

BENEFIT

Business Models for Enhancing Funding
& Enabling Financing for Infrastructure in Transport

Deliverable: D 2.3 – Financing Schemes Typology



European

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Glossary

Within BENEFIT certain terms are used throughout. These are described here.

Collective BENEFIT database: This is the BENEFIT database consisting, at the start of the project, of seventy-five case studies of funding transport infrastructure and twenty-four country profiles. These are published data from COST Action TU1001 and the OMEGA Centre megaprojects. During the course of the project, the database will be supplemented with at least twenty-eight more cases of funding/financing infrastructure (in particular public funding/financing, which are less represented).

Funding Scheme: A funding scheme is considered to be any combination of private and public income generated by or towards the infrastructure over its life cycle. These may include any combination of user contribution (tolls, fees, fares etc.) or public contributions based on direct and indirect taxation etc.. Public funding may also take on the form of availability fees, shadow tolls etc.

Financing Scheme: A Financing scheme is considered to be any combination of public and/or private financial investments required by the infrastructure over its life cycle.

Business model: The business model describes the business case of the overall investment. Depending on the setting, it may be narrowed, including strictly the infrastructure projects considered, or it may be widened, including other planned and commonly designed activities in order to capture other “planning gains” (and other value-added services) and even exploiting synergies across the sectors (eg. transport, energy, ICT). The latter incorporates the notion of innovative procurement and other approaches to infrastructure delivery, now in the pilot phase.

Key Elements: Elements are groups of variable dimensions of the same context, which influence the performance of the funding scheme and financing scheme. Elements, as noted in figure 1.1.1, are the implementation environment (socio-political, micro and macro economical, institutional, regulatory, etc.); the transport mode (functionality; natural and contractual exclusivity, etc.); business model structure; funding scheme; financing scheme and governance arrangement (risk allocation; decision process; ownership rights, etc.).

Typology: A typology concerns groups of factors describing an Element that contribute in demonstrating a particular behaviour. Example: Negative Private investment environment type in the implementation context typology. The group of factors leading to the demonstration of this behaviour may be: poor growth forecast, lack of enabling legal framework etc. Typologies for every element (context) will be generated during the project using the collective BENEFIT database (country profiles and case studies) as field examples and desk research. Quantitative and qualitative analysis are the analytical tools that may be used.

Decision Matching Framework: This is the Analysis and Decision Framework to be developed by the BENEFIT project. The framework will contain typologies influencing the overall performance of the investment. It will initially be developed using hypotheses of optimum matching between types, which are confirmed as Matching Principles (rules describing by which optimum performance may be achieved) during the course of the project. As such, it could be used as an analysis tool (eg. identification of “mismatches”) or decision tool (eg. given the types of elements, which funding scheme type is most appropriate) or project rating framework (expressed as the risk to match a specific financing scheme) or project rating enhancing framework (which types may be changed and in which direction to improve project rating).

1. Introduction

BENEFIT takes an innovative approach by analysing funding schemes within an inter-related system. Funding schemes are successful (or not) depending on the Business Model that generates them. The performance of the Business Model is affected by the implementation and the transport mode context. It is matched successfully (or not) by a financing scheme. Relations between actors are described by a governance model (contracting arrangements). These are key elements in Transport Infrastructure Provision, Operation and Maintenance, as illustrated in figure 1.

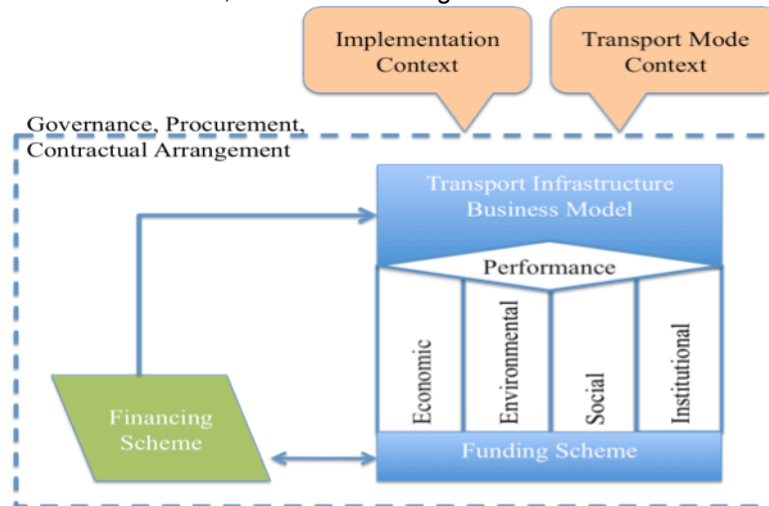


Figure 1: BENEFIT Key Elements in Transport Infrastructure Provision, Operation and Maintenance

Success is a measure of the appropriate matching of elements. Within BENEFIT funding and financing schemes are analysed in this respect. Describing these key elements through their characteristics and attributes and clustering each of them into typologies is the basis of, first, developing a generic framework. Identifying best matches in their inter-relations (matching principles) leads to move from a generic framework to a powerful decision making one (Decision Matching Framework) that is developed to guide policy makers and providers of funding (and financing) extensive comparative information on the advantages and limitations of different funding schemes for transport infrastructure projects and improve the awareness of policy makers on the needs of projects serving an efficient and performing transport network within the horizon 2050. Besides, the framework allows policy makers to identify changes that may be undertaken in order to improve the potential of success, such as improving the value proposition of the business model.

In developing this framework, BENEFIT takes stock of case studies known to its partners in combination with a meta-analysis of relevant EC funded research and other studies carried out with respect to funding schemes for transport (and other) infrastructure and direct contact with key stakeholder groups. More specifically, BENEFIT uses the published case study descriptions of seventy-five transport infrastructure projects funded and financed by public and private resources from nineteen European and four non-European Countries covering all modes of transport. It also exploits twenty-four European country profiles with respect to contextual issues (institutions, regulations, macroeconomic and other settings) influencing funding and financing of transport infrastructure. This data has been produced within the framework of activities undertaken by the OMEGA Centre for Mega Projects in Transport and Development and the COST Action TU1001 on Public Private Partnerships in Transport: Trends and Theory. In addition, BENEFIT, through its partnership and respective experts, consolidates almost twenty years of successful European Commission research with respect to issues related to transport infrastructure and planning, assessment and pricing of transport services. Therefore, its approach is supported by the tacit knowledge and insights of the BENEFIT partnership with respect to infrastructure projects in transport.

By applying the Decision Matching Framework, BENEFIT will undertake:

- An ex-post analysis and assessment of alternative funding schemes (public, PPP and other) based on existing experiences in different transport sectors and geographical areas and their assessment with respect to economic development, value for public money, user benefits, life-cycle investment, efficiency, governance and procurement modalities, etc.; and, provide lessons learned, identification of the limitations of the various schemes and the impact of the economic and financial crisis.
- An ex-ante (forward) analysis and assessment of the potential of transport investments and the related funding schemes, including innovative procurement schemes still in a pilot phase, to contribute to economic recovery, growth and employment, in view of future infrastructure needs with a 2050 horizon for modern infrastructure, smart pricing and funding.

BENEFIT is concluded within twenty one months and bears the following innovative aspects:

- Transport infrastructure business models and their project rating: Improved value propositions lead to funding schemes with enhanced creditworthiness enabling viable financing, balancing of project financing and funding risks, increasing the value basis of stakeholders and highlighting the potential of transport investments.
- Transferability of findings with respect to lessons learned, limitations and the impact of the economic and financial crisis through the introduction of typologies.
- Open-access case study database in a wiki format, allowing for continuous updates and providing a knowledge base serving both practitioners and researchers.

1.1 Contribution of this Report to the BENEFIT Project - Typologies

The key concept of the BENEFIT project is the analysis and re-construction of transport infrastructure funding and financing through a system described by its elements, as shown in figure 1. These elements are described through their key characteristics vis-à-vis the funding and financing schemes described as “typologies”. These are clustered as “dimensions” attributes of the elements. Each dimension, in turn, is described by indicators, which provide “values”.

Using these typologies, the property space may be re-structured generically allowing for objective analysis of cases and, also, the creation of a framework guiding decision-making. Achieving the “ideal type” is an objective.

For each element of the transport infrastructure delivery system (see figure 1), a typology is identified. More specifically, a typology is identified for:

1. The implementation context, i.e. the particular political, legal/regulatory, social etc. environment the infrastructure is delivered in.
2. The transport mode context, i.e. the transport mode particularities and specificities the infrastructure is developed to serve.
3. The transport infrastructure Business Model, i.e. the value proposition of the infrastructure as it is bundled with other offerings and services.
4. The funding scheme, i.e. the revenue stream that is generated through the business model, which contributes in “paying back” the investment. Notably, as shown in figure 1, the funding scheme is generated by the economic, environmental, social and institutional outcomes of the business model.
5. The financing scheme, i.e. the structure of the investment, and, finally,

6. The Governance scheme, i.e. the rules and stakeholder relations organizing and regulating the infrastructure delivery system.

