the timely payment of interest.

8.6 Probability of hard default and hard recovery rate

Although we do not use them to derive the rating, our analytical approach provides two credit metrics which are useful for risk management: i) the probability that the investor will lose one euro or more from having invested in a given instrument (i.e. the probability of *hard* default); and ii) the expected recovery rate upon hard defaults (i.e. the *hard* recovery rate). The probability of hard defaults is typically lower than the likelihood of credit impairment events because the definition of a hard default is narrower. This is because impairment events do not always result in a failure to pay or in a haircut on the outstanding claim of senior creditors. These metrics are related to the metrics banks and institutional investors use internally when they produce regulatory PD and LGD calculations and can be considered estimates of the regulatory PD and recovery rate. Appendix IX explains how we derive these credit metrics.

9 Counterparty risk

We analyse counterparty risk alongside the project's fundamental characteristics. Our scores reflect the credit implications of financial and operational exposures to the different counterparties. The different risk factors' contributions to total loss embed our expectations of how counterparty risk affects the project's credit performance in each risk area considered.

We assess the risk factors that refer to a relevant counterparty's credit quality using our ratings, credit estimates, assessments of credit risk, or public ratings issued by other regulated rating agencies. We may also leverage on internal ratings by financial institutions approved for the internal ratings-based (IRB) approach, but before doing so will analyse the bank's rating system and map the internal categories to our rating scale. The depth of the assessment of a counterparty's credit quality depends on the importance of the counterparty's role in the transaction, the availability of alternative providers in the market, and the ease of replacing a defaulted counterparty. We also consider the availability of suitable alternatives in the market and the ease with which a counterparty could be replaced where relevant.

We analyse the materiality of a relevant exposure to an external counterparty, depending on how severely a counterparty failure could impact the credit performance of the rated instrument. We distinguish financial risk from operational risk and assess how well available remedies mitigate or reduce risk exposures to counterparties in the context of the project. Remedies common in project finance, particularly for financial counterparties, include minimum credit ratings, replacement language, financial guarantees, and cash collateralisation. Financial exposures are often diversified among several counterparties, reducing excessive reliance on a single risk presenter. Examples include the common practise in project finance to maintain several bank accounts with different banks.

For material exposures, we assess the rated instrument's sensitivity to a counterparty default and quantify the impact on the rating, taking into account the counterparty's credit quality, the size of the risk exposure, as well as the exposure's duration. We may constrain the rating if there is a material, unmitigated risk exposure to a counterparty and remedies are unavailable or ineffective. Examples include potentially sizeable derivative exposures to hedge providers, letter-of-credits covering equity commitments, or large exposures to account banks such as maintenance or balloon reserve accounts. For details on the counterparty assessment of financial counterparties, refer to our [Rating Methodology for Counterparty Risk](#).

10 Legal analysis

Similar to the treatment of counterparty risk, we analyse the credit implications of a project's material legal aspects along with its fundamental characteristics. We then score the contributions to total loss of the relevant risk factors. Our analysis generally considers three sources of possible legal risks: i) the security; ii) the issuer of the rated debt; and iii) the transactional parties and documents. We review available legal opinions to gain comfort on its analytical assumptions in relation to relevant legal issues.

Some legal aspects relevant to project finance credit analysis are the same as those found in structured finance (e.g. related to the security, issuer or SPV, or documentation). For further details, see Appendix XI.

11 Sovereign risk

Our analysis includes a measure of country risk. We assess convertibility risk, obstructions to free capital transfers, and the risk of institutional meltdown over the risk horizon of the rated debt instrument(s) where relevant. Our ratings also take macroeconomic factors into account. We view a project finance transaction with a substantial exposure to a financially weak domestic sovereign as a material credit risk that would negatively impact the ratings, via the risk factors contributing to losses from credit-impairment events.

We typically carry out a qualitative, forward-looking assessment of the trends affecting the country and the economic activity of the sector to which the project is exposed. This analysis considers, where relevant, material macroeconomic, environmental, sovereign or industry risk factors that may impact the performance of the rated debt instrument(s).

However, we do not systematically limit the maximum rating achievable by a project finance debt instrument based on the sovereign credit quality of the country of the project. We believe the credit rating of a sovereign is, generally, not an adequate anchor for applying a rating cap, particularly in eurozone countries.

However, we believe credit ratings must adequately and consistently reflect the credit risks of a project, including risks arising from an exposure to a country with weak economic fundamentals. This gives investors the opportunity to consistently compare credit risks between different project finance exposures across different locations.

12 Rating sensitivity

Our project finance rating reports show the ratings' stability with respect to shocks on risk areas that contribute to losses for investors. Sensitivity analysis tests for shifts in the loss contributions of risk factors affecting a project and the expected recovery rate. This analysis illustrates how intensely ratings depend on the assessment of risk factors and the recovery assumption for a given project finance credit exposure. Sensitivity test scenarios should not be interpreted as likely or expected scenarios.

Figure 30 shows the typical sensitivity scenarios we report as part of the rating analysis. We could decide to lower the final rating assigned to a project finance debt instrument to increase the rating's stability in cases where excessive sensitivity to any key analytical assumption compromises an adequate level of stability for a rating.

Figure 30. Typical sensitivity tests considered during the analysis

Analytical assumption tested	Shifts considered
Stress to all risk factors in all areas	Scores reduced by one level
Shock stress to the risk area with the most relevant credit-impairment event	Scores driving relevant risk area reduced by two levels
Haircut to recovery	25% haircut to recovery assumptions

Source: Scope Ratings.

13 Consideration of environmental, social and governance factors

We recognise that environmental, social and governance (ESG) factors can affect a project's cash flows and the likelihood and severity of credit losses. The guidelines presented in this methodology embed ESG factors. Our project finance rating reports indicate where ESG factors are drivers of credit risk, for the benefit of investors willing to comply with the principles for responsible investment (PRI).

Appendix X shows the Project ESG Grid that we include in our rating reports to provide information on the ESG themes that we believe are relevant for the credit risk analysis of a project finance exposure.

14 Monitoring

We monitor project finance ratings using available performance reports produced by the technical advisors and the SPV. The ratings are monitored continuously and reviewed at least once a year or earlier if warranted by events.

15 Rating model

The analytical framework described in this methodology is implemented in our proprietary rating model named PF EL Model (the name stands for 'project finance expected loss model') version 1.2, available in Scope Rating's list of models, published under <https://scoperatings.com/governance-and-policies/rating-governance/methodologies>.

Appendix I PD and EL strengths

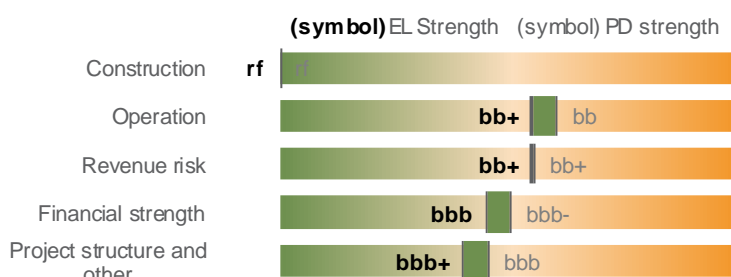
We use the terms probability of default (PD) strength and expected loss (EL) strength to point at specific vectors in the respective idealised tables. Strength levels are therefore not ratings.

PD strength is denoted by a lowercase symbol that points at a row in our idealised PD table. This table provides the default assumptions for rated assets in line with our methodologies for secured instruments.

EL strength is also denoted by a lowercase symbol that points at a row in our idealised expected loss table. This table provides the quantitative definition for our expected loss ratings in line with its methodologies for secured instruments.

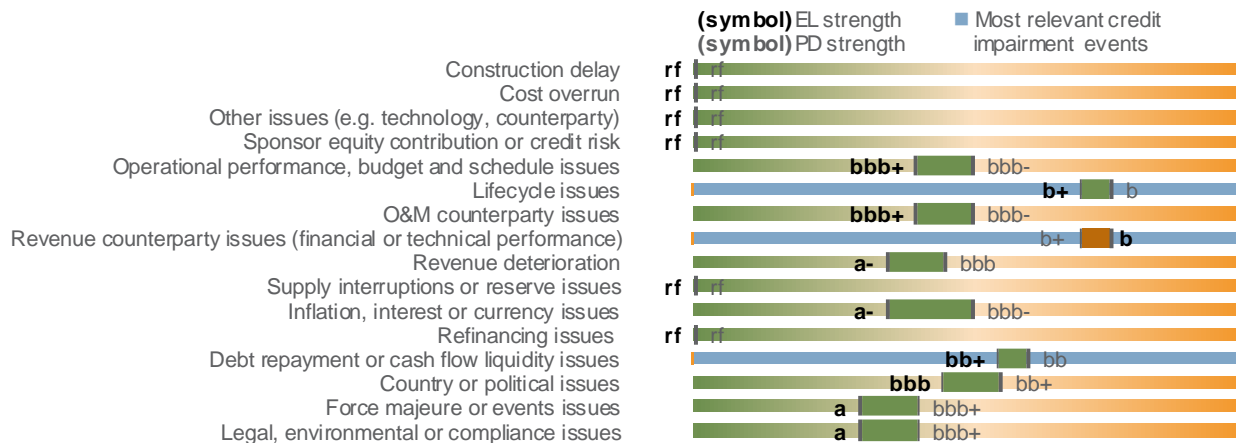
Figure 31 and Figure 32 show an example project's PD and EL strength levels in terms of risk areas and credit-impairment events, respectively.

Figure 31. PD and EL strengths of risk areas⁴



Source: Scope Ratings.

Figure 32. PD and EL strength of credit-impairment events



Source: Scope Ratings.

⁴ rf stands for risk free and does not provide any PD or EL contribution.

Appendix II Technical note on the expected loss framework

We analyse the probability-weighted average loss, i.e. the expected loss, and the probability-weighted risk horizon (RH), i.e. the *expected risk horizon* (ERH), for any given exposure to project finance credit risk. We compare the expected loss and the ERH to our idealised expected loss table and derive a reference rating indication for the rated credit exposure, be it an entire project or a project finance instrument.

A central analytical assumption is that the idealised credit-impairment events we consider are mutually exclusive from each other. The likelihood of each possible credit-impairment event is derived from the fundamental analysis of risk factors contributing to the risk of credit losses for debt instrument. We estimate the contribution to credit losses by applying sector- and event-specific recovery assumptions and the time value of money at the rate promised to the investor. Event probabilities are used to weight the severity or loss given default of each possible credit-impairment event. This can be effectively represented using a probability tree as depicted in **Error! Reference source not found.**

The probability or likelihood of a given credit-impairment event can be found by multiplying the conditional probabilities of the corresponding branch in the probability tree. For example, the likelihood of lifecycle issues is equal to the probability of surviving the construction phase, times the conditional probability that the operational risk area triggers a credit-impairment event, times the conditional probability that the project faces lifecycle issues. For the case study example in **Error! Reference source not found.**, REF_Ref528251051 \r \h **Error! Reference source not found.** shows that, the likelihood of 'Lifecycle issues' is 2.59%, which results from 100% likelihood of surviving the construction phase multiplied by the likelihood of credit impairment linked to the 'Operation' risk area, 3.61%, and multiplied by likelihood-share that corresponds to 'Lifecycle issues', 71.74%.

Losses are defined with respect to the current par value of the exposure (i.e. the present value calculated with the promised cash flows discounted at the promised rate). The loss given default of a credit-impairment event is the difference between the par value of the exposure and the present value of all principal and interest cash flows for the investor, also discounted at the promised rate of the exposure – as seen in expressions (8) through (10).

Total expected loss for the credit exposure is the sum of the expected loss calculated for each of the credit-impairment events.

$$(8) \text{ Expected loss} = \sum_{i=1}^N \text{prob}\{\text{Default-like event}_i\} \times \text{Loss}_i = \sum_{i=1}^N \text{prob}\{\text{Default-like event}_i\} \times (1 - \text{Recovery}_i)$$

$$(9) \text{ Loss}_i = \frac{\text{par} - \sum_{t=1}^T \text{PV}_{\text{promised rate}}(CF_t^i)}{\text{par}} \text{ or } \text{Recovery}_i = (1 - \text{Loss}_i) = \frac{\sum_{t=1}^T \text{PV}_{\text{promised rate}}(CF_t^i)}{\text{par}}$$

$$(10) CF_t^i = (\text{Principal } CF_t^i + \text{Interest } CF_t^i)$$

The risk horizon of an exposure under scenario j is derived from the sum of all cash flows for the investor under scenario j:

$$(11) RH^{\text{Scenario } j} = \frac{\sum_{t=1}^T t \times CF_{\text{total}}^{\text{Scenario } j}(t)}{\sum_{t=1}^T CF_{\text{total}}^{\text{Scenario } j}(t)}$$

$$(12) CF_{\text{total}}^{\text{Scenario } j}(t) = CF_{\text{principal}}^{\text{Scenario } j}(t) + CF_{\text{interest}}^{\text{Scenario } j}(t) + CF_{\text{recovery}}^{\text{Scenario } j}(t) + CF_{\text{other}}^{\text{Scenario } j}(t)$$

$$(13) \text{ Expected RH} = \sum_{j=1}^m \text{probability}\{\text{Scenario } j\} \times RH^{\text{Scenario } j}$$

The probability tree helps illustrate how each credit-impairment event contributes to the total expected loss from the project finance credit exposure. The loss rates or severities are expressed as a percentage of the exposure's notional at the time of the analysis.

Continuing the example of lifecycle issues in the same project presented above, the contribution to expected loss is equal to the product of the unconditional likelihood of lifecycle issues, 2.48%, and the severity of such credit-impairment events, 43%. This results in a contribution of 1.11% to the total expected loss of the project. Assuming an expected risk horizon of the credit exposure of 10 years and that all other credit-impairment events had the same severity, the corresponding category in our idealised loss curves would be BBB. We consequently set the expected loss strength of the project with respect to lifecycle issues at b⁵.

Finally, total expected loss in this example is the sum of all contributions as shown in Figure 33, for a total of 3.49%. This total expected loss over an expected risk horizon of 13.7 years is commensurate with a BBB expected loss rating because it is greater

⁵ Lowercase characters indicate that this is not a rating but a reference to the idealised loss curves.



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than 2.66%, the maximum expected loss on a BBB+ exposure over 10 years, and smaller than (or equal to) 3.75%, the maximum expected loss on a BBB exposure over 13.7 years.

