

BENEFIT

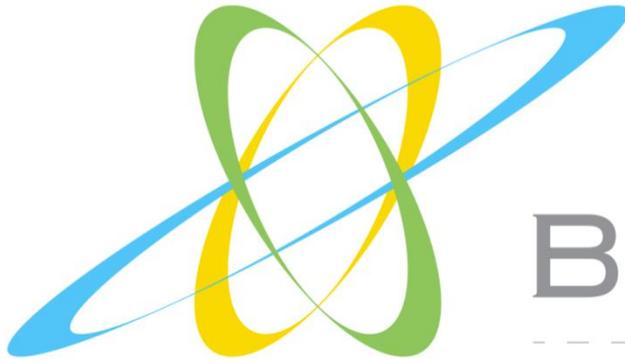
Business Models for Enhancing Funding
& Enabling Financing for Infrastructure in Transport

Deliverable: D 5.1 – Potential of Investments in Transport Infrastructure



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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 in the project. Depending on the context, 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 (e.g. 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 project dimensions of the same context, which influence the performance of the funding scheme and financing scheme. Elements, as noted in Figure 1.1.1 [of the proposal/contract], are the implementation environment (socio-political, micro and macroeconomic, institutional, regulatory, etc.); the transport mode (functionality; natural and contractual exclusivity, etc.); business model structure; funding scheme; financing scheme and governance and institutional arrangement (risk allocation; decision making processes; ownership rights, etc.).

Typology: A typology concerns groups of factors describing a project 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 how optimum performance may be achieved) during the course of the project. As such, it could be used as an analysis tool (e.g. identification of "mismatches") or decision tool (e.g. given the types of elements, which funding scheme type 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) is most appropriate).

Snapshots: These describe the project case study at various points in its life cycle through the typology indicator values at the particular point in time.

Transport Infrastructure Resilience Indicator: The ability of a Transport Infrastructure project to withstand changes within its structural elements with respect to its ability to deliver specific outcomes (such as cost and time to completion, expected traffic and expected revenue targets). The Transport Infrastructure Resilience Indicator has an underlying rating system whose categories reflect the likelihood of achieving pre-specified outcomes targets and expressing the level of vulnerability of the project to external adverse implementation conditions.

Indicators

The *Financial Economic Indicator* measures more than just the macro-economic and macro-financial context of a country, but more broadly the business environment and can be seen as a proxy of the level of productivity of a country. The Global Competitiveness Index of the World Economic Forum was selected to describe this indicator.

The *Institutional Indicator* encompasses factors ranging from political stability to government efficiency as described by the respective score of the global competitiveness index.

The *Cost Saving Indicator* is a composite indicator including: Ability to construct (Level of civil works/ technical difficulty; Capability to construct; Construction risk allocation as per contractual agreement; Assessment of optimal construction risk allocation based solely on the capability to construct); Ability to monitor/control/plan and provide political support of the respective (public) contracting authority; Adoption of Innovation and its successful application; Life Cycle Planning and operation (Life cycle planning verification; Capability to operate; Operation risk allocation as per contractual agreement; Assessment of optimal operational risk allocation based solely on the capability to operate).

The *Revenue Support Indicator* is a measure of the project's ability to generate revenues. It is a composite indicator that includes: The level of Coopetition of the new (greenfield) and existing (brownfield) parts of the project; revenue transport and non-transport sources managerial assessment.

The *Reliability/Availability Indicator* represents the level of physical and operational reliability and availability of

the transport service

The *Governance indicator* refers to factors setting the governance scene within a project. In this respect, it is defined by the contractual conditions and the process leading to them.

The *Remuneration Attractiveness Indicator* represents the various income sources with their assessed risk and potential cost coverage.

The *Revenue Robustness Indicator* represents the various revenue sources with their assessed risk and potential cost coverage.

The *Financing Scheme Indicator* reflects an expanded version of the cost of capital included in the project both from public and private sources.