The implementation and transport mode context, describe to a large extent the business model that may be developed. The business model will create economic, environmental, social and institutional outcomes and, ultimately, produce relevant and respective funding schemes. Governance introduces an external change to this initial setting by introducing new rules and relationships. Finally, the financing scheme reflects the financing capacity created.

In this approach, the typologies of the implementation and transport mode context, as well as those of the business model and funding scheme are considered in one entity described in report D2.2, while the Governance Typology in report D2.4.

The present report D2.3 is the deliverable of Task 2.3 and describes the financing scheme typology.

1.2 Report Structure and Contribution to the BENEFIT Project

The focus of the present report concerns the identification of key characteristics formulating the typology of Financial Schemes of transport infrastructure projects.

In the **BENEFIT proposal** the different **sources of capital were highlighted** as the main theme to be studied in Task 2.3. However, the team soon found out that an approach starting from sources of capital would be too narrow and too superficial in order to fulfill the main goal of Work Package 2, namely, creating a consistent set of typologies. It will be seen, however, that sources of capital will appear naturally – and in the right perspective – as part of the important sub-typology 2.2 (see section 2.5.2).

The BENEFIT proposal also highlighted a project's **creditworthiness** as a main category to be studied in Task 2.3. Again, the team soon found out that creditworthiness, with its emphasis on debt financing, is too narrow for our purpose, since we have to consider all kinds of capital, that is, besides debt also equity – and their different forms – and mezzanine forms and even (and quite important) debt substituting instruments like insurances and guarantees. This lead us to formulate a more general criterion as “the ability of the project to meet its expected financial targets”, which includes creditworthiness with respect to debt financing (see section 2.5).

In short, the methodology of Task 2.3 and the description of its results in this deliverable are more generic than was initially set out in the task description. Starting with “Leading questions” of Task 2.3 in section 2.3 the reasoning goes on in sections 2.4 and 2.5, finally leading to concrete typologies in 2.5.1 and 2.5.2.

2. Background

2.1 Typologies

The contextual elements in Figure 1 may be described by a set of properties with considerable diversity, which are variants forming the property space. Evidently, their reduction to typologies is required in order to create the research environment and allow the “reconstruction of the property space”. A typology concerns groups of factors describing an element that contribute in demonstrating a particular behaviour. Achieving the “ideal type” is an objective – the set of all typologies put together in Work Package 2 should be the least extensive one capable of describing the system adequately.

2.2 Task 2.3 “Financing Schemes” within Work Package 2 “Foundations” and within the whole of BENEFIT

Task 2.3 analyzes the financial conditions and possibilities of transport infrastructure projects (TIPs). TIPs may be set up either as government financed projects or as PPP projects, or as something in between. As set out in the Introduction and section 2.1, Task 2.3 is part of Work Package 2 “Foundations” that endeavors to describe TIPs from all relevant sides in the form of general traits or typologies so as to allow comparisons and some generalizations based on a substantial number of case studies.

The angle of perspective of Task 2.3 from which to look at TIPs is that of the financial schemes and the reasons determining them. This will be set out in much more detail in the next sections. In BENEFIT a common understanding has been reached to distinguish between “funding schemes” and “financing schemes”: funding refers to the regular stream of income that is generated by a project, whereas financing refers to the acquisition of capital from sponsors and investors that is required to get the project started and to sustain it financially, where the funding opportunities enter as an important input.

Project partners are fully aware that outside of BENEFIT the two terms funding and financing are not as clearly distinguished as defined above. Particularly, in the EU Call for this project H2020 MG.9.3 2014 “Analysis of funding schemes for transport infrastructure” the term funding is used to refer to both, funding and financing, as defined above. In other words: financial schemes are at the core of the project BENEFIT as a whole. While Task 2.3 has a distinct role within WP 2, its topic will be relevant throughout the whole project duration. Members of Task 2.3 will work in various other WP that will come up and continually contribute financial aspects and perspective. This holds particularly for Task 3.2 Policy Tool & Rating Methodology and Task 4.3 Effects of the Crisis, while at the same time Task 2.3 will also – as part of WP 2 supplying typologies – play into Task 4.1 Lessons Learnt and Task 3.1 Matching Principles. The understanding of Task 2.3 is to provide the foundations and a common understanding for all these contributions on financial aspects that will have to be made during the BENEFIT project.

The next issue – and the one that will be at the focus of this presentation – is that of the financial schemes typology. Before turning to that a closer look will be given to the concept of financing.

2.3 Leading Questions Concerning Financial Schemes

Task 2.3 should deal with – and provide typologies based on – the following leading questions:

1. What describes a financial scheme of a project?
2. **What determines the cost and availability of financing for a TIP?**
3. **What determines the financing structure or scheme of a TIP?**
4. What role do financing schemes play in project success?

Note, the first question has a somewhat narrower scope than the others. It only asks for a description. In contrast, the second and third questions ask for determinants underlying an observed financial scheme.

The determinants of financial cost and structure (for example its creditworthiness) have to do with (perceived) risks and returns of a project. In the following, we will immediately go for questions two and three, which have therefore been highlighted. Answering these two questions automatically includes answering the first one.

The last question of the above list refers to a very profound analysis, which is beyond the scope of Task 2.3. However in conjunction with the other parts of Work Package 2 several potentially relevant properties for project success will be worked out, and in the remainder of research project BENEFIT (already starting in Task 4.1 Lessons Learnt) we hope to get answers to this question as well.

2.4 Public vs. Private Projects

Financial schemes, and particularly their determinants, will be fundamentally different for public or private projects. This criterion or, more precisely, **a project's "degree of publicness" will constitute the first typology of financing schemes**. To capture this range one can distinguish between the following four cases:

1. TIP run by a purely public agency
2. TIP run by a publicly owned company or SPV (special purpose vehicle), maybe formally corporatized
3. TIP run by a public-private partnership (PPP)
4. TIP run by a purely private company without government contract

In the **first case, a purely public project**, the infrastructure is run as a part of the relevant government level, just like schools, police departments, or the like. It is financed by tax money or by the public debt of that government level. It is impossible to say which part of the financial sources of that government level is used for the financing of this TIP and which part for other purposes. Thus, it is actually hard to say what the financial scheme of the purely public project is. In this case we will take the "financial scheme" of the government level itself as being representative of the financial scheme of the TIP. Thus, if the budget of this government level is 80% tax financed and 20% debt financed, we will say that the purely public TIP is 80% equity financed and 20% debt financed, and we will take the government level's debt rate as applying to both debt and equity (and thus to the WACC¹).

Note that, whereas the financing scheme of a purely public TIP is a somewhat artificial concept, the *funding scheme* may be as important as for private companies, even if some part of the funding is also tax-based. However, it should be added that the case of purely public projects has become rare in Europe. Now consider the opposite case, **a purely private company without any government contract (case four)**. Here, the TIP is financed by a private company independent of any government action or agreement. But the company is using the overall leverage of its balance sheet to finance all its projects (TIP included). It will therefore be difficult to discern the financing scheme that is applicable to the TIP from the balance sheet of the whole company. Hence, similar to the first case, the best thing to do is to take the financial scheme of the whole company as being representative of the financial scheme of the TIP.

Note that purely private investments are quite usual in the transport *service* industry, like private bus or train operators, ship owners or airlines. In the United States there are even privately owned and financed integrated rail freight companies that finance and operate their own railway infrastructures. However, in Europe purely private transport infrastructure investments are rare. In Europe the natural monopoly property of transport infrastructure almost always leads to government intervention. We can therefore discard this case.

In the **third case**, the TIP is financed and / or run by a **public-private partnership (PPP)**, i.e. a by a private company that acts on the basis of a contract with the government. PPP are often established as

¹ See Section 0 on the concept of the WACC.

means to invest in TIPs which would have not been possible with the budget available to the public.² Thus, PPPs cannot simply draw on the public budget but have to arrange their financing schemes on their own. For this reason **PPPs are the leading case for analysing financing schemes**. Financial schemes of PPPs differ as much as legal combinations of public and private shares can be designed in a PPP.

The **second case, a publicly owned, but legally independent company** is an intermediate case between purely public and PPP. Such companies use tax-funded elements as well as financial instruments, which are also used by private companies. Most of the publicly owned companies are formally incorporated and have to fulfil the same legal requirements as private companies, even though their owner is a public body. Generally, the more independent the company is, the more will it resemble a PPP and, thus, the more relevant will be its financial decisions for its survival.