Notably, the expected loss rating of the project in this example is one notch higher than the implicit PD strength of the project, bbb- (i.e. 8.5% over 13.7 years, as per the our idealised PD curves).

Figure 33. Example of calculation of total expected loss

	PD strength	Likelihood	Severity	Expected loss	EL strength
Construction delay Conditional likelihood = 0.00%	rf	0.0000%	48%	0.00%	rf
Cost overrun Conditional likelihood = 0.00%	rf	0.0000%	56%	0.00%	rf
Other issues (e.g. technology, counterparty) Conditional likelihood = 0.00%	rf	0.0000%	48%	0.00%	rf
Sponsor equity contribution or credit risk Conditional likelihood = 0.00%	rf	0.0000%	34%	0.00%	rf
Operational performance, budget and schedule issues Conditional likelihood = 13.81%	bbb-	0.4982%	23%	0.11%	bbb+
Lifecycle issues Conditional likelihood = 71.74%	b	2.5872%	43%	1.11%	b+
O&M counterparty issues Conditional likelihood = 14.45%	bbb-	0.5210%	23%	0.12%	bbb+
Revenue counterparty issues (financial or technical performance) Conditional likelihood = 85.88%	b+	2.0105%	60%	1.21%	b
Revenue deterioration Conditional likelihood = 14.12%	bbb	0.3305%	26%	0.08%	a-
Supply interruptions or reserve issues Conditional likelihood = 0.00%	rf	0.0000%	38%	0.00%	rf
Inflation, interest or currency issues Conditional likelihood = 31.99%	bbb-	0.4363%	22%	0.10%	a-
Refinancing issues Conditional likelihood = 0.00%	rf	0.0000%	36%	0.00%	rf
Debt repayment or cash flow liquidity issues Conditional likelihood = 68.01%	bb	0.9275%	48%	0.45%	bb+
Country or political issues Conditional likelihood = 59.85%	bb+	0.7357%	26%	0.19%	bbb
Force majeure or events issues Conditional likelihood = 20.07%	bbb+	0.2467%	26%	0.06%	a
Legal, environmental or compliance issues Conditional likelihood = 20.07%	bbb+	0.2467%	25%	0.06%	a
No credit impairments Conditional likelihood = 100.00%		91.4596%	0%	0.00%	
Total	0.0%	100.0%	40.9%	3.4920%	

Source: Scope Ratings.

Appendix III Technical note on timely payment

We may assign a lower rating than the rating obtained from the expected loss and expected risk horizon if the likelihood of impairment (i.e. the probability of project restructuring) is high relative to the expected loss. We expect this to be an uncommon scenario because expected recovery rates in project finance do not tend to be extremely high, due to the bar-belling of recovery distributions.

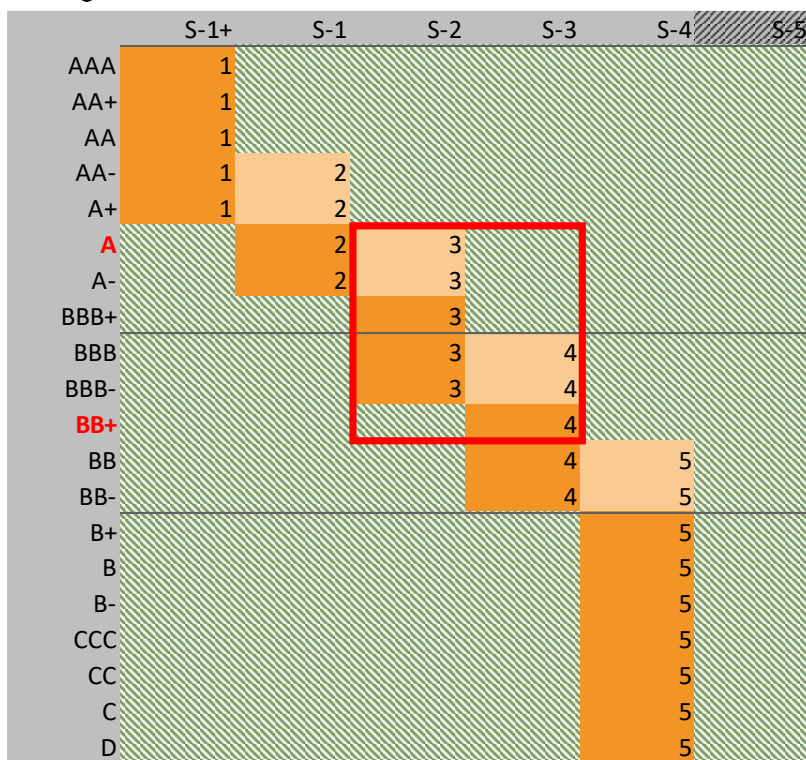
We assess the probability of restructuring in the context of the exposure's risk horizon to determine the implicit PD strength of the instrument, based solely on the likelihood of impairment as defined in this methodology. We then determine the distance between the PD strength that corresponds to the instrument's impairment likelihood and the rating obtained from the expected loss.

We limit the expected loss rating when it is much higher than the PD strength of the instrument. The maximum distance between the expected loss rating and the PD strength is defined by considering the relationship between the long- and short-term rating scales published in our rating definitions and available on our [website](#).

Most project finance ratings will reflect a two-notch uplift from the corresponding PD strength because the security package available to project finance investors typically allows for recovery levels of above 50%; only rarely does this uplift exceed four notches. We will limit the expected loss rating if the PD strength aligns with a short-term category in the fundamental credit rating scale which is at most one step – in the short-term scale – lower than the short-term category corresponding to the expected loss rating. In such case, we will assign an expected loss rating equal to the highest long-term rating possible for the matching short-term rating that is one step – in the short-term scale – higher than the short-term category that corresponds to the PD strength of the instrument.

In the example shown in Figure 34, we will typically assign a rating of A if the expected loss rating is A+ and the default probability's quality is commensurate with a BB+. This is because the short-term rating corresponding to an A+ is S-1+/S-1, and the short-term rating corresponding to a BB+ is S-3, which is more than one short-term category away from S-1. Consequently, the expected loss rating is limited at the highest rating that corresponds to a short-term S-2 category: A.

Figure 34.



Source: Scope Ratings.

Guarantors provide credit enhancement to the structure by way of credit substitution. Scope will consider whether the credit risk of the guaranteed transaction party can be replaced by the credit risk of the guarantor.

Appendix IV Approach for rating multiple debt instruments of the same issuer

According to our methodology, we can assign the same rating or different ratings to various debt instruments of the issuer (project company), depending on the underlying characteristics of the analysed instrument and its ranking in the project's cash flow waterfall.

Financial instruments can typically achieve the same rating as the main financial instrument of the project (e.g. term loan) if the following conditions are met:

- i) pari passu ranking in all scenarios,
- ii) access to the same project collateral,
- iii) cross default provisions,
- iv) the same maturity,
- v) no material difference in the amortisation profile, and
- vi) no material difference in the interest rate promised to the investor.

Examples of such instruments include ancillary facilities such as debt service reserve facilities (DSRFs), value-added tax facilities, certain types of investment facilities.

Appendix V Analytical guidelines for scoring risk factors

We assess the risk contribution of each relevant risk factor, adhering to the following analytical guidelines. These guidelines ensure analytical consistency and define the degree of rating differentiation provided by our analytical framework. We consider quantitative variables supplemented by qualitative information that is benchmarked against industry standards and our credit opinion. We adjust the analytical guidelines from time to time as part of a methodology update to maintain appropriate credit differentiation between exposures. If changes in market or underwriting practices lead to a structural change in average collateral quality, we adjust the relevant guidelines (such as DSCR thresholds) as appropriate.

Risk factors are evaluated in the context of the risk factor's contribution to the credit exposure (i.e. instrument). Our scoring system uses values ranging from 'very low (contribution to credit risk)' to 'very high (contribution to credit risk)'. This enables us to differentiate between projects.

In certain cases, the risks associated with one or several risk areas may be wholly or in part transferred to a third party. Examples include the assumption of all risks present during the operational phase by a public authority in certain PPP projects. In such case, we would substitute the risk contributions from risk factors relating to the operational phase with the counterparty risk of the third party that has agreed to assume these risks. For all risk areas whose risks are not fully assumed by a third party, the following guidelines apply (in the case above, for example, construction risk and sponsor risk).

Sponsors' experience, track record and importance of the project

Characteristics/ risk assessment	Very low	Low	Average	High	Very high
Credit quality ^a	aa- and above	a- and above	bbb- and above	bb- and above	b+ and below or issues are present
Technical capabilities, experience and track record	Exceptional	Strong	Good	Adequate	Very limited or issues are present
Economic incentives	Substantial	Significant	Adequate	Limited	None
Commitment to the project, share maintenance provisions	Strong	Good	Adequate	Limited	Key sponsors left at critical time

^a For the assessment of counterparties, see Section 8 of the methodology. Credit quality commensurate with the rating level expressed in our rating definitions available on our [website](#).

Source: Scope Ratings.

Construction risk

Construction complexity, permits, design and technology

Characteristics/ risk assessment	Very low	Low	Average	High	Very high
Construction works	Simple	Low complexity	Heavy engineering or industrial	Highly complex	Highly complex or novel
Size	Small	Adequate	Manageable	Large	Very large (no precedents)
Interface risks, construction dependencies	None	Minimum	Immaterial	Material	Material issues
Permits, licenses, rights	Granted	Granted	Outstanding and likely	Outstanding	Material issues
Title and access to the project's site	Granted	Granted	Outstanding and likely	Outstanding	Material issues

Regulatory and public opposition	None or fully mitigated	Highly unlikely	Not expected	Possible	Material issues
Site conditions	Excellent	Good	Adequate	Challenging	Material issues
Technology design	Well-established, strong operating history	Well-established, good operating history	Established, some operating history	Highly technical or complex; new or unproven	Material issues

Source: Scope Ratings.

Construction contracts, budgets and schedule

Characteristics/ risk assessment	Very low	Low	Average	High	Very high
Construction contract	Fixed price, date certain. 'turnkey' or engineering, procurement, and construction contract 'EPC'	Fixed price, date certain. 'turnkey' or 'EPC'	Fixed price, date certain. 'turnkey' or 'EPC'	Partially fixed or no certain date	'Cost plus price', date is not fixed
Construction contract pricing and timing	Adequately priced and timed; abundant and comparable data	Adequately priced and timed, sufficient comparable data	Adequately priced and timed, some comparable data	Below or above market, limited market data	Significantly below or above market, no market data
Cost and time contingencies	Very strong, well above historical benchmarks	Good level, above benchmarks	Adequate, comparable to benchmarks	Aggressive, below benchmarks	None or very weak
Defects liability period; warranties	Both clearly above market	Long-term, good level	Adequate	Weak	None or very weak
Construction progress	Ahead of time, on budget	On time and within budget	Some delays, cost overruns within milestones, overall programme on time and within budget	Delays but within long stop dates, cost overruns but within liability cap	Material delays, cost overrun

Source: Scope Ratings.

Construction funding and liquidity package

Characteristics/ risk assessment	Very low	Low	Average	High	Very high
Funding sources	Very strong quality, highly certain	Good quality, highly predictable	Good quality, good availability	Shortfall possible	Risk of underfunding present
Contingent sources	Strong	Available	Some, limited	None	None
Liquidated damages	Substantial, well above market	Above market	Sufficient, at market	Below market	Clearly below market, none
Security package	Full cover, timeliness	Solid cover, certain timeliness, minimum counterparty risk	Sufficient cover, timeliness, acceptable counterparty risk	Below market cover, potential counterparty or timing risk	None

Source: Scope Ratings.

Counterparty risk

The guidelines are applicable for at least one contractor if 'joint and severally' liable, each one if 'severally' liable.

Characteristics/ risk assessment	Very low	Low	Average	High	Very high
Credit quality ^a	aa- and above	a- and above	bbb- and above, or bb- and above with other characteristics at 'very low' level	bb- and above, or b+ and above with other characteristics at 'low' level	b+ and below or credit related issues are present
Technical capabilities, experience and track record	Exceptional	Strong	Good	Adequate	Very limited or performance issues are present
Fit to contractor business model	Prestige project	Highly strategic	Strategic	Minor importance	None
Economic incentives	Substantial	Significant	Adequate	Limited	None
Project's size fit to contractor's revenue base	Good	Good	Adequate	Excessive	None
Viable alternative contractors	Many available	Sufficient availability	Some available	Limited availability	None

^a For the assessment of counterparties, see Section 8 of the methodology. Credit quality commensurate with the rating level expressed in our rating definitions available on our [website](#).

Source: Scope Ratings.

Equity contribution risk

Sponsors contribute to construction counterparty risk if they have not provided full equity commitment up-front. In this situation, there is a credit exposure from the risk that the sponsor does not provide pro-rata committed equity during the construction or start-up phases.

Characteristics/ risk assessment	Very low	Low	Average	High	Very high
Exposure	No risk	Fully mitigated by parent company guarantee or letter of credit	Fully mitigated by parent company guarantee or letter of credit	Mitigated by parent company guarantee or letter of credit	Not mitigated or issues are present
Guarantor credit quality ^a	N/A	a- and above	bbb- and above	bb+ and above	N/A

^a For the assessment of counterparties, see Section 8 of the methodology. Credit quality commensurate with the rating level expressed in our rating definitions available on our [website](#).

Source: Scope Ratings.

Operational risk

Operational complexity, technology and standing

Characteristics/ risk assessment	Very low	Low	Average	High	Very high
Nature of operating activities	Simple, routine	Simple, routine, simple parts replacement, non-specialised	Average technical requirements, specialised	High-risk operating environment	Major operating problems present
Technology, design	Well-established, currently in use; long, proven operating history	Well-established, currently in use; proven operating history	Currently in use; some operating history	Highly technical or complex, new or unproven	Issues exist
Operational status	Excellent	Good	Robust	History of issues, potentially repeating in the future	Issues exist

Source: Scope Ratings.