Executive Summary

The *Business models for enhancing funding and enabling financing for infrastructure in Transport* (BENEFIT) project research aims to provide policy makers and providers of funding (and financing) with extensive comparative information on the advantages and limitations of different funding schemes for transport infrastructure projects. Further, the analysis of business model options and project governance schemes to enhance transport infrastructure projects performance is also part of the research. An analysis a decision model called here BENEFIT Matching Framework has been developed in which a number of project factors dealing with the environment of project implementation, project governance, project business models, and funding and financing schemes were identified, represented by indicators, and related to the performance variables of transport infrastructure projects. This BENEFIT Matching Framework was operationalised into a rating system, namely the Transport Infrastructure Resilience Indicator (TIRI) rating system. The TIRI rating system was developed in Task 3.2 and is the outcome of an approach that combines elements of the BENEFIT Matching Framework with concepts from system's resilience and the rating of infrastructure project creditworthiness (see D3.2).

Through 11 case analyses of projects, an assessment of the usability of the proposed rating system is conducted and shown in this report, in order to demonstrate the potential use of the BENEFIT Matching Framework as an ex-ante assessment of transport projects. This evaluation can sensibly show the relevance of this framework to inform policy making. More specifically, the evaluations consist of determining whether the rating system can be used in the planning and procurements phase of project, in which different procurement options, implementation conditions, as well as funding and financing schemes are considered. The evaluations also consider the potentials of the BENEFIT Matching Framework to inform decisions in both the financial close phase of a project and the implementation phases. Next, by analysing the contributions made by the BENEFIT Matching Framework in the different stages in the projects, the Framework monitoring capabilities is analysed to verify whether this Framework and its Rating system may assist in predicting project performance and adopting measures during the project life-time. Renegotiations cases are also assessed in the case analyses to further evaluate the BENEFIT Matching Framework.

The BENEFIT Matching Framework proven to be useful in the planning phase of transport projects. At this stage and to likely deliver a project according to cost, time, and traffic and revenue expectations, projects could be set at their optimal potential conditions provided existing constraints. Many, if not all, the factors considered by the BENEFIT Matching Framework were shown to be feasible of being implemented in the 11 project cases analysed for the planning stage. This irrespectively of each country's level of maturity of the different approaches of project delivery.

The BENEFIT Matching Framework was useful to identify the most effective actions to set in place during procurement and implementation phases. This was achieved using the elements provided by the BENEFIT Matching Framework and the use of project-specific information reported by the case analysts. Notably, a number of factors are hampering an optimal implementation of all the elements integrated by the BENEFIT Matching Framework. Typically the hampering factors are the exogenous vulnerabilities influence (e.g. the business environment, the level of productivity, and the political stability of a country, amongst others), the little knowledge and adoption of cooperation based approaches to project delivery (e.g. Public Private Partnerships), reliance on traditional procurement and transport business provision (instead of transport business developing), and inappropriate country regulations.

In the set of cases analysed, during renegotiations, the introduction of potential mechanisms proposed by the BENEFIT Matching Framework to improve performance is limited. For instance, the granting of incentives for performance, the reallocation of risks, and the allocation of other sources of revenue to the contractor were not seen during renegotiations in the project analysed. Typically, renegotiations analysed were about the introduction of subsidies and reduction of toll fares, the increase of fares and modification of the services scope, and the extension of the time to delivery of the contract.

Finally, and since life-cycle evaluations were performed including assumed future scenarios on the 11 cases, it was confirmed that the BENEFIT Matching Framework might be employed potentially as a monitoring instrument. The BENEFIT Matching Framework rating may assist in predicting project performance and adopting measures during the project life in order to minimize adverse effects of the implementation context or exploit opportunities.