2.5 Derivation of Typologies from the Goals and Determinants of Financial Schemes

The goals of a company running a PPP coincide with the goals of any other private-sector company: profit maximisation. A public company running a TIP may not have the sole goal of profit maximization. But it will always have the goal of avoiding uncontrolled losses in the long run, and just from the financial perspective this is the goal that ranks highest. Moreover, experience shows that this goal has the property of becoming the dominant goal once losses get soaring. We therefore introduce as a general financial **viability condition** of a TIP – be it a PPP or purely public – that no losses are incurred in the long run.

Generally, profit is defined as proceeds minus cost. Let cost here be defined excluding interest expenses, then the profit has to cover at least the interest expenses. But equity owners must also be remunerated; else they will withdraw their capital from the firm. Thus, a company is viable only if its profit exceeds the sum of (i) interest expenses and (ii) the opportunity cost of equity. This sum is called the **total capital costs** of the company. Hence, viability requires that profit exceeds total capital costs.

Dividing by the amount of invested capital, this **viability condition** becomes:

$$\frac{\text{Profit}}{\text{Invested Capital}} > \frac{\text{Total Capital Cost}}{\text{Invested Capital}} \quad (1)$$

The left-hand side of condition (1) is defined as the **Return on Invested Capital (RoIC)**:

$$RoIC = \frac{\text{Profit}}{\text{Invested Capital}}$$

To be precise the numerator of this fraction refers to the Net Operating Profit after Tax (NOPAT), which is calculated without subtracting interest expenses, while the denominator refers to the book value of the invested capital.³

Now turn to the right-hand side of the viability condition (1), which can also be replaced by a prominent expression. Basically, the invested capital (denominator) consists of debt and equity. Moreover, total capital costs (nominator) can be decomposed into total debt cost (= the interest expenses of a typical company of this type) and total equity cost (= the opportunity costs of such company's equity). We introduce the following notation:

R_e = unit cost of equity
 R_d = unit cost of debt
 E = market value of the firm's equity
 D = market value of the firm's debt

² European Investment Bank (2005) Evaluation of PPP Projects Financed by the EIB, EIB Publications, available at <http://www.eib.org/projects/publications/evaluation-of-ppp-projects-financed-by-theeib.htm>.

³ Brealey, Myers, Allen, 2008, section 13.2.

where the market values of debt and equity are often approximated by their respective book values. The invested capital then equals $E + D$, the total cost of debt equals $D * R_d$, the total cost of equity equals $E * R_e$, and thus the total cost of capital equals $D * R_d + E * R_e$.

Then the right-hand side of the viability condition becomes $(E * R_e + D * R_d)/(E + D)$ and coincides with the so-called **Weighted Average Cost of Capital (WACC)**, which is defined as:

$$WACC = \frac{E}{E + D} R_e + \frac{D}{E + D} R_d$$

In this equation, the costs of each category of capital (equity and debt) are proportionately weighted according to their amount in the company's financial structure. Thus the WACC shows how much interest the company has to pay for every money unit it finances.⁴

Putting everything together, the **viability condition of the TIP** becomes:

$$RoIC > WACC \quad (2)$$

In words: Ultimately it is **the ability of the project to meet its expected financial targets**, i.e. to repay in full and in due time its debt investors and in addition to generate adequate returns for the equity investors. This will be the **second typology** of financial schemes and could be classified in a qualitative scale as low, medium or high.

For a project the ability to meet its financial targets is determined by the following general conditions under which it operates, which will therefore constitute **two sub-typologies**:

1. **Sub-typology: The financial profile of the project.** I.e. all properties of the project that will affect its evaluation from the financial perspective⁵
2. **Sub-typology: The risk-return appetite of the investors/financiers to provide various sorts of capital and other financial instruments** (equity, debt, mezzanine, insurances, guarantees etc). I.e. all characteristics of the relevant potential financiers affecting their willingness to provide finance

These two sub-typologies will be discussed and expanded in detail in the following subsections 2.5.1 and 2.5.2. A concise summary of all financial typologies will be given in section 3.

2.5.1 The financial profile of a project (sub-typology)

Which properties of a project will affect its financial evaluation? Starting again from the viability condition (2), we have to investigate the determinants of RoIC and WACC, i.e. the fundamentals of project return, cost, and capital cost.

Almost every TIP starts with a **construction phase**, where the infrastructure is built or renewed and net returns (or net cash flows) are negative. After that, it enters the **operation phase** where the infrastructure is used and net returns (hopefully) turn to the positive. This holds particularly for so-called **greenfield projects** that start with a long-time construction phase (for building a new port, airport, road or railway line) before entering its even longer-time operation phase. For **brownfield projects**, that start with transport infrastructure already in place, the construction phase is smaller by both cost and time, but still there is often a starting investment needed (for renewing or extending the existing infrastructure) such that net returns will also be negative for some time (also, since construction works usually impair the use of the infrastructure).

⁴ Brealey, Myers, Allen, 2008, section 10.1.

⁵ Note that “financial profile” is not to be confounded with “financial structure” which describes the structure of the financial instruments used (like the debt / equity ratio). The financial structure is addressed in the next section.

In order to satisfy the viability condition (2) the positive net returns of the operation phase have to be large enough to repay for the deficits made during the construction phase. This implies, first, that the financial arrangements made at the beginning of the project have to bridge the time-gap between the expenses made at the beginning and the inflow coming thereafter. Second, it is required that the net returns of the operating phase are large enough so that the financial arrangements can be fulfilled at all. Due to the extreme amounts of money and the extreme time structure of money flows involved (particularly in case of a greenfield project), the financial decisions of the investors, whether and at what conditions to finance it, contain substantial elements of “speculation” or dealing with uncertainties. **Generally, all risks and all opportunities that may affect the project in the future in any economically significant way are also relevant for the financial decisions and will be reflected in the structure and cost of financing.** That is why risks are so important for financial schemes and are analyzed extensively in the table in Appendix A.1. It lists common risks of TIPs (first two columns), based on a variety of such lists provided by the literature.

A word is in order on the **notion of risk**. For a purist financial economist, “risk” refers only to the *variance* of the returns or of the value of a financial asset, not to its *expected* return. Risk in this sense includes the upside and downside potentials equally, and it is just a taste-matter of “risk-aversion” by investors that makes them dislike such risk to some degree. In contrast, for a practitioner a “risk” is usually just a piece of bad news with some additional uncertainty attached to it. It is first of all understood as a reduction of the *expected* return or value of a financial asset. The aspect of uncertainty (variance) comes in addition, but may only be of second order importance to the practitioner. The uncertainty may even be regarded as the remaining aspect of hope. For example, suppose during the construction phase of a new road tunnel news comes up that the geological conditions may turn out to be more difficult than was initially expected. This news will increase the expected cost and thus reduce the expected value of the tunnel project. However, if there remains some chance that these difficulties will not materialize, this additional uncertainty represents actually the aspect of hope: although it introduces some variance (may be only of second order importance to the practitioner), it restores some part of expected value of the project (which is always of first order importance).

In the following we will adhere to this practitioner’s point of view, i.e. regard as “risks” any potential bad news that may come up.⁶ If such risk is perceived at the beginning of the project, it reduces first of all the project’s expected value, but also increases its variance. If the risk even realizes during the course of events, that will be even worse news, depressing project value even more (although deleting variance).

Many of the risks commonly listed (as for example in Appendix A.1) are very case-specific and, moreover, will only be known to the project insiders. Recall that a typology should focus on the most relevant traits of projects and has to be applicable to almost a hundred case studies; see sections 1 and 2.1. Thus, **in order to derive a typology** that can be applied to almost a hundred case studies we have to look for information that can at least hoped for being available in a usual case study. In some instances an available “proxy information” may serve as a substitute for a piece of information that would be interesting, but is usually not attainable.

Short reminder that two main typologies have already been defined above:

1. Public versus private project
2. Ability of the project to meet its expected financial targets

In order to explore the second of these two, the sub-typology capturing the financial profile of a project is needed. As stated before, not only the risks but also the upside opportunities of a project need to be assessed, as they all affect the financial potential of a project. Based on broad considerations about the risks and opportunities of projects, we arrive at the following:

⁶ Also the list of project risks given in Appendix A.1 is inspired by this notion of risk.

2.1 Sub-typology capturing the financial profile of a project:

With respect to the construction phase:

- 2.1.1 Certain aspects of the general implementation context of the project pertaining to the country like: availability of inputs, likelihood of strikes in the construction industry, legal system (reliability of contracts, potential changes in safety requirements during construction): influences risks directly.
- 2.1.2 Any important open issues of site acquisition and required permits?: influences risks directly.
- 2.1.3 Brownfield/ greenfield: Informs qualitatively or quantitatively about the relative size (in terms of financing needed and of time duration) of the construction phase during which funding streams will be very low relative to cost. It is therefore a measure of risk magnitude.
- 2.1.4 The overall cost of the project during the construction phase: if available, the most important single information about the construction phase. Will determine the magnitude of the needed financing and, if extraordinarily high, already point to potential difficulties of obtaining financing.
- 2.1.5 The complexity of its construction phase: Will be relevant with respect to potential time/cost overruns.
- 2.1.6 The strength and reliability of the construction contractors: Will be relevant with respect to potential time/cost overruns.
- 2.1.7 Does a rating exist, and if, how good is it?: Can be interpreted as an aggregate indicator that risks are moderate or that they are managed well (will also reduce cost of financing; see sub-typology on risk/return appetite)
- 2.1.8 Type of specific risk mitigation instruments (like insurances and guaranties) used for the construction phase: The use of such instruments is a clear and fairly precise indicator about the existence and relevance of the corresponding risks.