Operations and maintenance (O&M) contracts, budgets and planning

Characteristics/ risk assessment	Very low	Low	Average	High	Very high
Pass-through of risk	Long-term, full pass-through of all O&M risks (no liability cap)	Long-term, pass-through O&M risk (high liability cap)	Pass-through of O&M risk (adequate liability cap)	No full pass-through or subject to limited liability	Very limited pass-through or liability cap
Contract pricing and length	At market, supported by abundant market data	At market, sufficient market data	At market, some market data	Below or above market or subject to material pricing change	Substantially below or above market
Budget and schedule assumptions	Very credible	Credible	Not aggressive	Somewhat aggressive	Aggressive
Replacement for non-performance contract clause	Easy	Readily	Possible	Only severe underperformance, none	Unclear, none
SPV management (if project operated by SPV)	N/A	N/A	Highly experienced, established track record	Experienced management	Inexperienced management
O&M reserve accounts or other sources of liquidity	Strong, pre-funded	Good, pre-funded	Adequate	Underfunded	Missing or significantly underfunded
O&M cost cash flow breakeven level	Substantially above market	Above market	In line with market	Below market	Significantly below market

Source: Scope Ratings.

Lifecycle risk

Characteristics/ risk assessment	Very low	Low	Average	High	Very high
Lifecycle programme	No lifecycle risk	Very predictable, spread across asset life	Predictable, moderate size	Substantial size, some flexibility	Substantial size, limited flexibility
Budget and schedule assumptions	N/A	Above market	In line with market	Somewhat aggressive	Aggressive
Lifecycle reserve account or other sources of liquidity	N/A	Well-sized, pre-funded	Sufficient, pre-funded	Moderately-sized or not fully pre-funded	None
Lifecycle cost cash flow breakeven level	N/A	Above market	In line with market	Below market	Significantly below market

Source: Scope Ratings.

Counterparty risk

The guidelines are applicable to the strongest contractor if a 'joint and several' liability exists, or to each contractor separately in the case of a 'several' liability.

Characteristics/ risk assessment	Very low	Low	Average	High	Very high
Credit quality ^a	aa- and above	a- and above	bbb- and above, or bb- and above with other characteristics at 'very low' level	bb- and above, or b+ and above with other characteristics at 'low' level	b+ and below or credit-related issues present
Technical capabilities, experience and track record	Exceptional	Strong	Good	Adequate	Very limited or performance issues present
Fit to contractor business model	Prestige project	Highly strategic	Strategic	Minor importance	None
Economic incentives	Substantial	Significant	Adequate	Limited	None
Liquidated damages and security package	Very strong	Strong	Adequate	Weak	None
Viable alternative contractors	Many available	Sufficient availability	Some available	Limited availability	None

^a For the assessment of counterparties, see Section 8 of the methodology. Credit quality commensurate with the rating level expressed in our rating definitions available on our [website](#).

Source: Scope Ratings.

Revenue risk

Revenue contracts

Characteristics/ risk assessment	Very low	Low	Average	High	Very high
Term, price, volume risks	Covers at least debt term, price/volume fixed	Covers debt term, 70% of price or volume fixed	Covers debt term and 50% of price or volume fixed	Full exposure to market risks on price and volume creating some uncertainty	Full exposure to market risks on price and volume creating high volatility
Contract-outs and termination	Fully protected	Protected	Contract-outs, termination difficult	Possible	Likely or taking place
Revenue contract mismatch	Fully matches	Matches	Almost no mismatches	Some, could lead to problems	Disputes or renegotiations taking place
Dispute resolution	Clear, tested and well-proven	Clear, well-proven	Clear, tested	Local court mechanism	None
Adverse regulatory, political changes	Fully protected	Protected	Protected from severe events	Possible	Likely or taking place
Regulatory framework (if applicable)	Stable, transparent, supportive, long-term track record	Stable, transparent, supportive	Balanced, acceptable track record	Weak or untested	Very weak
Probability of adverse regulatory changes (if applicable)	Very low	Limited expectation	Unlikely	Possible	Likely or taking place

Source: Scope Ratings.

Economic fundamentals

Characteristics/ risk assessment	Very low	Low	Average	High	Very high
Competitive advantage	Strong	Good or very limited competition	Existing	Neutral, or strong competition	Disadvantage
Demand/supply balance	Very strong	Strong	Adequate	Uncertain or weak	Unfavourable
Barriers to entry	High	Protective	Existing	Low	New entrants expected
Long-term market outlook	Excellent	Stable, predictable	Stable over debt term	Possible changes over tenor	Highly uncertain or negative
Project rationale	Very strong	Strong	Good	Limited or questionable	Weak
Participants' alignment of interest	Very strong	Strong	Good	Limited or questionable	Misaligned

Source: Scope Ratings.

Supply or reserve risk

Characteristics/ risk assessment	Very low	Low	Average	High	Very high
Supply agreement term, price, volume, quality and delivery	Covers at least debt term; fully protects from price, volume, quality, delivery risks	Covers debt term; protects from price, volume, quality risks; strong delivery provisions	Low-quality; volume and price risks; adequate delivery provisions	No protection; weak delivery provisions	None
Supply interruption and force majeure	Fully protected	Good protection	Some protection	No protection	Issues present
Contract-outs and termination	Fully protected	Protected	Contract-outs, termination difficult	Possible	Likely or taking place
Revenue contract mismatch	Fully matches	Matches	Almost no mismatches	Some, could lead to problems	Disputes or renegotiations taking place
Dispute resolution	Clear, tested and well-proven	Clear, well-proven	Clear, tested	Local court mechanism	None
Supply availability	Many alternative suppliers at better cost	Many alternative suppliers at similar cost	No material issues or alternative suppliers are available	Could become insufficient or limited alternatives	Material supply issues present
Resource quality and reliability (for projects without supply contract)	Excellent	Good	Adequate	Questionable	Uncertain or issues present
Reserve availability (for projects without supply contract)	Liquid and deep market, multiple alternative suppliers, available substitutes	Liquid and deep market, alternative suppliers, available substitutes	Good market, alternative suppliers, available substitutes	Questionable	Uncertain or issues present

Source: Scope Ratings.

Counterparty risk

The weighted average assessment is used in cases where the multiple contractual counterparties are sufficiently diverse. The weakest assessment is used in cases of limited diversity. In the case of multiple counterparties and a strong reliance on the revenue stream from one counterparty, the assessment of that single counterparty is warranted.

Characteristics/ risk assessment	Very low	Low	Average	High	Very high
Credit quality ^a	aa- and above	a- and above	bbb- and above, or bb- and above with other characteristics at 'very low' level and multiple alternatives availability	bb- and above, or b+ and above with other characteristics at 'low' level and multiple alternatives availability	b+ and below, or payment and performance issues present
Track record	Exceptional	Strong	Good	Adequate	Very limited or issues present
Fit to contractor business model	Prestige project	Highly strategic	Strategic	Minor importance	None
Economic incentives	Substantial	Significant	Adequate	Limited	None

^a For the assessment of counterparties, see Section 8 of the methodology. Credit quality commensurate with the rating level expressed in our rating definitions available on our [website](#).



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Source: Scope Ratings.

Financial strength

Debt repayment (coverage ratios and leverage, repayment profile, liquidity)

Characteristics/ risk assessment	Very low	Low	Average	High	Very high
Minimum DSCR (market risk)	$\geq 3.0x$	$\geq 2.0x$	$\geq 1.5x$	$\geq 1.2x$	$< 1.2x$
Minimum DSCR (contracted)	$\geq 2.0x$	$\geq 1.5x$	$\geq 1.2x$	$\geq 1.1x$	$< 1.1x$
Leverage ratio (LLCR, PLCR, equity ratio)	Strongly above market	Above market	At market	Below market	Significantly below market
Liquidity reserves (DSRA)	Pre-funded, above market	Pre-funded, good level	Adequate	Weak	None

Source: Scope Ratings.

Cash flow stress scenarios

Cash flow stress scenarios combine a range of key factors impacting the project's creditworthiness (e.g. traffic levels, power prices).

Characteristics/ risk assessment	Very low	Low	Average	High	Very high
Resilience to cash flow stresses	Very strong (strong cash flow cushion)	Good (some cash flow cushion)	Adequate (limited cash flow cushion)	Weak, resulting in defaults, though debt payment is possible through cash reserves	Some defaults including cash reserves

Source: Scope Ratings.

Inflation, interest rate and foreign exchange risks

Characteristics/ risk assessment	Very low	Low	Average	High	Very high
Inflation, interest rate, foreign exchange risks	None or fully mitigated	Limited exposure	Some exposure	Material exposure	Issues present
Cash flow resilience to changes	N/A	Strong	Adequate	Weak	No resilience

Source: Scope Ratings.

Refinancing risk

Characteristics/ risk assessment	Very low	Low	Average	High	Very high
Credit strength and cash flow projections at the point of refinancing	Strong	Good	Adequate	Weak	Very weak
Leverage at the point of refinancing	Strong	Good	Adequate	Weak	Very weak
Debt payback period (after refinancing)	Very short and before expiration of all contracts and useful economic life	Several years and before expiration of key contracts and useful economic life	Adequate (above 10 years) before expiration of key contracts and useful economic life	Slightly exceeds contracts or useful economic life	Exceeds contracts or useful economic life
Financial covenants	Stringent or cash sweep	Good or cash sweep	Adequate or partial cash sweep	Loose covenants, no cash sweep if deleveraging required	None
Historical refinancing's track record and lending appetite	Excellent	Good	Adequate	Weak	None
Financial markets forecast	Positive	Positive	Stable	Challenging	Weak

Source: Scope Ratings.

Counterparty risk

Characteristics/ risk assessment	Very low	Low	Average	High	Very high
Credit quality ^a	aa+ and above	aa	a	bbb	Below investment grade or counterparty issues present
Track record and structural mitigants (e.g. counterparty replacement trigger level)	Exceptional	Strong	Good	Adequate	Very limited or issues present

^a For the assessment of counterparties, see Section 8 of the methodology. Credit quality commensurate with the rating level expressed in our rating definitions available on our [website](#).

Source: Scope Ratings.

Project structure and other risks

Financing and legal framework, compliance

Characteristics/ risk assessment	Very low	Low	Average	High	Very high
Bankruptcy remoteness	Fully meeting criteria	Fully meeting criteria	Less restrictive on few non-material subjects	Questionable	Not meeting criteria
Cash-controlling covenants	Strong	Strong	Adequate	Weak	No covenants
Intercreditor agreement	Strong	Strong	Adequate	Weak	No intercreditor agreement (if relevant)
Legal integrity of all material contracts	Ensured	Ensured	Ensured	Questionable	Issues present
Legal and regulatory compliance (including ESG factors, equator principles)	Full compliance, projects with no social or environmental impacts	Full compliance, projects with minimal social or environmental impacts	Full compliance, projects with potential, limited adverse social or environmental impacts	Partial compliance, projects may have negative social or environmental impacts	Issues present

Source: Scope Ratings.

Country risk

Characteristics/ risk assessment	Very low	Low	Average	High	Very high
Credit quality ^a	aa- and above	a- and above	bbb- and above	bb- and above	Below b+ or issues are present
Political risk	Highly remote	Very low	Low	High	Issues present
Business environment	Strong	Stable	Adequate	Weak	Very weak

^a For the assessment of counterparties, see Section 8 of the methodology. Credit quality commensurate with the rating level expressed in our rating definitions available on our [website](#).

Source: Scope Ratings.

Force majeure and other events risks

Characteristics/ risk assessment	Very low	Low	Average	High	Very high
Likelihood	Highly unlikely	Highly unlikely	Unlikely	Highly probable	Highly probable
Protection	Full credit protection	None	Some credit protection	Some credit protection	No credit protection

Source: Scope Ratings.

Appendix VI Quantitative processing of risk factor scores

Our scoring system assigns numerical values to the risk factor scores assigned by the analyst and reviewed by the rating committee. The scores represent the likelihood that a default-like event corresponding to a given risk area will impair the project and contribute to the overall likelihood that the rated exposure will be impaired. The scores take values from Very low to Very high, which are then mapped to numerical weights as shown in Figure 35. The likelihood of a given risk area triggering a credit-impairment event is derived by blending the scores of the different risk factors using the weights shown in Figure 36. Finally, the probability of a given risk area triggering a credit-impairment event is distributed across all events within that risk area. The numerical weights used to distribute the total probability of the risk area to the events were determined as part of the methodology calibration.

Figure 35. Risk factor scores and probability weights

Scoring choice (factor contribution to event risk)	Risk factor contribution to area triggering default (*)
Not applicable / risk-free	0.000%
Very low	0.003%
Low	0.071%
Average	1.142%
High	5.941%
Very high	47.076%

(*) The numerical values of the different scoring choices correspond to one-year probabilities in our idealised PD table to form an exponential structure for the scoring hierarchy.

Source: Scope Ratings.

Figure 36. Weights for blending risk factor scores

Risk factors driving risk	Construction	Operation	Revenue risk	Financial strength	Project structure and other
Sponsor's experience, track record and importance of the project	8.20%	10.00%	8.00%	8.00%	13.00%
Construction complexity, permits, design and technology	20.70%				
Construction contracts, budget and schedule	20.70%				
Construction funding and liquidity package	20.70%				
Counterparty risk	20.70%				
Equity contribution risk	9.00%				
Operational complexity, technology and standing		22.50%			
O&M contracts, budget and planning		22.50%			
Lifecycle risk		22.50%			
Counterparty risk		22.50%			
Revenue contract			18.40%		
Economic fundamentals			18.40%		
Supply/reserve risk			18.40%		
Supplier risk			18.40%		
Offtaker risk			18.40%		
Debt repayment				36.00%	
Sensitivity to cash flow stress scenarios				14.00%	
Inflation, interest rate and forex risks				14.00%	
Refinancing risk				23.00%	
Counterparty risk				5.00%	
Financing and legal framework, compliance					29.00%
Country risk					29.00%



General Project Finance Rating Methodology

Project Finance

Events and force majeure risks					29.00%
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Source: Scope Ratings.

Appendix VII Analytical guidelines for scoring recovery risk factors

We assess the risk contribution of each recovery risk factor, adhering to the following analytical guidelines. These guidelines ensure analytical consistency and define the degree of rating differentiation provided by our analytical framework. We consider quantitative variables that are supplemented by qualitative information benchmarked against industry standards and our credit opinion.

Recovery risk factors are evaluated in the context of the recovery risk factor's contribution to the severity of credit-impairment events impacting the credit exposure (i.e. instrument). Our recovery scoring system ranges from 'low (contribution to default severity)' to 'high (contribution to default severity)'. This enables us to differentiate between the recovery strength of projects and adjust standard recovery assumptions accordingly.

Project security

Characteristics / risk assessment	Average	High
Project security	First ranking, in full	Limited
Step-in rights	Clear	Limited, unclear
Intercreditor agreement	Strong	Weak

Source: Scope Ratings.