Abbreviations

MF		Matching Framework
TIRI	:	Transport Infrastructure Resilience Indicator
FEI	:	Financial – Economic Indicator
InI	:	Institutional Indicator
GI	:	Governance Indicator
CSI	:	Cost Saving Indicator
RSI	:	Revenue Support Indicator
RAI	:	Remuneration Attractiveness Indicator
RRI	:	Revenue Robustness Indicator
FSI	:	Financing Scheme Indicator

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1 Introduction

1.1 Introduction to the BENEFIT Project

BENEFIT seeks to take an innovative approach by analysing transport project funding schemes within an inter-related system. Funding schemes are deemed to be “successful” (or not) depending on the Business Model that generates them as well as their stakeholders and policy contexts. The performance of the Business Model is assumed to be affected by the implementation typology and the transport mode context – together with other contextual changes over time and space, including changes in overarching policy frameworks. It is matched successfully (or not) by a financing scheme. Relations between actors are partially described by a governance model (contracting arrangements). These are key elements in Transport Infrastructure Provision, Operation and Maintenance, as illustrated by Figure 1.1.1.

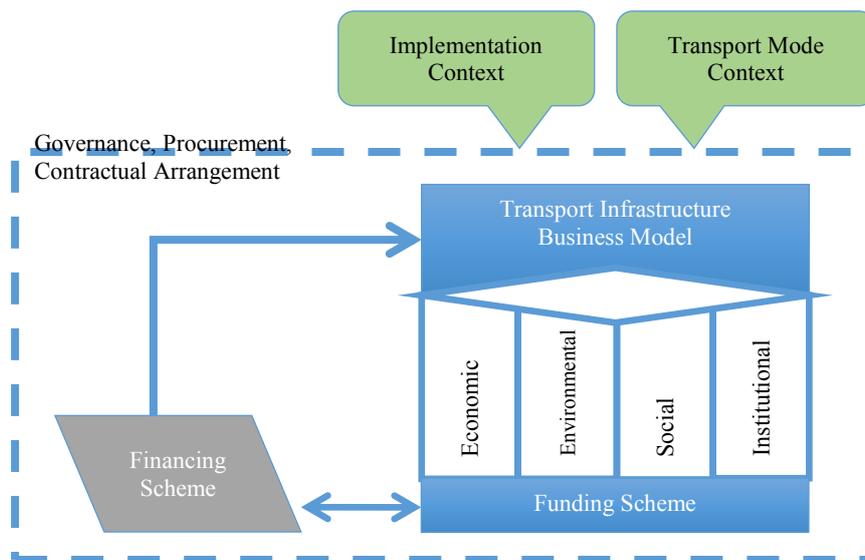


Figure 1.1.1: BENEFIT Key Elements in Transport Infrastructure Production, Operation and Maintenance

Success in relation to the application of a particular business model is seen here as an assessment of the appropriate matching of elements. Within BENEFIT funding and financing schemes are analysed in this respect. Describing these key elements proposed through their characteristics and attributes and clustering each of them into typologies is the basis of, first, developing a generic input/output model. Identifying best matches and their inter-relations (matching principles) leads to move from a generic model to a Decision Matching Framework. The latter framework is developed to provide policy makers and providers of funding (and financing) with extensive comparative information on the advantages and limitations of different funding schemes for transport infrastructure projects. Further the framework will improve the awareness of policy makers on the needs of projects that serve an efficient and performing transport network within the Horizon 2050. Moreover, the model will allow policy makers to identify changes that may be undertaken in order to improve the potential of success, such as enhancing the value proposition of the business model.

In developing this model, BENEFIT takes stock of project profiles known to BENEFIT partners in combination with a meta-analysis of relevant European Commission funded research. Other studies carried out with respect to funding schemes for transport (and other) infrastructure in combination with direct contact with key stakeholder groups are sources of this proposed research as well.

More specifically, BENEFIT uses the published project profile 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. 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. In this sense the 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 undertakes:

- An ex-post analysis and assessment of funding schemes (such as public, PPP and others) based on existing experiences in different transport sectors and geographical areas. This assessment includes the analysis of life-cycle investment, efficiency, governance and procurement modalities, etc.; and, provides 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 transport investments and the related funding schemes. This includes the analysis of innovative procurement schemes, still in a pilot phase, in order to develop future infrastructure needs with a 2050 horizon which should be based on smart pricing and funding.