With respect to the operation phase:

- 2.1.9 The general mode and implementation context of the project like: transport mode, country (including aspects as the rule of law, tax regime, likelihood of strikes in the transport infrastructure branch, etc.), macroeconomic conditions (including mode-specific cyclical characteristics of end-user demand and risk-absorption by the service level): Will govern general demand risks like business cycle and thus revenue risks.
- 2.1.10 The funding model of the project: Will govern project-specific revenue risks.
- 2.1.11 The complexity of its operating phase: Will be relevant with respect to potential cost overruns.
- 2.1.12 The governance of the project and the strength and reliability of the operating contractor: Will be relevant with respect to potential cost overruns.
- 2.1.13 Other relevant aspects of the business model including the various counterparty contractual obligations, how the project is affected by competition etc.: Can be relevant either with respect to potential time/cost overruns or with respect to revenue risks.

2.1.14 Type of specific risk mitigation instruments (like insurances and guaranties) used for the operation phase: The use of such instruments is a clear and fairly precise indicator about the existence and relevance of the corresponding risks.

Ultimately, all parameters related to the reliability of operating cash flows eventually end up reflecting specific risks that appear or disappear during the life-time of the project. In this respect, this sub-typology as well as the overall financing typology should be considered to be time-dependent and changing during the project's life-cycle.

2.5.2 The risk-return appetite of investors/financiers to provide various sorts of capital and other financial instruments (sub-typology)

Above, we have derived the viability condition (2) of a TIP. Note that, using the same substitutions as for deriving that condition, the general goal of profit maximization can be reformulated as:⁷

$$\max(RoIC - WACC) * Invested Capital$$

Thus, the company seeks not only to maximize its net return, but also to minimize its WACC (all else given).⁸ The latter is done by finding the optimal financial scheme.

However, a famous result from pure capital theory asserts that the WACC is fixed and given, independent of the financial scheme (Modigliani Miller Theorem). But this “irrelevance property” rests on many idealized assumptions, particularly, that there are no taxes and no transaction costs (of default, for example), and that there is perfect information in a very strong sense implying that there is no asymmetric information either and thus that there are no incentive issues in companies, as all such issues would be resolved in endless “complete contracts”.⁹

In a more realistic world financing schemes will be chosen in such a way as to minimize (expected) taxes, transaction costs, and disincentives. **For example, a prominent trade-off between equity and debt** comes up if one introduces just taxes and some transaction costs of default. According to US legislation, interest on debt is tax deductible, so that a firm has an incentive to reduce its WACC by raising more debt.¹⁰ However, using more debt increases the probability of default, which is connected with additional transaction cost. Hence, there is (or better: may appear) a U-shaped relationship between the percentage of debt (leverage) and the WACC. Then, at a certain level of leverage, the WACC is minimised: the optimal debt/equity ratio.¹¹

In real life there is not just “equity and debt” but there are **different classes of debt and equity** (for example, debt of different priorities) as well as intermediate types of finance (so-called **mezzanine** finance). In addition, there are some financial instruments, which are not regarded as part of the capital structure, but still help to reduce the overall WACC.¹² Examples are **insurances and guarantees** that – at a price – isolate the company capital from specific risks. If available, **government guarantees** to carry certain risks are always welcome as they usually come at a very low or no price for the company. In financial theory, these instruments are also called “**credit enhancing**” or “**credit substituting**” **instruments** in order to emphasize their role of supporting the company's total capital. The table in

⁷ This formula is equivalent to the definition profit = revenue – other cost – capital cost.

⁸ In addition, the company would also want to maximize the amount of invested capital. This is completely true for certain investments that can be scaled without affecting RoIC and WACC. However, in most cases, RoIC and WACC will not be independent from the size of the investment.

⁹ See Brealey, Myers, Allen, 2008, section 10.1.

¹⁰ The WACC formula would have to be adapted to show this “tax shield” effect. See Brealey, Myers, Allen, 2008, section 10.1.

¹¹ Tan, 2007, section 5.9.

¹² The WACC formula will be extended such that the costs of each category of finance is proportionately weighted according to its amount in the company's financial structure.

Appendix A.1 lists in the third column the large variety of such specified risk mitigating instruments and relates them to the respective types of risks. Appendix A.2 (Risk Mitigating Instruments) explains some important types of these instruments in more detail and provides references to the literature on the subject.

The project management will consider all these financial instruments – equity and debt of different classes, mezzanine, and “credit substituting” instruments – simultaneously in order to find a mix that minimizes its overall cost of financing. At the same time, the management will also consider **the various sources of finance** on which he can draw.

As **sources of debt**, one should at first differentiate between banks and non-banks, keeping in mind though that usually more than 80% of project debt finance comes from banks (see Appendix A.3). Banks should be further distinguished into leading and non-leading banks. **Lead banks** take up a rather large portion of a project’s debt and, as a pre-condition, require a deep look into the TIP’s business plans and other material and may also interfere with the business plans in order to limit overall risks; the management input of a lead bank can be seen as a further means to reduce default risks, and thus the WACC. In contrast, a **non-leading bank** assesses the project more superficially, maybe relying on the leading bank’s credit as a positive signal, and takes up only a smaller share of the project’s debt. Leading and non-leading banks can also be formally connected in a syndicate. Non-bank credit can be further distinguished as coming from (i) **other institutional investors** (like pension funds) or (ii) **the public** (bond issue).

The same distinction applies to equity, where specified investment funds (like specialized infrastructure funds) would take the role similar to non-bank institutional investors for the credits. On the sources of equity and debt and for further literature on the subject see the Appendices A.3 (The Role of Commercial Banks) and A.4 (Main financing mechanisms).

Sources of specialized risk mitigating instruments are again the banks and other financial institutions, sometimes even the general public. Government institutions (or government-supported instruments) may also play an important role. See again Appendix A.2.

Every element of finance will come at a cost (except perhaps some government support). Apart from the risk profile of the project itself, which has been characterized in the last subsection, it is **the specific risk-return appetite of the financiers** offering the various financial instruments that determines their cost. (In the following we will consider as “**financier**” anyone who acts as a source of any kind of finance discussed before, i.e. not only of debt, equity and mezzanine, but also of insurances and guarantees.)

The risk-return appetite of the financiers can be related to the following properties:

- a) Financers’ own cost of refinancing resp. their next best investment alternatives (determining their “opportunity cost of capital”)
- b) Financers’ internal business model (risk diversification motive, specific knowledge about certain financial products or sub-markets)
- c) Financers’ risk perception and appetite

However, the above “typology” cannot be observed in practice so proxy indicators have to be used in order to determine the risk appetite of financiers and their perception of the riskiness of the project. Based on broad considerations, we arrive at the following:

2.2 Sub-typology capturing the risk-return appetite of financiers:

2.2.1 Part of government finance: if existing, it will directly reduce the part needed from other financiers.

2.2.2 Financers’ general implementation context like general market liquidity, market confidence, financial and legal system, political confidence, macroeconomic conditions: will affect financiers’ willingness or ability to provide finance.

- 2.2.3 Type of common financing committed (debt vs equity vs mezzanine): committing debt reflecting risk aversion, committing equity reflecting risk–tolerance, mezzanine has mixed characteristics (discussion on debt subordination could also be relevant).
- 2.2.4 Project gearing ratio: more equity in the mix denotes higher riskiness and requirement of bigger equity buffer.
- 2.2.5 Type of specific risk mitigation instruments (like insurances and guaranties) committed: the use of such instruments is not only a clear and fairly precise indicator about the existence and relevance of the corresponding risks (thus as proxy informative about the financial profile of the TIP, see last section), but also that these risks are either seen as “unbearable” (i.e. bearable only at unusually high costs) for providers of usual capital or that specialized institutions can insure against these risks at an unusually low price.
- 2.2.6 Does a rating exist, and if, how good is it?: will reduce cost of debt in particular, but probably also of debt and other (can also be interpreted as an indicator that risks are moderate resp. are managed well; see sub-typology on risk-profile of a project).
- 2.2.7 Financing terms: Higher interest rates and ADSCRs (explained immediately below) as well as higher required IRRs showing higher perceived project riskiness.
- 2.2.8 Source of finance used in project’s financing structure: in this case, common market assumptions could be used in order to benchmark investor risk-return appetite, i.e. institutional investors being very risk averse, banks not being afraid of construction risk, etc.