Collateral enforceability

Characteristics / risk assessment	Average	High
Collateral foreclosure	Positive prospects	Negative prospects
Track record	Tested, positive	Untested or negative

Source: Scope Ratings.

Recovery enhancements, termination provisions

Characteristics / risk assessment	Low	Average
Recovery enhancement (multilateral lenders, political insurance, termination provisions)	Yes	No

Source: Scope Ratings.

Fundamental economic value of the project

Characteristics / risk assessment	Low	Average	High
Fundamental characteristics of underlying project asset	Strong	Adequate	Weak
Capital structure	Moderate	Adequate	Aggressive
PLCR (market risk)	>2.5x	1.8x – 2.5x	<1.8x
PLCR (contracted)	>2.0x	1.4x – 2.0x	<1.4x

Source: Scope Ratings.

Appendix VIII Standard project-level recovery assumptions

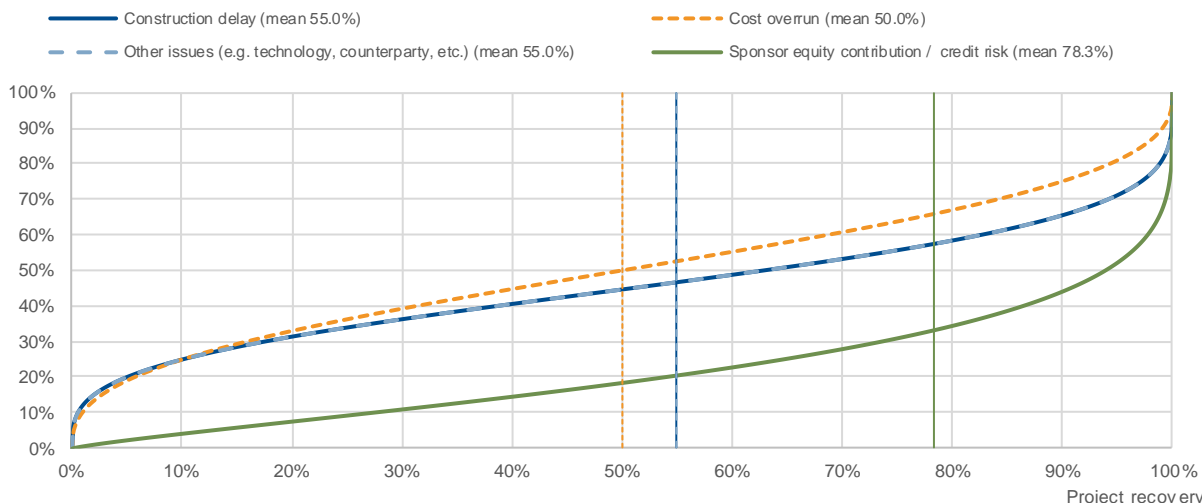
The following charts represent our standard recovery rate assumptions. These charts show the cumulative probability⁶ of realising a given recovery rate at project level (i.e. recovery on total project value) at the end of the resolution process⁷. Note that the shape of the distribution plays a critical role in explaining tranche-level expected recovery rates in our analysis.

The following charts group the project-level recovery distributions for the credit-impairment events of the five risk areas of our analytical framework. There are two sets of distributions, depending on the resilience of the asset's value to stress, either higher or lower, as defined in Figure 16.

These expected recovery assumptions will be adjusted as per this methodology (e.g. the actual recovery rate used for the analysis of a senior project finance exposure will be higher than these assumptions).

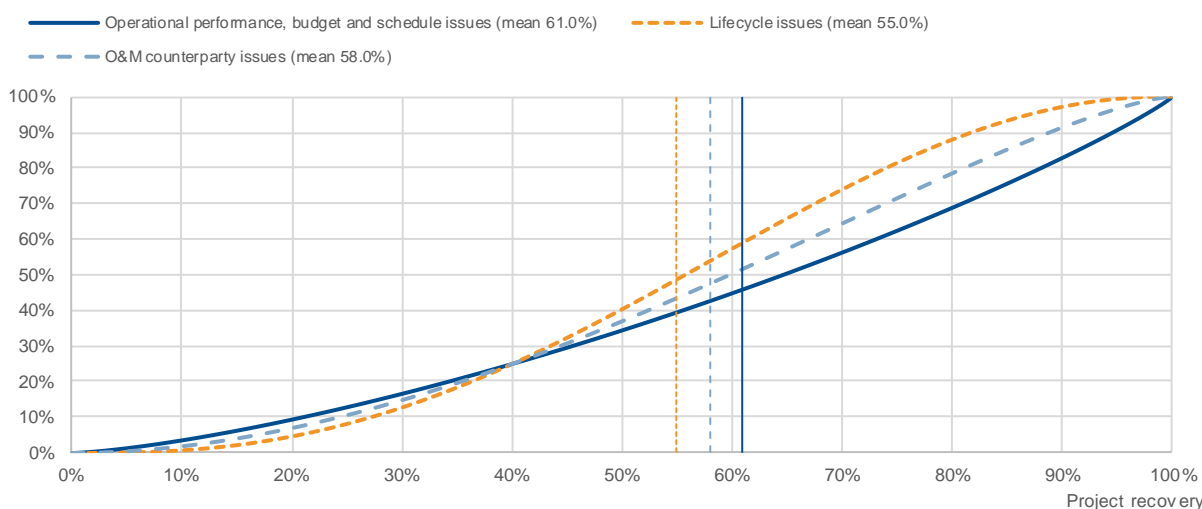
Recovery distributions for lower asset-value resilience under stress

Figure 37. Construction (lower asset-value resilience)



Source: Scope Ratings.

Figure 38. Operation (lower asset-value resilience)

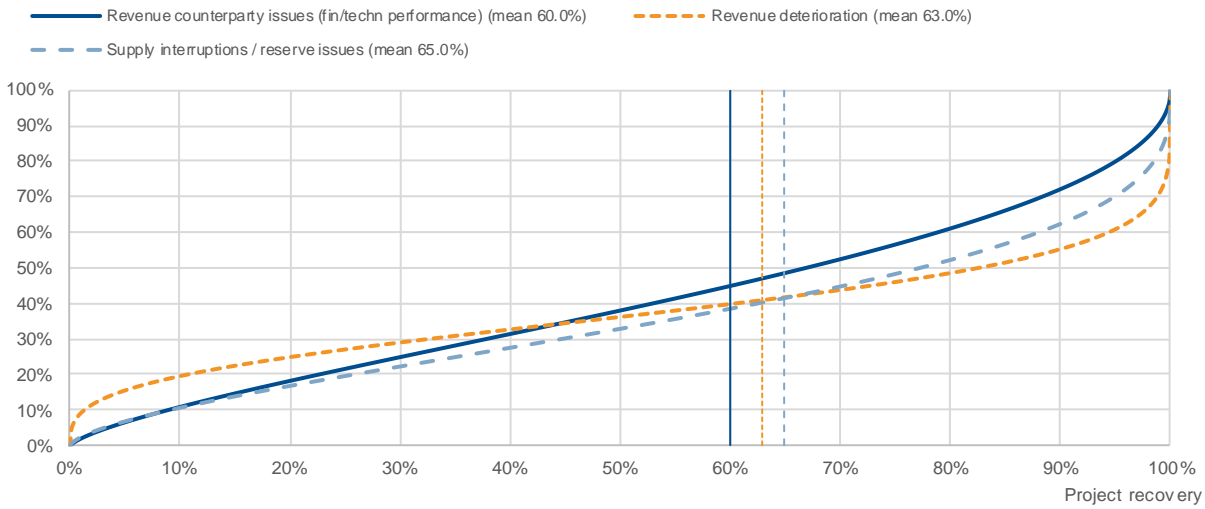


Source: Scope Ratings.

⁶ The probability on the vertical axis is the probability of realising a recovery rate which is 'equal or less' than the corresponding recovery value on the horizontal axis. For example, the probability that a cost overrun in the construction of a project linked to lower asset-value resilience under stress will result in a project-level recovery rate of 70% or less is 60% (see Figure 37).

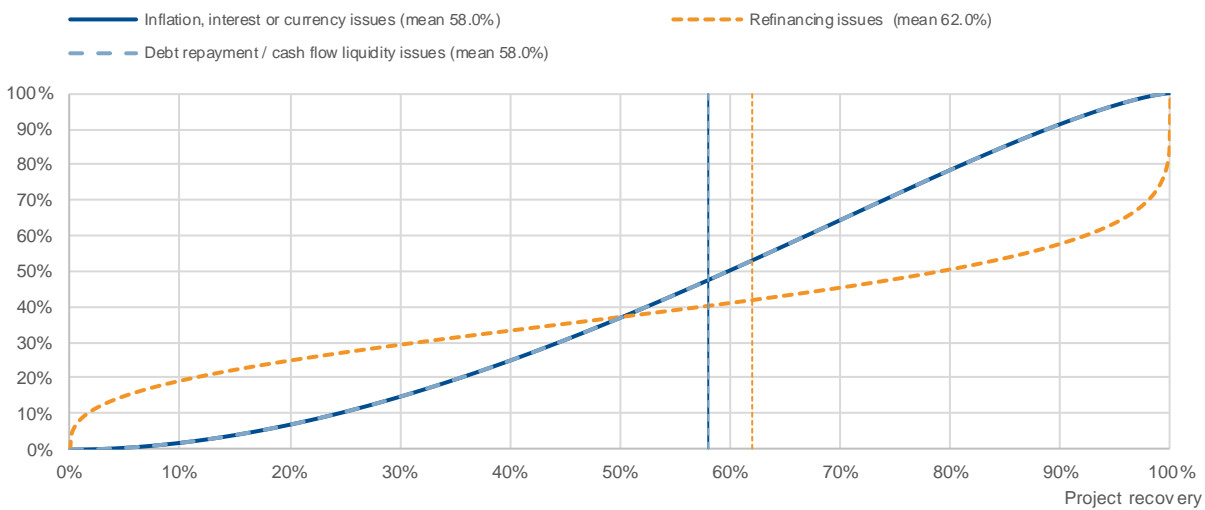
⁷ We have built these assumptions considering the discounted recovery data reported by the project finance data consortium. This recovery data is sometimes known as project-level discounted recovery. The discounted recovery is the nominal recovery discounted over the resolution period. We double-count the discounting of recovery rates in order to make the rating methodology sensitive to the rate promised to the investor.

Figure 39. Revenue risk (lower asset-value resilience)



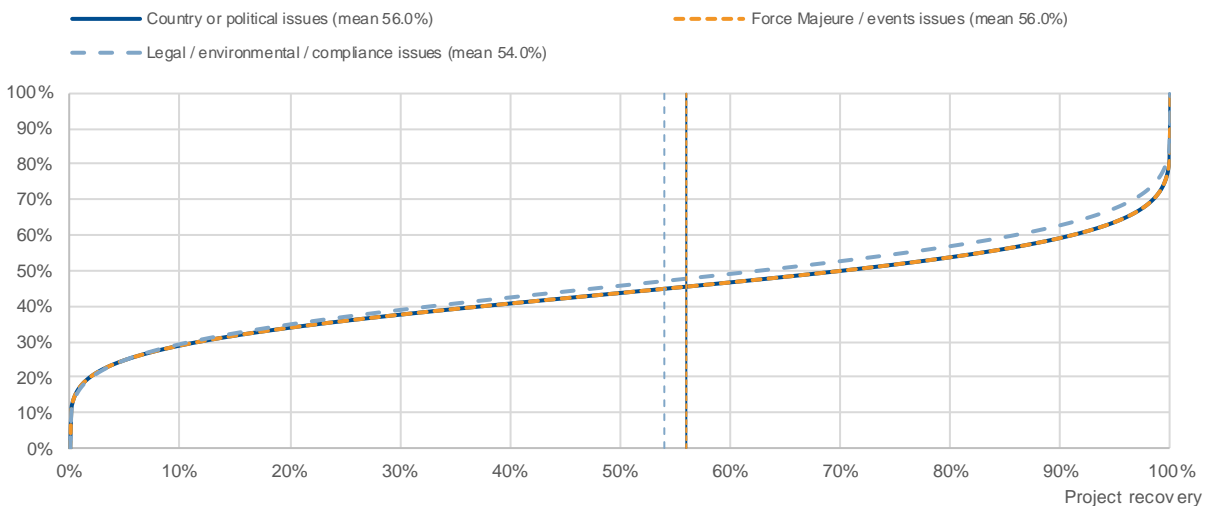
Source: Scope Ratings.

Figure 40. Financial strength (lower asset-value resilience)



Source: Scope Ratings.

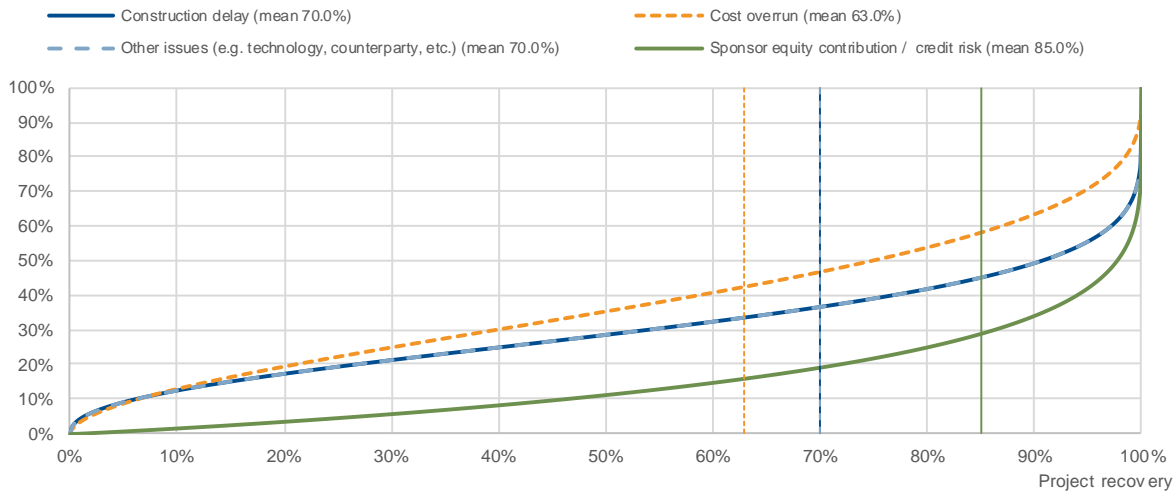
Figure 41. Project structure and other (lower asset-value resilience)



Source: Scope Ratings.