1.2 Contribution of this Report to the BENEFIT Project

1.2.1 Contribution

The work undertaken under Task 5.1 aims to meet the following objectives, as stated in the BENEFIT research project proposal:

“Taking stock of the outcomes of BENEFIT (WP4 and in particular, task 3.2), the policy guiding tool and project rating attribute of the Decision Matching Framework is demonstrated. This concerns studying options put forward by policy makers and providers of funding. EC policy documents, in support of infrastructure needs for Europe 2050, put forward a number of options (diversify sources of finance both from public and private including coordination with the Cohesion and Structural Funds; schemes for the internalisation of external costs and infrastructure use charges; synergies across sectors; EU project bonds etc.). Illustrative cases will be developed representative of central issues facing infrastructure development in the EU (such as cross-border bottle necks addressed by the TEN-T, INEA), infrastructure, which has been significantly impacted on by the economic crisis (such as motorways, which represent the greater share of project finance) or adoption of innovation (and other investments) during the infrastructure life-cycle. Final selection will be made in collaboration with the Advisory Group and the prominent interests in the Consultation Group.

In each case, improved business model value propositions in terms of funding and financing will be addressed and evaluated. Key in this objective is to demonstrate that by improving the business model value proposition, the funding scheme is enhanced and in turn enables viable financing. Findings will be reported with descriptions of the most promising (and lesser so) typological settings for applications demonstrating the potential of investments in transport in relation to their funding schemes. The partners contributing to this task are expected in combination to be able to address possible cases selected (sic).”

In line with this research aim and according to the lessons learnt and the limitations identified in Task 3.2., the objective of Task 5.1. is to demonstrate the use of the BENEFIT Matching Framework and the Transport Infrastructure Resilience Indicator (TIRI) rating system as an ex-ante project assessment tool for transport projects. The TIRI rating system was developed in Task 3.2 and is the outcome of an approach that combines elements of the BENEFIT Matching Framework, developed earlier in this research, with concepts from system's resilience and the rating of infrastructure project creditworthiness (see D3.2).

Through 11 case analyses of projects, an assessment of the usability of the proposed rating system is conducted. More specifically, the evaluations consist of determining whether the rating system can be used in the following contexts (as suggested in Task 3.2):

- The planning phase, where alternative decisions of project design and structure may be evaluated under different procurement options, implementation conditions, as well as funding and financing schemes.
- The procurement phase, by defining or revising the conditions of the early involvement of a number of bidders in the proposed project; the rising costs and revenue risk allocation; the characteristics of the incentives and disincentives given to the contractor; and other issues related to Governance, Cost Saving and Revenue Support Indicators.
- The financial close phase, when a cooperative model for infrastructure delivery is adopted (e.g. PPP). In this case, the Financing Scheme Indicator guides the choice for a given financing structure. The contribution of new and innovative financing instruments may be assessed with respect to the selected scenario of project implementation.
- The implementation phase, by addressing the opportunity of including innovation and new business activities. During implementation, employed as a monitoring instrument, this rating system may assist in predicting project performance and adopting measures during the project life in order to minimize adverse effects of the implementation context or exploit opportunities.
- During renegotiations, particularly focused on the funding and financing scheme, minimal conditions of renegotiations (given the project structure and implementation context) may be guided by the rating system.

Following this and based on the specific case analyses findings, recommendations with respect to improving the transport infrastructure resilience¹ are proposed.

1.2.2 Limitations of Original Planning

The present report does not provide the assessment of illustrative cases on issues related to infrastructure of the Trans-European Transport Networks (such as cross-border bottle necks). Instead, projects from within the EU which have been significantly impacted by the economic crisis or in which adoption of innovation is implemented throughout the project life-cycle are considered. The reason for this particular limitation is that the BENEFIT database does not include adequate cases for which enough information was available to conduct the initially proposed ex-ante assessments.