The ADSCR mentioned under item 2.2.7 is a measure of a company’s sustainable liquidity level. A project manager should always have a look at the **Annual Debt Service Coverage Ratio**:

$$ADSCR = \frac{\text{Annual Net Operating Cash Flow}}{\text{Total Debt Service}}$$

This is a measure of cushion between debt service and cash flow available for debt service per year.¹³ A too high ratio of debt may lead to default when the project’s cash flow is not sufficient to service debt. This would negatively affect creditworthiness. Thus a management rule – and a part of a typology – is that ADSCR should never fall below a certain level deemed acceptable.

¹³ Fitch Ratings, 2012.

3 Typology Describing the Financing Scheme and its relationship to other typologies

The following Table 1 summarizes the typologies of financial schemes derived in the last section (first two columns). They consist of 24 types. The third column of the table informs whether the respective type is already covered by another typology of Work Package 2 of BENEFIT (as there are: mode context and implementation context, business model, funding scheme, and governance¹⁴) or by general project description. The ones that are not covered are highlighted as “original financial”.

Table 1: Summary of financial schemes typology and its relation to other typologies

No.	Financial typology	Already covered by other typology
1.	Public SPV vs Partially Private	General project description
2.	Ability of the project to meet its expected financial targets (high / medium / low). This overall assessment builds on the following two sub-typologies 2.1 and 2.2	Original financial (but derived from sub-typologies 2.1 and 2.2)
2.1 Sub-typology capturing the risk-profile of the project		
With respect to the construction phase		
2.1.1	Certain aspects of the general implementation context of the project pertaining to the country like: availability of inputs, likelihood of strikes in the construction industry, legal system (reliability of contracts, potential changes in safety requirements during construction)	Implementation context
2.1.2	Any important open issues of site acquisition and required permits?	General project description
2.1.3	Brownfield/ greenfield	General project description
2.1.4	The overall cost of the project during the construction phase	General project description
2.1.5	The complexity of its construction phase	Business model
2.1.6	The strength and reliability of the construction contractors	Governance
2.1.7	Does a rating exist, and if, how good is it?	Original financial (see also 2.2.6) already covered in General project description
2.1.8	Type of specific risk mitigation instruments (like insurances and guaranties) used for the construction phase	Original financial (see also 2.2.5)
With respect to the operation phase		
2.1.9	The general mode and implementation context of the project like: transport mode, country (including aspects as the rule of law, tax regime, likelihood of strikes in the transport infrastructure branch, etc.), macroeconomic conditions (including mode-specific cyclical characteristics of end-user demand and risk-absorption by the service level)	Mode and implementation context
2.1.10	The funding model of the project	Funding model
2.1.11	The complexity of its operating phase	Business model
2.1.12	The governance of the project and the strength and reliability of the operating contractor	Governance
2.1.13	Other relevant aspects of the business model including the various counterparty contractual obligations, how the project is affected by competition etc.	Business model
2.1.14	Type of specific risk mitigation instruments (like insurances and guaranties) used for the operation phase	Original financial (see also 2.2.5)
2.2 Sub-typology capturing the risk-return appetite of financiers		
2.2.1	Part of government finance	Original financial
2.2.2	Financers' general implementation context like general market liquidity, market confidence, financial and legal system, political confidence, macroeconomic conditions	General implementation context
2.2.3	Type of common financing committed (debt vs equity vs mezzanine)	Original financial
2.2.4	Project gearing ratio	Original financial
2.2.5	Type of specific risk mitigation instruments (like insurances and guaranties) committed	Original financial (already mentioned under 2.2.8 and 2.2.14)
2.2.6	Does a rating exist, and if, how good is it?	Original financial (already

¹⁴ Where “governance” is used as short-hand for governance, procurement and contracting arrangements.

No.	Financial typology	Already covered by other typology
		mentioned under 2.2.7) already covered in General project description
2.2.7	Financing terms	Original financial
2.2.8	Source of finance used in project's financing structure	Original financial

It turns out that only a few items of the financial schemes typology are “original financial” items. This should not come as a surprise, as the financial conditions reflect practically all risk and return aspects of a project.

The main typology on the ability of a project to meet its expected financial targets (item 2) is “original financial”, but it is an aggregated assessment relying on the information content of its sub-typologies.

The sub-typology 2.1 capturing the risk-profile of a project has no “original financial” items that do not reappear the sub-typology 2.2 capturing the risk-return appetite of financiers (namely, items 2.1.7, 2.1.8, and 2.1.14). Not surprisingly, the risk-profile of a project depends on risk types that are already covered by the other typologies describing the project.

Thus, basically all the “original financial” items of the financing scheme are in the sub-typology 2.2 capturing the risk-return appetite of financiers, and these items are *descriptive ones* of the financing scheme itself (items 2.2.1, 2.2.3, 2.2.4, 2.2.5, 2.2.7, and 2.2.8). **Hence, almost all the “original financial” items can be summarized as: A detailed description of the actual financing scheme of the project.**

In addition, if a project **rating** is available, that is of course also of interest. But this should already be part of the general project description.

3.1 Key Characteristics of the Financial Schemes Typology

We arrive at the list of dimensions, indicators and measures given by Table 2. In order to assess the financial scheme of a project this information should be known – in addition to the required information from other typologies as indicated in Table 1.

Thus Table 2 represents only the types of Table 1 that are characterized as “original financial”. Moreover, two of these are also omitted: Type 2.2.6, “Does a rating exist, and if, how good is it?”, is already covered by the general project description. Type 2, “ability of a project to meet its expected financial targets” is a complex type that can only be derived as an aggregate of its two sub-typologies. Apart of that, it cannot be decomposed into indicators and measures by itself.

As a result, Table 2 represents the types 2.2.1 to 2.2.8 of Table 1 with the exceptions of 2.2.2 and 2.2.6.

Table 2: Dimension, Indicators and Measures of Financial Schemes Typology

No	Topic	Indicators	Evidenced Measure	Captures type of Table 1
1	Capital structure	Total capital	In Euro	2.2.3
		Debt	Sorts of debt by - level of priority (% high, % medium, % low) - and source of debt (% bank, of which lead bank if existing, % non-bank financial institutions, % publicly traded bonds) Interest rate on average debt (exceptionally high, exceptionally low, neither of these ones)	2.2.3 2.2.8 2.2.7
		Equity	Sorts of equity by - preferred vs. common (%) - and source of equity (% bank, of which lead bank if existing and specialized banks if existing, % non-bank financial institutions like funds, % publicly traded shares)	2.2.3 2.2.8 2.2.7
		Mezzanine	Type and % of mezzanine instruments used. In particular: Senior subordinated debt %, participation notes %, redeemable preferred stock %, % convertible debt to total capital. % of mezzanine debt subordinated to senior debt; % of mezzanine debt senior to equity	2.2.3 2.2.8 2.2.7
		Gearing ratio	Ratios of debt to total capital, equity to total capital possibly for different aggregates of debt and equity (i.e. including more or less of the groups described above)	2.2.4
		Interest coverage ratio	ADSCR or similar	2.2.7
2	Supporting financial instruments	Government finance	In Euro	2.2.1
		Government guarantees on debt service or the like	Yes/no? Affecting which % of capital?	2.2.5
		Risk mitigating measures	In Euro (sum of all)	2.2.5

4 Conclusions

Transport infrastructure projects (TIPs), particularly if they are greenfield projects, require huge outlays of money at the beginning and for quite a long time. Only after the end of the construction phase will the operation phase start, the period of revenues, that will also last for a very long time. For a project to be economically viable, the long lasting stream of net returns must be sufficient to cover the huge outlays made at the beginning plus the interest or dividends accruing on them.

From a financial point of view this is a very critical situation. Financing is needed to fill the time-gap between outlays and revenue streams on very a large size and time scale. Uncertainties whether the project will indeed turn out to be financially viable will loom high.

Therefore the public sector is, at least in Europe, always involved in TIPs. But at the same time, tax money is also limited and may not be available at a sufficient scale to finance a TIP completely. As a response, governments either establish more or less independent agencies that act as “profit-loss-financing centers” building and running the TIP. Or they even invite the private sector to participate in a joint PPP for the project. For these public or partially private projects, the issue of financing is hopefully manageable, but will still be critical.

Task 2.3 derived typologies for financing schemes of TIPs that will later on be useful to assess and compare TIP case studies with coming from very different backgrounds (as concerns country, mode, business model and so on). A first distinction or typology has to be made between private and public projects, as the need for financing and the severeness of financing issues are stricter for private rather than for public projects. However, in the long run, also public projects will have to adhere to the basic financial viability condition.

This basic financial viability condition can be described as a long-run sustainable no loss condition or as “the ability of the project to meet its expected financial targets”. This fundamental condition is our second basic typology.