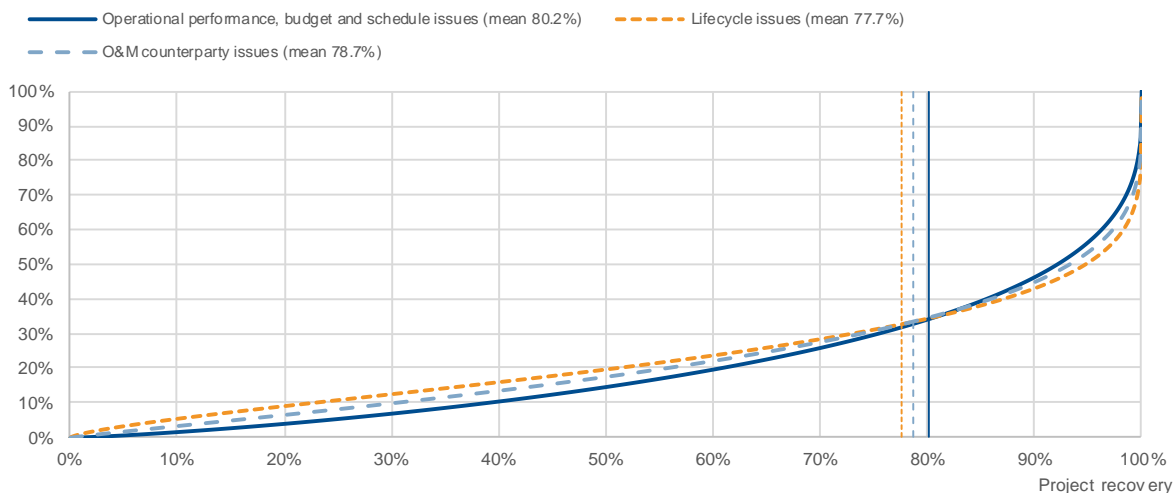
Recovery distributions for higher asset-value resilience under stress

Figure 42. Construction (higher asset-value resilience)



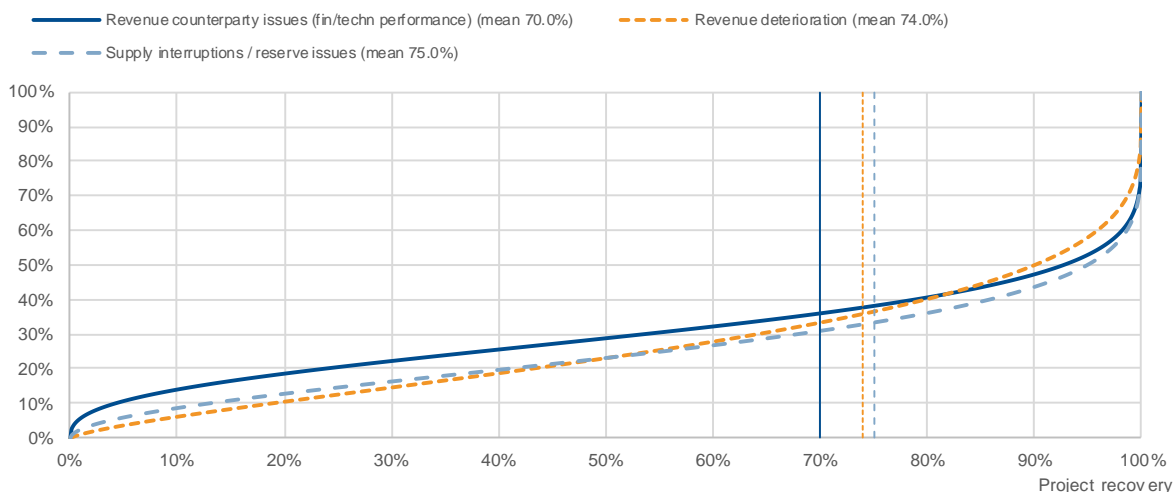
Source: Scope Ratings.

Figure 43. Operation (higher asset-value resilience)



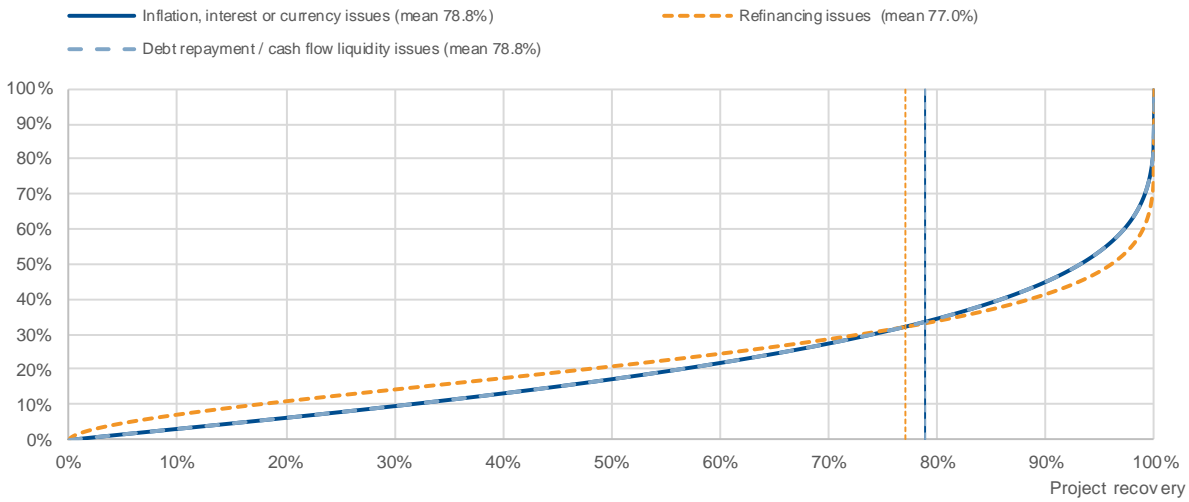
Source: Scope Ratings.

Figure 44. Revenue risk (higher asset-value resilience)



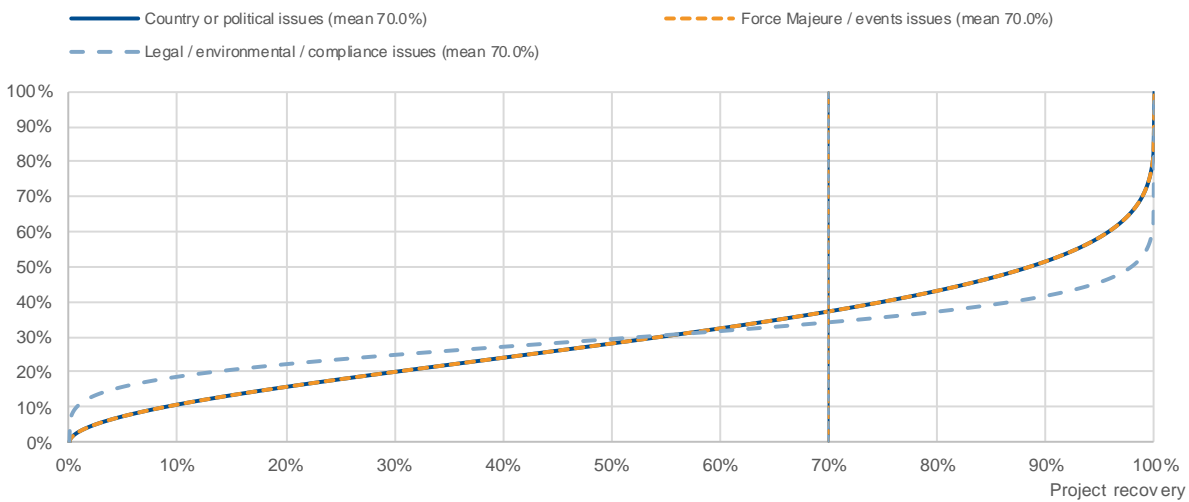
Source: Scope Ratings.

Figure 45. Financial strength (higher asset-value resilience)



Source: Scope Ratings.

Figure 46. Project structure and other (higher asset-value resilience)



Source: Scope Ratings.

Appendix IX Probability of hard default and hard recovery rate

Our analytical approach provides two credit metrics which are useful for risk management: i) the probability that the investor will lose one euro or more from having invested in a given instrument (i.e. the probability of *hard* default); and ii) the expected recovery rate upon hard defaults (i.e. the *hard* recovery rate). These metrics are not part of our rating calculations and do not alter the calculations in the methodology. They are simply a by-product which can be extracted from the information our methodology uses to produce the expected loss figure which drives the rating.

Events that result in some loss for the investor can be used as a proxy for failure to pay events (i.e. hard default events). The relationship between the likelihood of a credit impairment as considered in this methodology and the probability of hard defaults results from the consideration of the probability of full recovery under a given credit impairment event. Expression (14) shows this relationship and how the probability of hard defaults can be estimated.

$$(14) \text{prob}\{\text{hard default}\} \approx \text{prob}\{\text{impairment}\} \times \text{prob}\{\text{incomplete recovery}\}$$

Expression (14) can be expanded for the case of this methodology in the way shown by expression (15), which considers all credit impairment events and forces the condition that the recovery on hard defaults should not be negative.

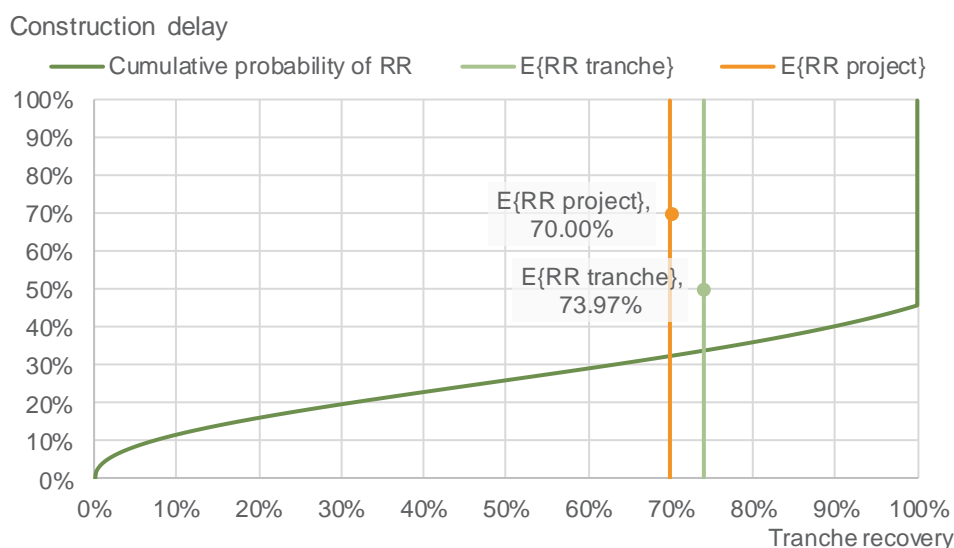
$$(15) \text{prob}\{\text{hard default}\} \approx \max\left\{\text{expected loss}, \sum_{i=1}^N \text{prob}\{\text{impairment event}_i\} \times \text{prob}\{\text{incomplete recovery under event}_i\}\right\}$$

The probability of incomplete recovery is the complement of the probability of full recovery, as shown in expression (16).

$$(16) \text{prob}\{\text{incomplete recovery}\} = 1 - \text{prob}\{\text{full recovery}\}$$

The probability of full recovery can be read directly from the recovery-rate distributions that our methodology produces for each credit impairment event. Figure 47 illustrates this: the vertical segment on the right-hand side of the recovery-rate cumulative-probability chart corresponds to the probability of full recovery upon a credit impairment event (54.14%). The probability of incomplete recovery is the complement (45.86% = 1 - 54.14%).

Figure 47. Instrument recovery distribution showing the probability of full recovery (54.14%)



Source: Scope Ratings.

The derivation of the recovery rate on hard defaults follows the condition that the expected loss is invariant in relation to changes in the definition of default. Expression (17) shows the derivation of the recovery rate on hard defaults.

$$\begin{aligned}
 (17) \text{Expected loss} &= \text{prob}\{\text{impairment}\} \times (1 - \text{Recovery on impairment}) = \\
 &= \text{prob}\{\text{hard default}\} \times (1 - \text{Recovery on hard default}) \rightarrow \\
 \rightarrow \text{Recovery on hard default} &= 1 - \frac{\text{Expected loss}}{\text{prob}\{\text{hard default}\}}
 \end{aligned}$$

Appendix X ESG risk assessment

We implicitly capture general environmental, social and governance factors during the rating process with the sole criteria of their material impact on the credit quality of a rated transaction.

This methodology identifies the elements that are now considered to be ESG factors, and a more systematic presentation of these factors.

Our analysis of risk factors (as defined in section 8.3.1), recovery risk factors (as defined in section 8.4.1.4), or the consideration of stress scenarios in the context of project-specific recovery calculations (as described in section 8.4.2) includes, among others:

- ◆ Forward-looking views that consider the sustainability of the project;
- ◆ Vulnerability risks through the analysis of technological and ecological transitions as well as demographic shifts;
- ◆ Quality and incentives of the management related to good governance; and
- ◆ Regulatory risk, also in relation to ESG considerations.
















Project ESG Grid

Our Project ESG Grid summarises the impact that ESG factors have on a project. The grid covers four broad ESG themes per pillar.

The grid has coloured indicators to indicate whether a particular ESG theme represents a credit-positive (green) or credit-negative (red) driver in the analysis of the expected loss for the investor in the specific project and exposure. The colours reflect an opinion in a relative context, but they do not correspond to quantitative scores (i.e. the indicators are ordinal rather than cardinal assessments).

We will not always report on all elements in the grid. We provide a yellow indicator if a certain ESG factor is not considered positive or negative for the credit analysis of a project.

Figure 48. Example Project ESG Grid

Environmental		Social		Governance	
Air pollution and GHG emissions		Labour management		Management, supervision and anti-corruption	
Energy efficiency		Employment and HSE management		Governance system	
Hazardous substances and waste		Social value, affordability, local community relations, human rights		Financial structure complexity	
Material sourcing and resource management		Customer stewardship and personal data privacy		Reporting and transparency	
Physical risks		Regulatory, reputational and social resistance risks		Political risks, lobbying and public relationships	

Source: Scope Ratings.