The limitations of Task 5.1. are connected to those that originate from the BENEFIT TIRI rating system and are the following:

The BENEFIT TIRI rating system is not applicable to rail infrastructure projects. The reason is that the BENEFIT database does not include an adequate number of rail projects for which enough information was available to construct the corresponding BENEFIT indicators and, through the analyses of which, a reliable rating system could be developed.

The BENEFIT TIRI rating system cannot be used to inform decision making for Airports and Ports infrastructure in relation to traffic and revenue project outcomes. According to deliverable 3.2, it was identified that in order to assess Airports and Ports the BENEFIT indicators need to be adjusted to the particularities of these modes, especially with respect to their wider implementation context. This was not possible due to lack of sufficient project data.

¹ The ability of a Transport Infrastructure project to withstand changes within its structural elements with respect to its ability to deliver specific outcomes (such as cost and time to completion, expected traffic and expected revenue targets). This was defined in the Glossary in this report.

1.3 Report Structure

This section provides a guide to the contents of this report. After discussing how this deliverable fits in the wider context of the BENEFIT project, (Chapter 1), this report aims to show evidence on the use and usefulness of the BENEFIT Matching Framework as an ex-ante project assessment tool for transport projects.

Chapter 2 introduces the problem of assessing transport projects and the extent to which the BENEFIT Matching Framework can serve as an ex-ante project assessment tool for transport projects. Next, the factors and elements proposed in the BENEFIT Matching Framework and how these can be expected to be used when assessing projects at stages in the project life-cycle are described.

Chapter 3 elaborates on the use of the BENEFIT Matching Framework to assess a set of real and ongoing project cases which were chosen from the BENEFIT database. Likewise, this chapter describes the projects analysed and reports particular findings for each typical stage in a project from a cross analysis of cases.

Finally, **Chapter 4** concludes this report by discussing conclusions from the development and application of the BENEFIT Matching Framework as well as highlighting topics for further research.

2 Background

2.1 Assessing infrastructure projects

Deliverable 3.2. has concluded that infrastructure projects are assessed under various contexts and for different purposes. Assessments can take place at the front end, aiming to determine whether projects should go forward with their implementation as well as how they should be structured. They can also be undertaken at the back end, usually aiming to evaluate whether initial expected outputs and outcomes have been met. In that sense, project assessments can be ex ante or ex post, depending on their timing with respect to the project's lifecycle. Furthermore, projects are usually monitored during their life cycle in an attempt to improve the prospect of achieving positive outcomes and avoiding/mitigating negative ones. Very importantly, in ex-ante assessments it is therefore standard practice to customise these assessments and/or interpret their results based on each stakeholder's own value system which reflects their unique point of view.

The BENEFIT Matching Framework is stakeholder –neutral providing a Transport Infrastructure Resilience Indicator (TIRI) which describes the likelihood of reaching specific project outcomes, such as cost and time to completion, expected traffic and expected revenue. TIRI is assessed for each outcome. Its rating, described in detail in the BENEFIT deliverable D3.2, is outlined here.

The Transport Infrastructure Resilience Indicator (TIRI) measures the ability of a Transport Infrastructure project to withstand changes (such as cost and time to completion, expected traffic and expected revenue targets). The Transport Infrastructure Resilience Indicator has an underlying rating system whose categories reflect the likelihood of achieving pre-specified outcomes targets and expressing the level of vulnerability of the project to external adverse implementation conditions. In this context, TIRI complements the widely used project creditworthiness ratings.

The BENEFIT TIRI places its focus on risk management which comes a step earlier than the ability to bear risk, under the logic that various circumstances that can jeopardise the ability of a project to deliver on its expected outcomes can be anticipated and potentially mitigated through managerial actions/decisions before the need exists for one of the project stakeholders to bear the financial consequences of a risk that has eventuated.

The BENEFIT TIRI rating system considers:

- The BENEFIT Matching Framework architecture and system nature (see Deliverable D3.1).
- The particularities of each mode of transport infrastructure as assessed with respect to the achievement of project outcomes (see Deliverables D4.4 and D3.2).