However, in order to assess this ability of a TIP one has to look deeper into the project and its potential sources of financing. We therefore disaggregated the financial viability condition into two financial sub-typologies:

1. Sub-typology: The financial profile of the project. I.e. all properties of the project that will affect its evaluation from the financial perspective
2. Sub-typology: The risk-return appetite of the investors/financiers to provide various sorts of capital and other financial instruments (equity, debt, mezzanine, insurances, guarantees, etc). I.e. all characteristics of the relevant potential financiers affecting their willingness to provide finance.

These sub-typologies were analyzed in more detail. It turns out that particularly the first sub-typology is determined by all the different risk categories that are already covered by other typologies of Work Package 2 (i.e. business model, funding model, governance issues, mode, country and other). This is not so surprising after all, as generally all risks and all opportunities that may affect the project in the future in any economically significant way are also relevant for the financial decisions and will be reflected in the structure and cost of financing.

The second sub-typology seems to refer to unobserved characteristics of potential investors. However, a typology needs to be based on observable characteristics. As proxies for the unobserved characteristics several properties of the actual financial structure are suggested.

We finally come up with a list of dimensions, indicators, and measures for the financial schemes that should be operational. Together with the information input, which based on other typologies this list should produce the required information needed to assess TIPs from the financial perspective.

5. References

- Antoneta, S. (2012). The EBRD Co-Financing By Loan Syndications. *Anale. Seria Științe Economice. Timișoara (XVIII)*, 531-534.
- Brealey, R. A., Myers S. C., Allen F. (2008). *Principles of corporate finance*. 9th Edition, internat. Ed., Boston [i.a.], McGraw-Hill.
- Chui, M., Domanski, D., Kugler, P., & J. Shek. (2010). The collapse of international bank finance during the crisis: evidence from syndicated loan markets. *BIS Quarterly Review* September, 39–49.
- Delmon, J. (2009). *Private Sector Investment in Infrastructure: Project Finance, PPP projects and Risk*. 2nd Edition, Kluwer Law International, Netherland.
- Estache, A., & Strong, J. (2000). *The Rise, the Fall, and ...the Emerging Recovery of Project Finance in Transport*. Washington: The World Bank Institute.
- Esty, B., Chavich, C., & Sesia, A. (2014). *An Overview of Project Finance and Infrastructure Finance*. Macchassusset: Havard Business School.
- European Investment Bank (2005). *Evaluation of PPP Projects Financed by the EIB*. Luxembourg.
- European Investment Bank (2012). *An Outline Guide to Project Bond Credit Enhancement and the Project Bond Initiative*. Luxembourg.
- Fitch Ratings (2012). *Rating Criteria for Infrastructure and Project Finance*. Global Infrastructure and Project Finance, NY, USA.
- Hawkins, G. D. (1981). An Analysis Of Revolving Credit Agreements. *Journal of Financial Economics* , 10 (1982) 59-81.
- Izaguirre, A. K., & Kulkarni, S. P. (2011). *Identifying Main Sources of Funding for Infrastructure Projects with Private Participation in Developing Countries: A Pilot Study*. Washington: World Bank.
- Matsukawa, T. and Habeck, O. (2007). *Review of Risk Mitigation Instruments for Infrastructure Financing and Recent Trends and Developments*. Trends and Policy Options No. 4, The International Bank for Reconstruction and Development, The World Bank, Washington D.C.
- Mirkov, R., Thomae, H., Feist, M., Maul, T., Gillespie, G., & Lie, B. (2012). *Modelling and Forecasting Customer Behavior for Revolving Credit Facilities*. Germany: Trisolutions GMBH, DZ Bank AG.
- Pellegrino, R., Vajdic, N., & Carbonara, N. (2013). Real option theory for risk mitigation in transport PPPs. *Built Environment Project and Asset Management*, 3(2), 199-213.
- Ruster, J. (1996). *Mitigating commercial risks in project finance*. Public Policy for the Private Sector, The World Bank, Note, (69).
- Scharfstein, D., & Stein, J. (2000). The dark side of internal capital markets: divisional rent-seeking and inefficient investment. *J. Finance*, 55, 2537–2564.
- Stevens, B., Schieb, P.-A., & Andrieu, M. (2006). *Infrastructure to 2030: A global perspective on the Development of Global Infrastructures to 2030*. Paris: OECD.
- Stowell, D. (2010). *An Introduction to Investment Banks, Hedge Funds, and Private Equity*. MA, USA: Academic Press.

Tan, W. (2007). Principles of project and infrastructure finance. Routledge.

Vasilescu, A.-M., Dima, A. M., & Vasilache, S. (2009). Credit Analysis Policies in Construction Project Finance. Management & Marketing , Vol. 4, No. 2, pp. 79-94.

Williams, D., Marks, K. H., Robbins, L. E., Fernandez, G., & Funkhouser, J. P. (2009). The Handbook of Financing Growth: Strategies, Capital Structure, and M&A Transactions. New Jersey: Wiley Finance.

WNA (2012). Nuclear Power Economics and Project Structuring. London: World Nuclear Association.

Yescombe, E. R. (2007). Public-Private Partnerships: Principles of Policy and Finance. Butterworth-Heinemann.

Appendix

A.1 Financially relevant risks of transportation projects and associated risk mitigation strategies

The following table lists risks of transport infrastructure projects, ordered by project phase and cause.

Risk category	Types of risks	Risk mitigation instruments
Risks of construction phase		
Site acquisition and permits	<ul style="list-style-type: none"> E.g. when still land has to be acquired at the time construction begins Construction permits, investment and financing permits, operating permits (e.g. for emissions or other environmental requirements) 	<ul style="list-style-type: none"> Political Risk Insurance (PRI) Partial Risk Guarantees (PRGs) Underwriting site acquisition Provision for increase in construction/concession time
Risks relating to the construction contractor	<ul style="list-style-type: none"> Planning risk (competence, experience) Technological risk (use of innovative or not fully understood technology) Credit risk (financial health, scale of contract in relation to other business) Non-availability of suitable replacement Conflict of interest (contractor as sponsor) Subcontracts (limited involvement in the contract) Appropriate pricing for the work (price too low or too high) Failure of contractor to perform under the (day-certain) contract (availability of building materials and supplies, labour problems) 	<ul style="list-style-type: none"> Contractor's all risks (CAR) insurance Third-party liability (performance bond) Liquidated Damages (LD) (retainage account)
Other causes of cost overruns or delays	<ul style="list-style-type: none"> Site condition (geological structure, previous use, latent defects, discoveries at the site), relief events (e.g. third-party risks as public protests etc.) Input costs Soft costs (e.g. development costs, mobilisation costs, insurance premiums, advisory costs, financing costs) 	<ul style="list-style-type: none"> Cost-overrun guarantee Sponsor escrow fund Completion guarantee extension to debt maturity Completion/performance guarantees Delay in start-up (DSU) or Advance loss of profits (ALOP) insurance
Political and sponsor risks	<ul style="list-style-type: none"> Changes-in-law risk Changes in contract specifications 	<ul style="list-style-type: none"> Compensation from Government Extension of concession

(including quality of contract)	<ul style="list-style-type: none"> Design risk (usually not covered in fixed-price / turnkey contracts) Disputes 	<ul style="list-style-type: none"> Partial Risk Guarantees (PRGs) Political Risk Guarantees (PRGs) Political Risk Insurance (PRI)
Performance risks	<ul style="list-style-type: none"> Inadequate performance on project completion (e.g. because of problems of poor design or inadequate technology) 	<ul style="list-style-type: none"> Completion guarantee Performance guarantees Warranties by Constructor Buydown LD
Risks of operation phase		
Demand risk	<ul style="list-style-type: none"> General demand (macroeconomic) risk Competition risks Quality risks (performance requirements) Traffic network risk: connecting infrastructure risk, competing infrastructure risk Obsolescence risk: due to more efficient variants, competing innovation, or demand shift 	<ul style="list-style-type: none"> Traffic/revenue guarantee Revenue sharing mechanism Revenue distribution mechanism Least present value of revenue mechanism Defer payments of the concession fees Minimum revenue guarantee Usage guarantee Partial Risk Guarantees (PRGs)
Risks relating to the operator	<ul style="list-style-type: none"> Lack of experience of the management team, record of revenue and cost management, facility maintenance, and capital renewal, effectiveness Contractual relationships 	<ul style="list-style-type: none"> Performance guarantees from operator
Other cost overrun and supply risk	<ul style="list-style-type: none"> Makeup, timing, and potential volatility of operating costs (e.g. commodities and utilities, labour, taxes, insurance, maintenance and renewal, and capital expenditure or "life-cycle" costs) Risk of strikes Technology risk (in respect of maintenance and performance) 	<ul style="list-style-type: none"> Standby funds for increased operating costs Cost-overrun guarantee Cost Pass-through Performance guarantees Maintenance reserve accounts 'All risks' insurance Business interruption (BI) insurance
Political and sponsor risks	<ul style="list-style-type: none"> Changes-in-law risk Regulation risk Early termination risk (e.g. termination of a concession, break clauses in off-take agreements, or loss or failure to renew a license) 	<ul style="list-style-type: none"> Compensation from Government Extension of concession Partial Risk Guarantees (PRGs) Partial Credit Guarantees (PCGs) Full Credit Guarantees or Wrap Guarantees Political Risk Guarantees (PRGs) Political Risk Insurance (PRI)
Tail risk	<ul style="list-style-type: none"> Significant and unique financial risks may occur in the final years of a project (e.g. reduced productivity or decommissioning, contractual obligations, or renewal of licenses etc. 	