Appendix XI Legal risks in infrastructure and project finance

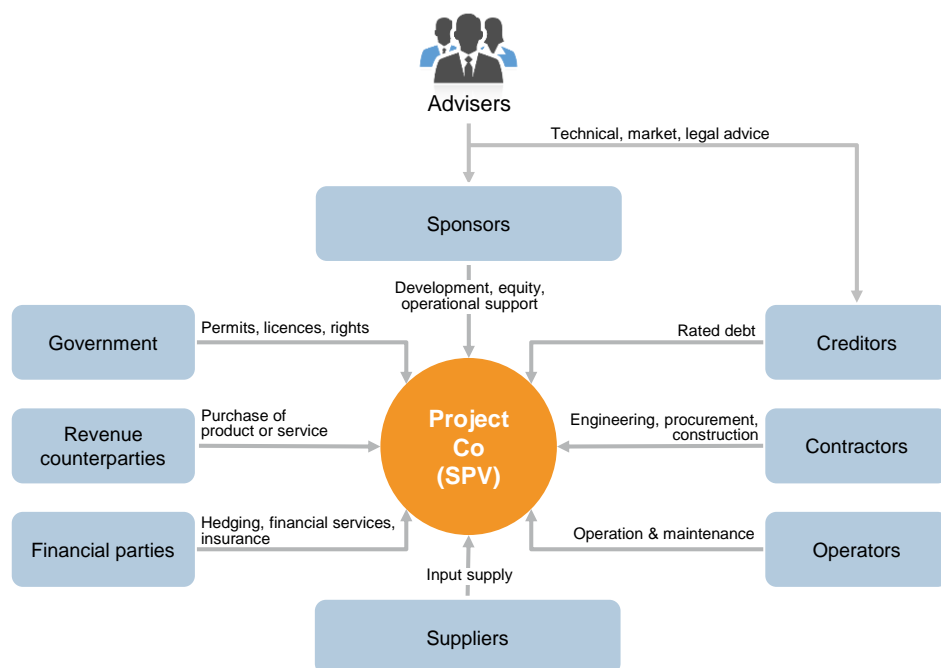
Introduction

Scope adjusts its analytical assumptions according to the legal principles described in this appendix. Most of these legal principles translate into the features shared between projects commonly identified as ‘bankable projects’. The legal aspects also determine the mechanisms and features Scope can or cannot give credit to when analysing sources of credit enhancement in a transaction. However, these legal guidelines do not constitute a rigid or exhaustive set of requirements. Scope captures the credit implications in its analysis in transactions where certain legal elements are missing. Scope reviews available legal opinions where relevant to gain comfort on its analytical assumptions in relation to relevant legal issues.

Scope considers the individual project, the contractual structure, the incentive mechanism and other aspects of each transaction when analysing the impact of material legal aspects and their mitigants on credit risks. The credit view that emerges in the analysis of a transaction depends on the applicability of the legal principles described in this appendix, in addition to a project’s fundamental characteristics.

Scope scores the contributions to total loss of the different risk factors in the context of its General Project Finance Rating Methodology. Scope’s analysis generally considers three sources of possible legal risks: i) the contract structure; ii) the issuer of the rated debt; and iii) the transactional parties and documents as outlined in Figure 1. This appendix examines the three main sources of legal risk in further detail and discuss elements that could give rise to possible legal risks.

Figure 49. Figure 1: Sources of possible legal risk



Source: Scope Ratings

Most of the concepts described herein were developed over time by the project finance industry and have, to a large extent, resulted in legally robust structures commonly known as ‘bankable projects’. Project finance transactions do not always rely on insolvency-remote SPV structures, and we score our view on the insolvency-remoteness according to our criteria as set out in section 8.3.1.6. While some of these considerations may also be applicable to ring-fenced corporate structures or hybrid issuers, these concepts are mostly relevant for transactions that are centred around a dedicated special-purpose vehicle.

This appendix provides an overview of the legal issues which can have an impact on the credit quality of project finance credit exposures. The legal concepts are common to most project finance transactions, regardless of the applicable jurisdiction. Scope assesses whether these principles are maintained by the jurisdictions applicable to the transactions.

Scope relies on internal legal expertise, transaction legal opinions and external legal advice, if necessary, in the course of this assessment.

Enforceable contracts

The quality of the underlying project and its contracts, and the SPV's legal recourse to the proceeds from them, are key elements of any project finance transaction. Scope assesses whether the payment obligations owed to the SPV are, legal, binding, valid and enforceable to ensure that the project produces the cash flows necessary to cover the SPV's liabilities.

Scope considers the validity and enforceability of obligations, typically confirmed by a legal opinion. The existence and enforceability of the claims and obligations stemming from the project contracts may be challenged by applicable laws. These laws may prohibit certain transactions (e.g. usury, fraudulent dealings, collusion); grant some counterparties extraordinary termination rights (termination for public interest); or stipulate formal prerequisites (e.g. filings, notarisation). In exceptional cases, existing law may even compromise certain concession agreements (e.g. when regional public entities enter competencies restricted to the central government).

Any factual elements necessary for the obligations to be considered existing and enforceable would be explicitly represented by the sponsor or the financial advisers acting on its behalf. Scope may limit its assessment to considering whether one of the transaction parties (i.e. the sponsor or the security trustee) is contractually obliged and capable of checking the existence and enforceability of the contracts, especially where the assets of the SPV consists of a portfolio of several projects (e.g. in a holding company financing).

Set-off and encumbrances may have a negative impact on the ratings of some project finance transactions. Creditors may not always be able to fully benefit from payment obligations, even if they were originated in a valid and enforceable fashion. For example, any rights of the obligor to refuse full payment due to statutory defenses or contractual changes to the payment obligations must be taken into consideration.

Set-off

Set-off rarely occurs in project finance because the existence of reciprocal claims, between the SPV and third parties, that can be set off is not common. Set-off can be of concern in projects that depend on payments from a single counterparty to generate revenues, such as concessions or power purchase agreements. Set-off may be invoked by a debtor where it holds a monetary crossclaim against the creditor. In this case, the debtor may be entitled to be absolved from honouring the creditor's claim to the extent of the crossclaim. The set-off right may be a statutory defense or contractually agreed, depending on the jurisdiction. Set-off may be waived by contract if it is a statutory defense.

Due to the above-described mechanism, set-off exercised by a debtor in relation to the asset may substantially reduce or completely cancel out the enforceable claim, i.e. the cash flows of the SPV. Scope examines whether the documents relating to the asset contain waivers of set-off and whether these are valid under the relevant jurisdiction where such crossclaims exist or are likely to come into existence. Scope assesses whether any features have been implemented in the structure to mitigate the negative impact of set-off in case such waivers have not been agreed upon or are not recognised by the applicable jurisdiction.

Set-off may also create challenges for the structure if invoked by transaction parties other than the project parties, for example the account bank. In this case, Scope examines how set-off is treated in the transaction documents mentioned below and how it affects the structure.

Encumbrances

Other impediments to creditors' claims on the issuer's cash flows are encumbrances of the rights to it, i.e. if any of these rights have been pledged, charged or are subject to a security interest for the benefit of a third party. This third party may be entitled to enforce its rights to the asset if the preconditions to such enforcement have been fulfilled.

The issuer

The issuing SPV constitutes one of the defining features of any project finance transaction. It serves as the mechanism de-linking the underlying project from the credit risk of the sponsor and hence enables the structure to rely solely on the cash flows generated by the project.

The issuer must fulfill several restrictive criteria in order to ensure that the payment deriving from the project is neither interrupted nor negatively affected in any way. These criteria can be grouped into the main goals to be achieved by the SPV: bankruptcy remoteness and non-consolidation. Bankruptcy remoteness should prevent the SPV from entering into insolvency proceedings. Non-consolidation should prevent the project of the SPV from being affected by the insolvency of its parent or other related company.

Bankruptcy remoteness and non-consolidation are targeted by using different types of corporate entities as SPVs, which will vary according to the jurisdiction under which they are set up. Some jurisdictions have issued specific laws providing for the incorporation of bankruptcy-and-consolidation-remote SPVs with the aim of facilitating project finance and other types of asset-backed finance transactions. A corporate entity not benefitting from this kind of statutory backup could nevertheless be set up in such a way that the necessary requirements are met. Project finance transactions occasionally rely on Orphan SPVs and/or on jurisdictions that provide appropriate legal frameworks to ensure bankruptcy remoteness and non-consolidation.

Bankruptcy remoteness

SPVs are set up as bankruptcy-remote vehicles so that the risk of insolvency proceedings being initiated against the SPV is reduced to the greatest possible extent. The importance of this feature must be considered in light of the effect an insolvency proceeding would have on the transaction. First, it affects the payment of interest and principal from the SPV to its investors. For example, payments may be disallowed in an insolvency scenario in order to protect other creditors. Second, a credit impairment event resulting from such a shortfall may give the investors the opportunity to enforce the security interest over the project granted to them. Enforcement action could then result in potential costly debt restructuring. Finally, insolvency will most likely trigger the termination of the contracts the SPV has entered and which are vital for the project's continued operation.

The different structural elements resulting in bankruptcy remoteness can be separated into restrictions that have been contractually agreed by the transaction parties and those that limit the number of potential claimants against the SPV. These elements apply cumulatively to the structure.

Contractual restrictions

The essential contractual arrangements include limited recourse and non-petition clauses, which generally form part of any transaction document creating potential obligations for the SPV. Their purpose is to prevent the transaction parties from initiating bankruptcy proceedings against the SPV. The SPV typically grants pledges over all its assets to a trustee, for the benefit of the investor, thus reducing other creditors' incentive to file for bankruptcy. Legal opinions will usually confirm that these contractual arrangements are valid, legally binding and enforceable.

Limited recourse

All creditors of the SPV (including the investor) agree to limit their recourse against the assets of the SPV. The limited recourse will typically be subject to the cash available under the waterfall of payments, complemented by a corresponding limitation of the termination rights so that if the cash flow does not cover the obligations towards the SPV's creditors after application of the waterfall, it will not constitute an event of default.

Non-petition

All creditors of an SPV (including the investor) typically agree not to file, initiate or join in any insolvency proceedings against the SPV. Given the uncertainty in some jurisdictions as to the validity of such clauses, the non-petition clause is sometimes limited to a certain time period.

Asset pledges

Pledging the SPV's assets to a security trustee for the benefit of the investor provides the latter with recourse to the assets should this prove necessary to protect its investment. More importantly, it is crucial in the context of bankruptcy remoteness to dissuade other creditors from filing for bankruptcy. Ultimately, the investors will have priority over the proceeds from the enforcement into the assets and no significant assets to be liquidated for the benefit of other creditors should remain in the estate of the insolvent SPV.

Debt limitations

The SPV typically complies with certain conditions that ensure it does not incur obligations other than those subject to the provisions in the transaction documents. The purpose is to limit the risk of the SPV becoming insolvent due to a mismatch of incoming and outflowing cash flows; ensure that the waterfall is not affected by any debt that was not initially anticipated in the structure; and prevent third parties from filing for bankruptcy of the SPV. These conditions are commonly made subject to representations of the SPV which often include the following:

- No existing debt: the SPV has no legacy obligations towards third parties in case it has not been set up explicitly for the rated transaction.
- Limitation of debt: the SPV is prohibited from incurring any debt other than that created in the transaction documents and by applicable law, including taxes. If it envisages incurring further debt, this may be capped in order to be quantifiable for the purpose of the credit risk analysis.
- Limited business purpose and powers: the SPV's constitutional documents provide for a business object and powers that are strictly limited to the project, the issuance of the debt, and the dealings necessary to set up the transaction structure.
- No employees: the SPV is prevented from entering into commitments in connection with employment contracts including pension liabilities except if specifically set out in the project agreement for the purpose of accomplishing the project.
- No subsidiaries: the SPV is prohibited from creating any subsidiaries that in turn could incur obligations for which the SPV might ultimately be liable.

Non-consolidation

Scope views consolidation risk as the threat that the SPV and/or its assets could be consolidated with (the estate of) another legal entity. This consolidation could ensue from corporate reorganisations or insolvency proceedings relating to the parent company.

No corporate reorganisation

Negative covenants often restrict the SPV from entering any mergers, acquisitions, consolidations or other forms of corporate reorganisations to prevent a corporate reorganisation from affecting the SPV or its assets. These negative covenants normally extend to ruling out dissolution, liquidation or sale of assets, although such negative covenants do not strictly address consolidation risk per se.

No statutory consolidation

In certain jurisdictions the insolvency proceedings may provide for the assets of the SPV to be consolidated with the insolvency estate of the parent company. This risk is sometimes addressed by using orphan SPVs or by choosing a jurisdiction that does not allow for such consolidations.

Structural elements can also mitigate consolidation risk if it is present in the applicable jurisdiction. The transaction typically includes elaborate separateness covenants and independent management provisions, etc. ensuring that the SPV will be treated by the applicable insolvency regime as a separate entity, which will hence not be consolidated with an insolvent parent company.

Other SPV safeguards

While Scope's legal analysis focuses on bankruptcy remoteness and non-consolidation, there are further contractual safeguards that are either indispensable or at least beneficial to the overall robustness of any project finance transaction. These include: representations regarding the fulfilment of appropriate regulatory requirements, the existence of an independent management, and a restriction on changes to the constitutional documents of the SPV.

Necessary licenses and authorisations

The SPV must have all licences and authorisations necessary to ensure that it can conduct its business in full compliance with all legal obligations and regulations. Any lack thereof could endanger the validity of project contracts, void other transaction documents, or prompt fines from the supervisory authorities resulting in additional liabilities. Scope will analyse any related representations set out in the SPV documents together with the legal opinions, including potential qualifications in this regard.

Independent management

The SPV is generally managed by a board that is independent from the SPV's parent or other transaction parties. This prevents the board from being wrongly incentivised in its management of the SPV and also limits the risk of a dependent manager filing for voluntary insolvency to benefit certain transaction parties or the SPV's parent company. One independent director may suffice depending on the capacities of individual board members according to the constitutional documents, and if that director is able to ensure that decisions taken by the board of the SPV are not influenced by any transaction parties having interests contrary to the investors.

No change to constitutional documents

Scope is aware that the above-mentioned necessary restrictions applying to the SPV could be subject to changes by its owners, which are generally entitled by law to amend the constitutional documents at their discretion. Appropriate covenants prohibiting any changes without notification to the various transaction parties can mitigate this risk. This also includes related consents including, in certain cases, the approval of the investors.

Transaction documents

Any project finance transaction involves several transaction parties that are necessary for the performance of the structure. Scope would usually investigate the general documentary issues pertaining to all transaction documents and those that are relevant only to specific agreements depending on the role of the respective transaction party.