The BENEFIT Matching Framework employs various typologies and their respective indicators. Furthermore, the BENEFIT project has identified that different combinations of indicators (see Deliverables D4.2; D4.4; D3.2) may contribute to the achievement of particular project outcomes such as cost –to-completion; time-to-completion; and actual vs forecast traffic or revenues.

The BENEFIT rating system maps the values of the Transport Infrastructure Resilience Indicator against mode-specific threshold values and thus determines in which rating category a project belongs to. Rating categories reflect the likelihood of attaining the respective targets for each outcome considered within the BENEFIT project. The specification of the rating categories is based largely on previous BENEFIT analysis results that have been summarised in Deliverable D3.2.

The BENEFIT TIRI rating system comprises three basic rating categories, namely A, B and C. These are specified as follows:

- A: Describing very high likelihood of reaching a given outcome.

- B: Describing average likelihood of reaching a given outcome.
- C: Describing low likelihood of reaching.

Table 2.1 summarises the range of potential values of the proposed rating system which considers the slightly different conditions a project may have. These are presented with additional rating notches, (+) or (-) shown next to the basic rating, A, B or C. Furthermore, the BENEFIT rating system considers conditions of the project according to the project implementation context (exogenous characteristics) and internal features of the project (endogenous characteristics), all of them captured by indicators of the BENEFIT Matching Framework (see Deliverable D3.2).

Table 2.1: Full ratings deployed for the BENEFIT rating system

Exogenous Vulnerability	Rating Category	Endogenous Vulnerability
None	A	None
None	A-	Some
Some	B _{EX}	Limited
Endogenous structure reduces vulnerability	B _{EX+}	Limited
Endogenous structure increases vulnerability	B _{EX-}	Limited
Limited	B _{EN}	Some
Limited	B _{EN+}	The combination of endogenous and exogenous conditions reduces vulnerability
Limited	B _{EN-}	The combination of endogenous and exogenous conditions increases vulnerability
Existing: The combination of endogenous and exogenous conditions reduces vulnerability	C+	Existing: The combination of endogenous and exogenous conditions reduces vulnerability
Existing	C	Existing

In the TIRI rating system, both exogenous and endogenous conditions are considered.

Table 2.2 assigns quantitative values to each rating category that aim to reflect the likelihood of achievement of the outcome targets (Likelihood Score). These values range from 1 (low likelihood) to 5 (very high likelihood) and have been assigned qualitatively for demonstrative purposes only. The mapping between the rating categories and the proposed likelihood values has not been fully validated yet and may serve only as a proof of concept. In effect, this initial assignment guides the assessment of the accuracy of the TIRI rating predictions as these are compared to the actual observed outcomes.

In the TIRI rating system, typical thresholds that distinguish “high” from “low” values of typologies were set for each infrastructure mode and for project outcome (see Deliverable D3.2). The following Tables 2.3 to 2.6 present the system of Transport Infrastructure Resilience Indicator typical rating per outcome for road infrastructure projects. They are based on the combined findings reported in Deliverable D3.2.

Table 2.2: Expected Likelihood of achievement of outcomes per Transport Infrastructure Resilience Indicator rating category

Rating Index	Expected probability of achievement	Qualitative Description
A	Very high	In almost all cases rated A project will achieve the expected project outcomes.
A-	High	Only few cases rated A- will not achieve the expected project outcomes.
B _{EN} +	Rather High	B _{EN} +
B _{EX} +	Rather High	B _{EX} +
B _{EN}	Average	Many cases rated B _{EN} will achieve the expected project outcomes. The result is highly dependent on the exogenous indicators. If implementation conditions remain fairly stable, the potential is positive. A decrease in the exogenous indicators will highly increase the likelihood of underachievement.
B _{EX}	Average	Many cases rated B _{EX} will achieve the expected project outcomes. The result is highly dependent on the exogenous indicators. If implementation conditions remain fairly stable, the potential is positive.
B _{EN} -	Rather Low	B _{EN} - rated cases have a rather low likelihood of reaching the expected project outcomes. These cases are more sensitive to exogenous indicators and rely more on the stability of the implementation context.
B _{EX} -	Rather Low	B _{EX} - rated cases have a rather low likelihood of reaching the expected project outcomes. These cases are more sensitive to exogenous indicators and rely more on the stability of the implementation context.
C+	Rather Low	C+ rated cases, while bearing poor likelihood of reaching their expected project outcomes, they do hold potential of achievement.
C	Low	C rated cases have a poor likelihood of reaching their expected project outcomes.