Permanent and overall risks		
Legal risk	<ul style="list-style-type: none"> Quality of the legal framework upon which the project assumptions rest 	<ul style="list-style-type: none"> Political Risk Insurance (PRI) Partial Risk Guarantees (PRGs) Policy Based Guarantees (PBGs)
Financial risks	<ul style="list-style-type: none"> Interest rates Inflation Exchange rate Debt servicing risk 	<ul style="list-style-type: none"> Interest rate guarantee Interest rates swaps Interest rate cap/floors Adjust concession price Debt guarantee Compensation payment Inflation swaps Inflation caps/floors Currency swaps Exchange rate guarantee Partial Risk Guarantees (PRGs) Political Risk Insurance (PRI) Debt service reserve funds Partial Credit Guarantees (PCGs) Financial completion guarantee Buy-down commitment Claw-back guarantee Cash-deficiency guarantee Performance guarantee
Counterparty risks	<ul style="list-style-type: none"> Limited ability (financial capacity) of a counterparty to absorb risks which were transferred to it, e.g. main supplier or customer fails to fulfil contractual obligations 	
Event risks	<ul style="list-style-type: none"> Force majeure (e.g. natural hazards) Human error or mechanical malfunctions 	<ul style="list-style-type: none"> Force Majeure insurance
Country risk	<ul style="list-style-type: none"> Country ceiling and dependability of legal regime Country rating 	

Sources: Matsukawa and Habeck (2007), Delmon (2009), Yescombe (2007), Pellegrino et al. (2013), Fitch Ratings (2012), Ruster (1996)

A.2 Risk Mitigating Instruments

Structuring and closing financial deals for transportation projects often requires implementation of additional instruments and agreements. Application of these instruments and agreements bridges financial gaps, reduces project's risk profile, enhances project's credit quality, and enables improved borrowing terms such as lower interest rates and extended loan maturities. One can generally distinguish three types:

1. Financial instruments issued by third parties. They serve to transfer some of project's risks away from potential investors to third parties that have better capacity to cope with these risks. They are offered by public financial institutions.
2. Bilateral agreements between project's participants. They serve to reduce some of project's risks thus making the project more financially viable.
3. Financial derivatives. They can be traded on financial markets (e.g. interest rate swaps) so that the respective risks can be sold at a market price to anyone willing to bear them at this price.

These instruments will now be described in turn in more detail.

Financial instruments issued by third parties. Most common forms of financial instruments which belong to the first group, i.e. instruments issued by the third parties, are **insurances and guarantees** (Matsukawa and Habeck, 2007). Guarantees are usually financial instruments that cover timely debt repayments. Procedure which triggers and enforces these guarantees is in general straightforward. On the other hand, insurance usually have trigger mechanism more complex with procedure for claims to be filed and periods for their evaluation before triggering payments by the insurer.

The advantages of these forms of instruments are many, both for the private and the public sector. For governments and public entities, guarantees can be beneficial in several ways (Delmon, 2009):

- Promote private financing for infrastructure projects;
- Lowering the loan's risk weight reducing the overall cost of debt;
- Ensure access to capital markets at viable terms;
- Reduce the cost of private participation leading to the reduced risk of tariff increases, etc.

For the private sector, guarantees can provide spectrum of benefits such as (Delmon, 2009):

- Mitigation of project's external risks that private sector cannot control such as sovereign and political risks;
- Improvement of project's financial viability, sustainability and bankability;
- Limit the risk exposure;
- Reinforce government commitments to private investors, etc.

Guarantees can be used to protect potential investors, both debt providers and equity sponsors (Matsukawa and Habeck, 2007). Depending on the type of the project, i.e. if it is a public project or if it includes a private participation, guarantees can mitigate risks associated with sovereign debt, public debt, corporate debt and equity investments. Available risk mitigation instruments can be categorized as political guarantees, credit guarantees and export guarantees. Export guarantees cover losses for projects tied to the export of goods and services. The first two categories, on the other hand, can be used to mitigate risks in transportation projects and they are further explained in detail:

- Political Risk Guarantees or Insurance cover losses incurred by political risk realization (Matsukawa and Habeck, 2007). They are sometimes called Political Risk Guarantees (PRGs), sometimes Partial Risk Guarantees (PRGs) on political risks, and in other cases there are Political Risk Insurances (PRI). PRG usually cover full amount of debt and mitigate risk of debt service default caused by the failure of the government and its institutions in fulfilling their contractual

obligations (Delmon, 2009). PRG are mostly used for protection of commercial lenders for private sector projects and are often implemented in developing countries, but sometimes also in other countries that have not proven track of record to be able to attract private investments on their own. Depending on the institution who is issuing these guarantees and its role in capital markets, PRGs can be used to mitigate:

- Political risk, e.g. war and civil disturbance, expropriation and nationalization, foreign currency availability and convertibility, etc.
- Contractual and regulatory risk, e.g. failure to meet contractual payment obligations, non-payment of a termination amount, arbitration process issues, changes in law, failure to issue licenses and approvals, etc.
- Also other market risks, e.g. foreign exchange rate, demand, etc.

PRI cover the default due to realization of political risks (Matsukawa and Habeck, 2007). They protect equity investors and lenders and are used for private projects.

- Credit Guarantees cover losses incurred in the case of a debt service default (Matsukawa and Habeck, 2007). Credit guarantees are used for mitigation of both political and commercial risks for debt providers, i.e. for both sovereign debt and corporate debt providers. Credit Guarantees can be Partial Credit Guarantees (PCG) or Full Credit Guarantees or Wrap Guarantees. Both types provide coverage regardless of the cause of default, i.e. in the case of political or commercial risks realization. PCG cover part of a debt service that is the principal payments and/or interest payments. It protects private lenders from debt service default by public sector borrowers. (Delmon, 2009) It is used both for private and public projects. It provides a public sector with better access to the bank and capital markets. It can be used for a specific loan or for a portfolio of loans (Matsukawa and Habeck, 2007). Full Credit Guarantees or Wrap Guarantees cover the full amount of the debt service in the case of default. They are usually used by bond issuers for achievement of better credit rating. One example is the Project Bond Credit Enhancement (PBCE) program implemented by the European Investment Bank (EIB, 2012). The EIB provides PBCE instruments for eligible infrastructure projects which support senior project bonds issued by the project company thus increasing their credit rating.

Common providers of these financial instruments are multilateral development banks and agencies, bilateral or national agencies, monoline insurance companies and private financial entities (Matsukawa and Habeck, 2007 and Yescombe, 2007).

Bilateral agreements. Second group relates to the set of bilateral arrangements between different project participants such as the public authority, the project company, sponsors and lenders. These arrangements serve to reduce some of project's risks to an acceptable level and thus reduce the cost of financing. Although there are a number of different arrangements, the most important in transportation projects is the one which addresses demand or traffic risk. These types of arrangements are usually in form of guarantees (e.g. minimum traffic guarantee) where the public authority covers potential losses and provides compensation if the demand or traffic drops below some pre-specified level. Other types of guarantees or commitments which the public authority underwrites in transportation projects may address a number of risks such as political, legal, and financial risks (e.g. interest rate guarantee). In some cases project sponsors may provide limited-recourse guarantees to lenders (Yescombe, 2007). One example is a contingent equity commitment in which sponsors are agreed to add additional amount as equity to keep cash-flows at required levels.

Financial derivatives. The third group represents set of financial derivatives used by the project company for elimination of financial risks: interest rate, inflation, and exchange rate risks. Although these risks can be mitigated either by the third party financial instruments or by the government guarantees, there is a significant part of financial markets which offers different forms of hedging strategies such as swaps, caps and collars (Yescombe, 2007).

The Table in Appendix A.1 gives an overview of financially relevant project risks and available risk mitigation instruments. Risks are grouped by project phases (construction and operating phases) plus a third group of overall risks. As summarized above, risk mitigation instruments may have various forms and origins, they can be presented as guarantee or insurance, and they can be purchased from specialized institutions or on financial markets.