Analytical steps

Scope's legal assessment of the transaction document will generally follow certain analytical steps:

- Assessment of whether the project contracts and financing documents contain all services or other actions necessary for the performance of the project structure.
- Assessment of the extent these contracts can negatively affect the expected cash flow.
- Check that the agreements with the transaction parties create valid, legally binding and enforceable obligations of the transaction parties vis-à-vis the SPV. Scope typically seeks legal confirmation and requests that the legal opinion covers all the transaction documents, i.e. all contractual arrangements entered into in relation to the rated transaction.

Transaction parties

Certain additional legal aspects are specific to the agreements with certain transaction parties, for example the investors and providers of credit enhancement.

Investors

The transaction document between the issuing SPV and the investor usually consist of a subscription agreement including the actual rated debt exposure (e.g. note). The terms and conditions of a market standard note or syndicated loan facility typically contain the following provisions:

- Use of proceeds
- Standard representations, warranties and covenants (as partly discussed above)
- Status of the debt instrument
- Cash-flow priority of payments
- Financial covenants and testing dates
- Various potential forms of credit enhancement e.g. cash sweeps and distribution lock-up mechanisms
- Account definitions and allocations of moneys
- Limitation of termination rights for the SPV
- Interest payment date (possibly subject to deferrals)
- Final legal maturity (not subject to deferral)
- Decision by the noteholders, reserved to holders of rated notes with an appropriate quorum

Providers of credit enhancement

Credit enhancement can stem either from third parties or from structural elements contained in the transaction documents. Scope will consider whether the agreements with the providers of credit enhancement or the structural elements are covered by a legal opinion when assessing their credit impact.

Third-party credit enhancement

Third-party credit and structural enhancement take various forms: guarantees, letters of credit, swap contracts, liquidity facilities, etc. This appendix focusses on guarantees as they constitute a key form of third-party credit enhancement. Guarantors provide credit enhancement to the structure by way of credit substitution. Scope will consider whether the credit risk of the guaranteed transaction party can be replaced by the credit risk of the guarantor.

Credit substitution may be contemplated if the guarantee features the following characteristics:

- **Irrevocable:** the guarantee cannot be revoked in relation to obligations entered into prior to the termination of the guarantee.
- **Unconditional:** the claim of the guarantee is not conditional upon the beneficiary of the guarantee having pursued its rights vis-à-vis the debtor or the completion of other prerequisites.
- **Waiver of defenses:** the guarantor forgoes the defenses that the principal debtor may have against the fulfilment of the guaranteed obligation.
- **Pari passu:** the guarantee ranks at least pari passu with the other senior unsecured obligations of the guarantor.
- **Beneficiaries:** the guarantee is for the benefit of the SPV, the security trustee or the noteholders and enforceable by the same.
- **Amendment/termination:** any amendment or termination of the guarantee is typically subject to the consent of the beneficiary. The guarantee will generally provide for an obligation to notify the rating agencies of any amendments. The notification obligation will encompass any change of guarantor (e.g. by way of merger, corporate restructurings, etc.).

Structural elements

Structural credit enhancement elements are common in project finance transactions and include the following:

- **Subordination:** the claims of a junior investor are subordinated to those of a senior investor as the junior investor is paid only after satisfaction of the senior investor's claim; thus, subordinated investors absorb the first losses.
- **Overcollateralisation:** the fundamental economic value of the project exceeds the obligations under the issued debt instruments.
- **Distribution lock-ups:** distributions to sponsors or debt service to junior investors can only be made if certain minimum debt service coverage and leverage thresholds are met.
- **Cash sweeps:** excess cash flows must (partially) be applied to early repayments. The amounts of early repayment may be based on certain conditions such as credit performance, time, or target repayment amounts.
- **Reserve funds:** the SPV retains cash as a reserve to cover costs, first losses, or to provide liquidity support. The reserve fund, if drawn, is typically replenished by extra cash available after the application of the cash-flow waterfall.

Taxation

Scope considers any liabilities originating from taxes that could affect the cash flows and hence the rating promise. Potential tax liabilities are of major concern because they are senior obligations by law in most jurisdictions and a failure to pay could trigger regulatory actions affecting the SPV and the transaction structure. The fact that tax liabilities usually rank senior to all of the SPV's other payment obligations in the cash flow priority of payments highlights their significance.

Sources of tax liabilities

Tax liabilities arise for various reasons and take different forms. Scope groups these taxes according to the item they are related to:

- **Project:** taxes may be levied in relation to the project as withholding taxes on the payments to be made from the project to the SPV; as VAT on the acquisition of equipment; or as stamp duties for the perfection of security.
- **SPV:** taxes may also be charged in relation to the SPV itself, i.e. the earnings of the SPV could be taxable unless the SPV is tax neutral or tax transparent. If neither is the case, taxation would not affect the structure if only the profit is subject to taxation, i.e. the earnings after deducting the cash needed to service the rated debt plus senior ranking obligations.
- **Transaction parties' payments:** payments of third parties, such as providers of credit enhancement, could be subject to taxation as well.

Tax analysis

Scope will request tax opinions to assess a transaction's tax liabilities from time to time.

Tax re-characterisation could create additional complexity, in particular in the case of cross-border transactions. Tax re-characterisation is relevant in transactions where a certain jurisdiction, other than that in which the SPV resides, applies its tax regime to the SPV. This could, for instance, be the jurisdiction in which a company providing all essential services to the SPV is domiciled. Secondary tax liabilities are relevant where the jurisdiction of an SPV's parent would claim unpaid tax liabilities of the parent from its affiliate, i.e. the SPV. Possible mitigants such as double taxation treaties governing potential cross-border taxation help to reduce taxes, but not their complexity.

Scope may not need to rely on external tax assessments to demonstrate that no tax obligations exist as long the relevant transaction documents contain valid, legally binding and enforceable gross-up clauses in favour of the SPV; or if the generated cash flow suffices to settle all tax claims.

Scope's ratings do not address the potential taxes borne by an investor on his investment in the rated exposure.

Legal opinions

Scope usually relies on external legal opinions in its legal review.

The legal opinions typically confirm:

- that all transaction documents constitute legal, valid, binding and enforceable obligations of the parties; and
- the effectiveness of SPV bankruptcy remoteness elements;
- the taxation of the underlying assets, transaction documents and the SPV.

The legal opinions may contain only the limited assumptions and qualifications that are standard for this kind of transactions. Scope will discuss any implications with the transaction counsel and the sponsor of the transaction if assumptions or qualifications cast doubt on the legal opinion. This allows Scope to adequately assess the issues raised and better understand their implications for the robustness of the structure.

Final remarks

Scope requests readers of these considerations on legal risks in project finance transactions to keep the following points in mind:

Change in law

These legal considerations reflect the legal situation at the time of their publication. This appendix will only be updated if these changes have a material impact on the legal considerations laid down herein. Changes in the applicable law are an ongoing process and one of the challenges to a legal analysis of project finance transactions. In addition, their interpretation (e.g. in jurisprudence or administrative guidance) significantly affects the robustness of the legal elements of project finance transactions leading to constant adjustments to the market standard documentation.



General Project Finance Rating Methodology

Project Finance

Miscellaneous

This appendix does not constitute legal advice, nor does it represent a promise by Scope that a certain rating will be achieved if all legal aspects described herein are covered by any structure presented for a rating.

Although Scope forms its own view on the legal robustness of project finance transactions, it acknowledges that the structures and legal elements of these transactions are driven by market participants and their legal counsels. Scope invites these parties, in particular, to contribute to the development of these legal considerations by sharing their views with Scope.

Appendix XII Example case study

This appendix provides a complete case study showing the application of the analytical framework in this methodology. This example is based on the hypothetical rating of a mezzanine debt tranche of a shadow toll road project in Spain. The example illustrates the features of this methodology and demonstrates the analytical insight.

Throughout this case study, labels in lowercase letters represent the PD or EL strength of risk areas and the rated exposure, as per our idealised EL and PD tables. These lowercase labels do not represent credit ratings.

Figure 50. Step 1 – Assessment of risk factors contributing to project losses and PD strength of risk areas

Assessment	Details	Section
ERH	10 years across all risk areas of the operational phase, accounting for impairments. 14 years when no impairments.	
Sponsors	Experience, track record and importance of the project (average) – The project has two sponsors, one industrial (70% share) and one financial (30%). Sponsors have very strong and valuable experience with similar projects and have high economic incentives. The industrial sponsor is internally rated investment grade and brings 25 years of project finance expertise, technical competence and financial capacity. Currently it invests in more than 10 similar projects in the same sector and country. The financial sponsor is specialising in equity and debt instruments with a primary focus on the infrastructure sector. There is strong alignment of interests.	8.3.1.1
Construction	Construction risk factors (n/a) – The project is in operation. PD strength: N/A	8.3.1.2
Operation	Operational complexity, technology and standing (low) – The project benefits from relatively simple operating activities and a good operational track record of 10 years. O&M contracts, budgets and planning (average) – O&M contract with pass-through of O&M risks are subject to an adequate level of liability cap. O&M contract pricing is aligned with the market with some comparable market data. There is an adequate O&M cash flow breakeven level and pre-funded O&M reserve account. Lifecycle risk (high) – There is some pressure on the lifecycle budget and schedule given actual traffic volumes are higher than expected. Historical road resurfacing expenditure has exceeded budgets. Counterparty risk (average) – O&M counterparty has adequate credit quality (BBB-) and a good track record. Project provides adequate economic incentives to the operator and is strategic in the operator's business model. PD strength: bb	8.3.1.3
Revenue risk	Revenue contracts (average) – Shadow toll road revenues are subject to long-term concession agreement. The structure of the revenue tariff is staggered and descending as the number of users increases; it is also linked to CPI. Given the higher-than-anticipated traffic volume, revenues are somewhat protected from volume risk compared to that of a typical shadow toll road. Economic fundamentals (low) – There is a good competitive advantage in terms of geographic location, as well as strong historical and projected demand. Traffic volumes significantly exceed the maximum annual proceeds stipulated in the tender. Supply/reserve risk (N/A) – The nature of the project presents no supply risks. Counterparty risk (high) – The local government of Spain has a relatively weak socio-economic profile; the fiscal deficit albeit benefits from strong liquidity support from the central government. The counterparty is internally rated below investment grade. The relationship between the SPV and the authority is improving following a recent dispute related to the lifecycle programme, and interests between the parties are aligned adequately. PD strength: bb+	8.3.1.4
Financial strength	Debt repayment (average) – Under the base case scenario, the project will generate senior debt service coverage ratios (DSCRs) of 1.3x, and average annual DSCRs of 1.4x. This is adequate for the shadow toll road. Cash flow stress scenarios (low) – The following sensitivities were applied to the project cash flows:	8.3.1.5

	Assumptions	Scenario																			
	Traffic reduction	-10%																			
	Tariff reduction	Flat (at 2016 level)																			
	Reduction in CPI	-1%																			
	Delay in payment by the authority	3 months																			
	Penalties	EUR 1m																			
	Lifecycle costs increase	+30%																			
	Additional lifecycle expenditure in 2018-2020	EUR 10m																			
	Change in lifecycle time schedule	brought forward by 2.5 years																			
	Operational costs increase	+10%																			
	<p>We conclude that the cash flows are broadly resilient to most reasonably conservative scenarios and in most cases the project has enough cash flows and available cash reserves to continue servicing its debt.</p> <p>Inflation, interest rate and foreign exchange risks (low) – Exposure to inflation is immaterial; sensitivity cash flow scenarios demonstrate adequate resilience.</p> <p>Refinancing risk (very low) – Very low refinancing risk is posed by this project.</p> <p>Counterparty risk (average) – The financial counterparty Bank X has adequate credit quality (A-).</p> <p>PD strength: bbb-</p>																				
Project structure and other	<p>Financing and legal framework, compliance (very low) – The project meets in full the bankruptcy-remoteness criteria (limited-recourse provisions, no cross-default, non-petition language, anti-filing mechanism, M&A and corporate activity restrictions, debt limitations). The legal integrity of all material contracts is ensured. The issue has a pledge-based secured structure that favours bondholders over the credit rights from the concession contract, bank accounts, credit rights from insurance contracts and the shares of the issuing company. The project benefits from a strong cash-controlling covenant package. Relatively strict equity distribution test is in place (lock-up level at 1.15x).</p> <p>Project complies fully with all necessary laws and regulations (ESG, equator principles).</p> <p>Country risk (average) – Spain has adequate credit quality (A- by Scope as of 30 November 2018 in this example), average political risk and an adequate business environment.</p> <p>Force majeure/events risk (average) – Based on the geographical location and the nature of the project, a force majeure event is highly unlikely.</p> <p>PD strength: bbb</p>		8.3.1.6																		
Credit enhancements	<p>N/A – There are no credit enhancements applicable to this project.</p>		8.3.1.6																		
Probability-of-default strength of the instrument	<p>In this case the PD strength of the instrument arises from adding the contributions of the four areas of the operational phase. The total probability of a credit-impairment event is 8.5%, which corresponds to the BBB- vector in our idealised PD table given a 13.7-year risk horizon.</p> <table border="1" data-bbox="325 1617 900 1832"> <thead> <tr> <th>Risk area</th> <th>PD strength</th> <th>PD</th> </tr> </thead> <tbody> <tr> <td>Construction</td> <td>N/A</td> <td>0.0%</td> </tr> <tr> <td>Operation</td> <td>bb</td> <td>3.6%</td> </tr> <tr> <td>Revenue risk</td> <td>bb+</td> <td>2.3%</td> </tr> <tr> <td>Financial strength</td> <td>bbb-</td> <td>1.4%</td> </tr> <tr> <td>Project structure and other</td> <td>bbb</td> <td>1.2%</td> </tr> </tbody> </table> <p>PD strength of the instrument: bbb-</p>		Risk area	PD strength	PD	Construction	N/A	0.0%	Operation	bb	3.6%	Revenue risk	bb+	2.3%	Financial strength	bbb-	1.4%	Project structure and other	bbb	1.2%	Appendix VI
Risk area	PD strength	PD																			
Construction	N/A	0.0%																			
Operation	bb	3.6%																			
Revenue risk	bb+	2.3%																			
Financial strength	bbb-	1.4%																			
Project structure and other	bbb	1.2%																			

Source: Scope Ratings.