Table 2.3: Transport Infrastructure Resilience Indicator Rating Cost-to-Completion for Road infrastructure Projects

	FEI	InI	GI	CSI	RSI	FSI
Max Resilience Rating: A A- for InI ∈ [0,61, 0,65] and FSI>0,60	≥ 0,60	≥ 0,65	≥ 0,500	≥ 0,333	≥ 0,150*	
Endogenous Vulnerability Rating: B _{EN} B _{EN} +	≥ 0,60	≥ 0,65	≥ 0,700	[0,333, 0,000]	[0,150, 0,000]	
Exogenous Vulnerability Rating: B _{EX} B _{EX} +	[0,50, 0,60]	≥0,65	≥0,500	≥0,333	≥0,150	≥0,600
Poor Resilience Rating: C C+ For larger values of GI	<0,50	<0,65	<0,500	<0,333	<0,150	<0,60
Rating: C	∇	∇	∇	∇	∇	→0,00

Table 2.4: Transport Infrastructure Resilience Indicator Rating Time-to-Completion for Road infrastructure Projects

	FEI	InI	GI	CSI	RAI	FSI
Max Resilience Rating: A A- for InI \in [0,61, 0,65] and FSI<0,60 or GI>0,600	$\geq 0,60$	$\geq 0,65$	$\geq 0,500$	$\geq 0,000$		
Endogenous Vulnerability Rating: B _{EN} B _{EN} ⁺ for larger values of GI B _{EN} ⁻ for smaller values of GI	$\geq 0,60$	$\geq 0,65$	$\geq 0,500$	[0,000, 0,200]	<0,500	
Exogenous Vulnerability Rating: B _{EX} B _{EX} ⁺ for larger values of GI B _{EX} ⁻ for InI \in [0,61, 0,65] and GI>0,500	[0,50, 0,60]	$\geq 0,65$	$\geq 0,500$	[0,000, 0,200]	<0,500	
Poor Resilience Rating: C C+ for larger values of GI or InI	<0,50	<0,65	<0,500	<0,00	>0,500	>0,600

Table 2.5: Transport Infrastructure Resilience Indicator Rating Actual vs Forecast Traffic for Road infrastructure Projects

	FEI	InI	GI	CSI	RSI	RAI
Max Resilience Rating: A A- for InI \in [0,61, 0,65] and GI>0,600 A- for RAI<0,500	$\geq 0,60$	$\geq 0,65$	$\geq 0,500$	$\geq 0,333$	$\geq 0,150$	
Endogenous Vulnerability Rating: B _{EN} B _{EN} ⁺ for larger values of GI and/or CSI and/or RSI B _{EN} ⁺ for RAI>0,500 B _{EN} ⁻ for smaller values of GI B _{EN} ⁻ for RAI <0,500	$\geq 0,60$	$\geq 0,65$	$\geq 0,500$	[0,000, 0,333]	[0,000, 0,150]	
Exogenous Vulnerability Rating: B _{EX} B _{EX} ⁺ for larger values of GI or CSI or RSI B _{EX} ⁻ for RAI <0,500 B _{EX} ⁻ for InI \in [0,61, 0,65] and GI>0,500	[0,50, 0,60]	$\geq 0,65$	$\geq 0,500$	$\geq 0,333$	$\geq 0,150$	>0,500
Poor Resilience Rating: C C+ for larger values of GI or InI C+ for RAI>0,500	<0,50	<0,65	<0,500	<0,00	<0,150	<0,500

Table 2.6: Transport Infrastructure Resilience Indicator Rating Actual vs Forecast Revenue for Road infrastructure Projects