A.3 The Role of Commercial Banks in Infrastructure Financing

This review focuses on the role commercial banks have played in bridging and provided finance to meet the infrastructure needs. The first section reviews research on the role of commercial banks while the next section analyses the various financial mechanism and structures applied by commercial banks in providing infrastructure finance.

The role of Commercial Banks

Izaguire and Kulkani's 2011 study for the World Bank notes 70% of projects as well as investments were funded via project finance. A 2012 study by the World Nuclear Association states commercial banks as the primary source of funds for project financings. Esty et al. (2014) provides an overview of infrastructure project finance from 2009-2013. The research reveals that in 2013, 81% of total debt raised towards infrastructure project finance corresponded to bank loans representing 584 projects. The table below shows the top ten arrangers of bank loan towards infrastructure project finance for 2013. Chui et al. (2010) notes that the syndicated loan market is the most important source of global corporate financing.

2013 Rank	Bank Name	No of Facilities	Amount Underwritten (\$,Million)	% of total
1	Bank of Tokyo-Mitsubishi UFJ	108	11,430	6
2	State Bank of India	20	10,090	5
3	China Development Bank	6	8,312	4
4	SMBC	80	7,924	4
5	Mizuho Financial	60	7,444	4
6	Korea Development Bank	16	5,659	3
7	Credit Agricole	62	5,106	3
8	Barclays	28	4,211	2
9	HSBC	32	4,192	2
10	ING	48	3,997	2
	Others	124	135,601	66
	Total	584	204,027	100

Source: Esty et al. 2014

Commercial Banks' financial mechanisms and structures

Commercial bank Project Finance Process: A project's creditworthiness determines its attractiveness for debt financing by banks and other lending institutions (Vasilescu et al. 2009). The process of analysing eligible projects for financing by commercial banks would depend on individual bank credit policy, macroeconomic circumstances, project sponsors, project location and most importantly the financial and economic viability. As such the appraisal process aims to identify and reveal these factors amongst others. While a lead bank might act as an arranger, a syndicate is often formed in conjunction with other commercial banks to sell-down large infrastructure loans.

Project Finance Distribution Mechanism: Project finance allows the execution of a project applying non-recourse debt with the characteristic separation of project cash flows and project sponsor's other assets (Scharfstein and Stein, 2000). Once a proposed project is economically sustainable, risks identified, political stability assessed accessing financing would be most likely. Projects are mainly financed by commercial banks via term loans, revolving credits, bridge loans or a combination of the two loan structures. (Antoneta, 2012).

Bridge Loans: A bridge loan as the name implies provides liquidity to the borrower by filling the gap between present cash needs and the receipt of a well-defined liquidity provision by equity or debt (Williams et al. 2009). Construction financing has been provided via short term bridge loans which are refinanced with longer-term debt (Estache and Strong, 2000). Although participating in bridge loans

assists bank in securing further lucrative business such as debt underwriting and advisory services, considerable risk exists due to the possibility of the refinancing being unsuccessful or delayed. Stowell (2010) notes that a large number of bridge loans availed between 2006 and 2007 were unable to be refinanced by long term financing due to the onset of the 2008/2009 global financial crises.

Term Loans: A term loan in project finance provides long term monetary credit which is repaid via a structure repayment schedule. Term loans can also act as a take-out options for bridge loans. Given the long term characteristics of infrastructure project finance, committed term loans with a structured repayment schedule profile fits such projects.

Revolving Credit Facilities: This facility structure is termed revolving due its flexible nature which allows the obligor/special purpose vehicle to use funds as needed, repay and reuse without reapplying for a credit line providing previous conditions and terms remain unchanged (Mirkov et al. 2012). Estache and Strong 2000 state the difference between revolving loan facilities and term loans is based on the ability of the borrowing entity to borrow, reduce, reimburse and withdraw funds from the available credit sum within a certain time period. Hawkins (1981) reveals the responsibility of a bank in a revolving credit facility as a commitment to loan up to a certain amount at a certain rate. In addition the responsibility of the borrowing entity is to repay both principal and interest on expiry.

Summary

Previous studies on the role of commercial banks in infrastructure project finance, presents banks as the primary source of finance providing 81% in 2013. Furthermore various project finance distribution mechanisms are appraised. Literature shows the bridge loan, revolving credit facilities and term loans are mainly applied in infrastructure project finance. However a hybrid approach of the different distribution mechanism could also be applied to meet project structure and needs.

A.4 Main Financing Mechanisms for Infrastructure Projects with Emphasis on Private Finance

1. Raising Private Infrastructure Capital

- Private capital provision by:
 - **Corporate finance** (Operation or service companies operating in infrastructure sectors)
 - **Project finance** (Contractual financing arrangement that is particularly important in infrastructure)
- Most common financing instruments & investment vehicles:
 - Financing instruments: equity, debt (loans & bonds), mezzanine
 - Investment vehicles: publicly traded (listed) vs. privately traded (unlisted)
 - Investment routes: direct vs. indirect investing (via funds)

Infrastructure Financing Instruments & Investment Vehicles			
		direct	indirect
Equity	public	listed infrastructure & utility stocks	listed infrastructure equity funds; index funds; EFTs
	private	direct equity investment in infrastructure company / project	unlisted infrastructure funds
Debt	bonds	corporate bonds of infrastructure companies; project bonds; PPP/PFI bonds; US municipal	infrastructure bond funds
	loans	direct loans to companies / projects / asset backed financing	infrastructure loan / debt funds

Source: EIB (2013)

- Mixed instruments:
 - Mezzanine capital: sub-ordinated debt of preferred equity
 - Hybrid vehicles: balanced funds
 - Variations within these categories
 - Derived products: infrastructure indices, exchange-traded funds (ETF), options
- Pros – Cons
Indicatively:
 - Investment in a share or bond of company involved in infrastructure may not necessarily be directed to specific infrastructure projects
 - Infrastructure funds can take a long time to get invested in underlying projects, and be subject to agency issues
 - Private investments may be less exposed to the vagaries but bear illiquidity, valuation and concentration risks in investor portfolios
 - No simple measure of private capital investment into infrastructure exists
- Risk/return profile from infrastructure debt vs. equity

Equity <ul style="list-style-type: none"> • Primary provides 10% p.a. through higher risk projects. • Secondary equity portfolios provide 7-8% p.a. • As with Mezzanine equity holders provide capital buffer 	Primary debt <ul style="list-style-type: none"> • High volume of new projects and available debt given typical leverage ratios • Takes construction risk thus 5-6% p.a. returns • Appropriate for low risk investors though illiquid • Investment grade
Secondary debt <ul style="list-style-type: none"> • Secondary loan portfolios offer 3-4% p.a. • As operational assets returns are 3-4% p.a. for public bonds due to higher credit ratings • Volumes low in both cases • Not all investment grade 	Conclusion <ul style="list-style-type: none"> • You get paid to take and can mitigate construction 'risk' • The market volume is far greater for primary projects • Understand and manage credit from early phase development

(Source: BIS, 2014)

2. Sources of infrastructure finance from capital markets:

▪ **Listed Infrastructure Equity**

- Corporate equity: major source of private finance for infrastructure
- Listed companies on public exchanges: most sizeable owners of infrastructure assets & providers of infrastructure services (incl. companies as operators, contractors, developers of projects)
- Private equity: rising trends in infrastructure sectors (utilities - important in stock markets; privatizations of electricity, gas, water, telecom & other utility companies)
- Privatization of transport assets (primarily airports, ports, toll roads, bridges & tunnels)
- Infrastructure stocks: subset of global stock markets

▪ **Listed Infrastructure Indices & Funds**

- Major specialist infrastructure indices by mid-2000s
- Global infrastructure stock market indices: contain up to 350 infrastructure companies (mrkt cap: up to US\$ 2.5tn)
- Differences between indices (size, number of stocks, countries & regions, methodology; up to over 80% utility stocks)

▪ **Corporate Bonds, Municipal Bonds, Infrastructure Bonds**

- Corporate bonds: important financing instrument for infrastructure companies on capital markets (especially large utilities)
- No infrastructure bond index known (exception: Canadian corp. bond sub-index 'DEX Universe Infrastructure Bond Index')
- Traditional reliance on bank debt (European corp.bond market: less developed than US; much smaller than European equity market)
- Municipal bonds (tax-exempt): major contributor to infrastructure finance (US)
- "Infrastructure bonds": extensively discussed in many developing countries (Chile, Peru, South Africa)
- "Structure bonds": popular with domestic institutional investors (Mexico)

- **Project bonds**

- Debt instruments issued by project finance companies for investment by institutional investors & other financial institutions; often tradable on secondary markets but also in private placements (project bonds: 10% of global project debt, 1994-2012)
- (Canada: well-established project bond market; Europe: small project bond market) (PFI bonds: common in UK; typically 'wrapped' or guaranteed by a "monoline" insurance company).