Figure 51. Step 2 – Calculation of the probabilities of credit-impairment events

Assessment	Details	Section																																										
Probability of credit-impairment events	<p>The analysis and scoring of risk factors also enable the differentiation of credit-impairment events. The total probability that a risk area triggers a credit-impairment event is now distributed among the events of the risk area, as a function of the scores of the relevant risk factors.</p> <p>Given a tree representation of the credit risk, the likelihood of a given credit-impairment event can be found by multiplying the conditional probabilities of the branches of the probability tree that lead to the event. For example, the likelihood of lifecycle issues is equal to the probability of surviving the construction phase, times the conditional probability that the operational risk area triggers a credit-impairment event, times the conditional probability that the project faces lifecycle issues (i.e. 100% x 3.61% x 71.74% = 2.59%).</p> <p>The following table summarises the results:</p> <table border="1"> <thead> <tr> <th></th> <th>Event contributing to project losses</th> <th>Total probability of event</th> </tr> </thead> <tbody> <tr> <td rowspan="4">Construction</td> <td>Construction delay</td> <td>0.00%</td> </tr> <tr> <td>Cost overrun</td> <td>0.00%</td> </tr> <tr> <td>Other issues (e.g. technology, counterparty)</td> <td>0.00%</td> </tr> <tr> <td>Sponsor equity contribution or credit risk</td> <td>0.00%</td> </tr> <tr> <td rowspan="3">Operation</td> <td>Operational performance, budget and schedule issues</td> <td>0.50%</td> </tr> <tr> <td>Lifecycle issues</td> <td>2.59%</td> </tr> <tr> <td>O&M counterparty issues</td> <td>0.52%</td> </tr> <tr> <td rowspan="3">Revenue risk</td> <td>Revenue counterparty issues (financial or technical performance)</td> <td>2.01%</td> </tr> <tr> <td>Revenue deterioration</td> <td>0.33%</td> </tr> <tr> <td>Supply interruptions or reserve issues</td> <td>0.00%</td> </tr> <tr> <td rowspan="3">Financial strength</td> <td>Inflation, interest or currency issues</td> <td>0.44%</td> </tr> <tr> <td>Refinancing issues</td> <td>0.00%</td> </tr> <tr> <td>Debt repayment or cash flow liquidity issues</td> <td>0.93%</td> </tr> <tr> <td rowspan="4">Structure and other</td> <td>Country or political issues</td> <td>0.74%</td> </tr> <tr> <td>Force majeure or events issues</td> <td>0.25%</td> </tr> <tr> <td>Legal, environmental or compliance issues</td> <td>0.25%</td> </tr> <tr> <td>No credit-impairment events</td> <td>91.46%</td> </tr> </tbody> </table>		Event contributing to project losses	Total probability of event	Construction	Construction delay	0.00%	Cost overrun	0.00%	Other issues (e.g. technology, counterparty)	0.00%	Sponsor equity contribution or credit risk	0.00%	Operation	Operational performance, budget and schedule issues	0.50%	Lifecycle issues	2.59%	O&M counterparty issues	0.52%	Revenue risk	Revenue counterparty issues (financial or technical performance)	2.01%	Revenue deterioration	0.33%	Supply interruptions or reserve issues	0.00%	Financial strength	Inflation, interest or currency issues	0.44%	Refinancing issues	0.00%	Debt repayment or cash flow liquidity issues	0.93%	Structure and other	Country or political issues	0.74%	Force majeure or events issues	0.25%	Legal, environmental or compliance issues	0.25%	No credit-impairment events	91.46%	8.3 Appendix VI
	Event contributing to project losses	Total probability of event																																										
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	No credit-impairment events	91.46%																																										

Source: Scope Ratings.

Figure 52. Step 3 –Severity of the three most relevant credit-impairment events using the project’s financial cash flow model

Assessment	Details	Section								
Expected recovery of most relevant events	<p>We consider future cash flows available to the investor until the end of concession period. These cash flows are stressed based on the conditions implied by the outcome under analysis and discounted at the rate promised to the investor.</p> <p>For the project, we calculated recoveries at the time of analysis for the following events:</p> <table border="1"> <thead> <tr> <th>Relevant event</th> <th>Expected recovery of exposure</th> </tr> </thead> <tbody> <tr> <td>Lifecycle issues</td> <td>57%</td> </tr> <tr> <td>Revenues counterparty issues</td> <td>40%</td> </tr> <tr> <td>Debt repayment/cash flow liquidity issues</td> <td>52%</td> </tr> </tbody> </table> <p>The relatively low expected recovery values reflect the subordinated nature of the rated instrument (i.e. a subordinated debt tranche).</p>	Relevant event	Expected recovery of exposure	Lifecycle issues	57%	Revenues counterparty issues	40%	Debt repayment/cash flow liquidity issues	52%	8.4.2
Relevant event	Expected recovery of exposure									
Lifecycle issues	57%									
Revenues counterparty issues	40%									
Debt repayment/cash flow liquidity issues	52%									

Source: Scope Ratings.

Figure 53. Step 4 – Determination of the instrument’s recovery risk score and recovery haircut

Assessment	Details	Section
Tranche characteristics	The instrument is a mezzanine loan attaching at 20% and detaching at 45% of the capital structure (i.e. the loan is subordinated to a senior loan that represents 55% of the project value, and it is senior to an equity piece representing 20% of the project value).	
Sector	Infrastructure and transportation.	
Recovery distributions	Recovery distributions for higher asset-value resilience under stress.	
Recovery risk factors	<p>We analyse the recovery characteristics of the project with respect to the rated instrument and derive a project-specific average recovery risk score. The scores reflect the contribution of each recovery risk factor to total credit risk.</p> <p>Project security package (high contribution to credit risk) – There are subordinated security rights.</p> <p>Collateral enforceability (average contribution to credit risk) – Expectations are adequate and there is some track record in the country.</p> <p>Recovery enhancements and termination provisions (average contribution to credit risk) – None are available</p> <p>Fundamental economic value of the project (average contribution to credit risk) – Fundamental characteristics of underlying project asset are adequate with a PLCR of 1.7x.</p> <p>Average recovery risk score: high/average contribution to credit risk</p> <p>Recovery haircut: +11.17% (to convert from standard recovery to project-specific recovery)</p>	8.4.1.4

Source: Scope Ratings.

Figure 54. Step 5 – Severity of less relevant credit-impairment events from standard recovery assumptions

Assessment	Details	Section
	Step 5 is demonstrated only for the O&M counterparty issues credit-impairment event of the operational risk area. We perform these steps for all credit-impairment events that are not selected for recovery analysis using the project’s financial cash flow model.	
Standard recovery distribution assumption (project level, at end of resolution process)	<p>Attachment and detachment scale for tranche 100% 80% 60% 40% 20% 0%</p> <p>Senior <-----> Junior</p> <p>Standard expected <u>project-level</u> recovery at end of resolution process after an O&M counterparty issues credit-impairment event = 78.7%</p>	8.4.1 Appendix VIII

<p>Standard recovery distribution assumption (tranche level, at end of resolution process)</p>	<p>The recovery distribution is obtained for the tranche, given the seniority of the rated instrument:</p> <p style="text-align: center;">Tranche characteristics</p> <p>Standard expected <u>tranche-level</u> recovery at end of resolution process after an O&M counterparty issues credit-impairment event = 73.5%</p>	<p>8.4.1.2</p>
<p>Project-specific expected recovery estimate (tranche level, at end of resolution process)</p>	<p>$Project\text{-}specific\ Expected\ Recovery_{At\ end\text{-}resolution}^{Tranche\text{-}level} =$ $= (1 - RRhaircut) \times Standard\ Expected\ Recovery_{At\ end\text{-}resolution}^{Tranche\text{-}level} =$ $= (1 - 11.17\%) \times 73.51\% = 65.29\%$</p> <p>Because the tranche's weighted average recovery score is <i>average/high</i>; which drives the recovery haircut (+11.17%) to convert from standard recovery to project-specific recovery.</p>	<p>8.4.1.4</p>
<p>Capped expected recovery estimate (tranche level, at end of resolution process)</p>	<p>$Expected\ Recovery_{At\ end\text{-}resolution}^{Tranche\text{-}level} =$ $= \min(95\%, Project\text{-}specific\ Expected\ Recovery_{At\ end\text{-}resolution}^{Tranche\text{-}level}) =$ $= \min(95\%, 65.29\%) = 65.29\%$</p> <p>Note: the 95% cap will generally have no effect when considering mezzanine exposures.</p>	<p>8.4.1.5</p>
<p>Resolution time</p>	<p>$Project\ resolution\ time = Country\ resolution\ time \times \left(1 + \begin{matrix} 50\% \text{ if enforceability risk} \\ \text{or} \\ 0\% \text{ otherwise} \end{matrix} \right) =$ $= 1.93\ years \times (1 + 0\%) = 1.93\ years$</p> <p>Note: for this project, the resolution time is not extended because Collateral enforceability is average.</p>	<p>8.4.1.6.1</p>
<p>Credited balance drop</p>	<p>This example assumes an expected balance drop of 25% at the expected time to default, from the balance outstanding at the time of the analysis, and we only give 50% credit to the expected balance drop:</p> <p>$Credited\ balance\ drop = 50\% \times Expected\ balance\ drop =$ $= 50\% \times 25\% = 12.5\%$</p>	<p>8.4.1.7</p>
<p>Time-value-, and balance-adjusted expected recovery estimate (tranche level, at time of analysis)</p>	<p>$Credited\ recovery_{Present\ value}^{Tranche\text{-}level} =$ $= 1 - (1 - Balance\ drop_{credited}) \times \frac{1 - \frac{Expected\ recovery_{At\ end\text{-}resolution}^{Tranche\text{-}level}}{(1+r)^{Resolution\ time}}}{(1+r)^{Performing\ time}} =$ $= 1 - (1 - 12.5\%) \times \frac{1 - \frac{65.29\%}{(1+5\%)^{1.93\ years}}}{(1+5\%)^{(9.59\ years - 1\ year)}} = 76.6\%$</p> <p>Because this example assumes an expected time to default of 9.59 years for O&M counterparty issues, the payment period is one year (and consequently the expected performing time is 8.59 years), the rate promised to the investor is 5%, and the credited balance drop is 12.5%.</p>	<p>8.4.1.6 and 8.4.1.7</p>
<p>Final expected recovery estimate (tranche level, at time of analysis)</p>	<p>Expected recovery of instrument under the O&M counterparty issues event: 76.6%</p> <p>Expected recovery rate we use for the estimation of the contribution to total expected loss on the mezzanine exposure, from credit-impairment events related to O&M counterparty issues, during the operational phase, for this particular project.</p>	

Source: Scope Ratings.

Figure 55. Step 5 – Calculation of all expected loss contributions and total expected loss

Assessment	Details	Section																																																								
Total expected loss	The expected loss is the sum of the contributions from all credit-impairment events. The following table shows the summary of all contributions:	8.4.2 Appendix II																																																								
	<table border="1"> <thead> <tr> <th>Event contributing to project losses</th> <th>Total probability of event</th> <th>Tranche-level expected recovery</th> <th>EL from event</th> </tr> </thead> <tbody> <tr> <td>Operational performance, budget and schedule issues</td> <td>0.50%</td> <td>77.5%</td> <td>0.11%</td> </tr> <tr> <td>Lifecycle issues</td> <td>2.59%</td> <td>57.0%</td> <td>1.11%</td> </tr> <tr> <td>O&M counterparty issues</td> <td>0.52%</td> <td>76.6%</td> <td>0.12%</td> </tr> <tr> <td>Revenue counterparty issues (fin. or tech. performance)</td> <td>2.01%</td> <td>40.0%</td> <td>1.21%</td> </tr> <tr> <td>Revenue deterioration</td> <td>0.33%</td> <td>74.4%</td> <td>0.08%</td> </tr> <tr> <td>Supply interruptions or reserve issues</td> <td>0.00%</td> <td>61.9%</td> <td>0.00%</td> </tr> <tr> <td>Inflation, interest or currency issues</td> <td>0.44%</td> <td>78.1%</td> <td>0.10%</td> </tr> <tr> <td>Refinancing issues</td> <td>0.00%</td> <td>63.5%</td> <td>0.00%</td> </tr> <tr> <td>Debt repayment or cash flow liquidity issues</td> <td>0.93%</td> <td>52.0%</td> <td>0.45%</td> </tr> <tr> <td>Country or political issues</td> <td>0.74%</td> <td>74.2%</td> <td>0.19%</td> </tr> <tr> <td>Force majeure or events issues</td> <td>0.25%</td> <td>74.2%</td> <td>0.06%</td> </tr> <tr> <td>Legal or environmental or compliance issues</td> <td>0.25%</td> <td>75.4%</td> <td>0.06%</td> </tr> <tr> <td>No credit-impairment events</td> <td>91.46%</td> <td>77.5%</td> <td>0.11%</td> </tr> </tbody> </table>		Event contributing to project losses	Total probability of event	Tranche-level expected recovery	EL from event	Operational performance, budget and schedule issues	0.50%	77.5%	0.11%	Lifecycle issues	2.59%	57.0%	1.11%	O&M counterparty issues	0.52%	76.6%	0.12%	Revenue counterparty issues (fin. or tech. performance)	2.01%	40.0%	1.21%	Revenue deterioration	0.33%	74.4%	0.08%	Supply interruptions or reserve issues	0.00%	61.9%	0.00%	Inflation, interest or currency issues	0.44%	78.1%	0.10%	Refinancing issues	0.00%	63.5%	0.00%	Debt repayment or cash flow liquidity issues	0.93%	52.0%	0.45%	Country or political issues	0.74%	74.2%	0.19%	Force majeure or events issues	0.25%	74.2%	0.06%	Legal or environmental or compliance issues	0.25%	75.4%	0.06%	No credit-impairment events	91.46%	77.5%	0.11%
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<p>Note: Construction events not shown because project is already in operation. Note 2: Most relevant credit-impairment events highlighted in bold and blue.</p>																																																										
<p>Total expected loss is 3.498%, which over a 13.7-year risk horizon yields an expected loss rating indication of BBB as per our idealised EL table.</p>																																																										
Probability of hard default and hard recovery rate	The probability that the investor suffers a loss over the life of the instrument is 3.49%, and the expected recovery rate on such loss events is 0%. This reflects the subordinated nature of the instrument and the high severity of restructuring events where the project value is haircut beyond the protection provided by equity.	8.6 Appendix IX																																																								



General Project Finance Rating Methodology

Project Finance

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