	RRI	RAI	GI	CSI	RSI	FSI
Max Resilience Rating: A If Traffic Rating A, then Revenue Rating A And Figure-of-Merit for Traffic outcome B A- for any RRI RAI, GI, CSI, FSI smaller	≥0,666	≥0,666	≥0,500	≥0,333	≥0,150	≥0,666
Endogenous Vulnerability Rating: B_{EN} And Figure-of-Merit for Traffic outcome A, B or C B _{EN+} for larger values of RAI and/or GI and/or CSI and/or RSI and/or FSI B _{EN-} for smaller values of RAI and/or GI and/or CSI and/or RSI and/or FSI	<0,666	[0,500, 0,600]	≥0,500	[0,000, 0,333]	≥0,150	≥0,500
Exogenous Vulnerability Rating: B_{EX} And Figure-of-Merit for Traffic outcome B or C B _{EX+} for larger values of RAI and/or GI and/or CSI and/or RSI and/or FSI B _{EX-} for smaller values of RAI and/or RRI and/or GI and/or CSI and/or RSI and/or FSI	≥0,666	≥0,500	≥0,500	≥0,333	≥0150	≥0,500
Poor Resilience Rating: C And Figure-of-Merit for Traffic outcome C C+ for larger values of RRI or RAI and/or GI and/or CSI and/or RSI and/or FSI	<0,666	<0,500	<0,500	<0,000	<0150	<0,500

2.2 The BENEFIT Matching Framework: Applications

The objective of Task 5.1. is to demonstrate the use of the BENEFIT TIRI rating system as an ex-ante project assessment tool for transport projects. Therefore, this section reports on how to use the BENEFIT rating system for this purpose. The proposed evaluations relate to looking into the factors included in each BENEFIT Matching Framework indicator and highlighting those that may be potentially improved, given the conditions and project stages considered. Note that the BENEFIT TIRI rating system is based on the BENEFIT Matching Framework. According to findings reported in Deliverable 3.2. improved project outcomes can only be achieved by jointly combining changes of project characteristics reflected in each indicator. Further, changes induced in a project should be considered with respect to the respective threshold values required to achieve the respective outcomes per mode. By doing so, potential actions that may be taken over the project life cycle to improve the resilience of a transport infrastructure project are identified.

2.3 Ability to influence indicators

2.3.1 Indicators Exogenous to the Project²

Amongst the BENEFIT Matching Framework typology indicators, those exogenous to the project are the ones describing its implementation context: the Financial-Economic (FEI) and the Institutional (InI) indicators (see Deliverables D2.2; D3.1; and D4.2). These indicators are built based on international indices published by prominent international institutions. More specifically:

² Section taken as is from Deliverable 3.2

- The Institutional indicator shows the extent to which the political, legal and regulatory, and administrative context in a country is stable and of a high quality. It includes three dimensions:

- The “political” sub-dimension “political capacity, support and policies” which is composed by three main governance indicators of the World Bank:
 - Political stability and absence of violence,
 - Control of corruption and
 - Voice & accountability.

When combined these three indicators give an overview of the general political situation in a country. In short, the political stability and absence of violence basically captures the likelihood of political instability and/or politically-motivated violence, where the voice and accountability reflects a country’s citizens are able to participate in selecting their government. Also, the control of corruption index delineates the extent to which public power is exercised for private gain.

- The “regulatory” sub-dimension “legal and regulatory framework” which is also composed by the World Bank Indicators:
 - Rule of law and
 - Regulatory quality

combined with the inverse of the aggregated indicators of the Organisation for Economic Co-operation and Development (OECD):

- Regulation in energy, transport and communications (ETCR) on the regulatory restrictiveness of markets.

The ECTR index of the OECD represents the extent of liberalization of these markets. Again, these three elements paint a rather comprehensive picture of the judicial and regulatory context of a country. When rule of law index represents the extent to which agents have confidence in and abide the rule of society, the regulatory quality index captures the ability of the government to formulate and implement sound policies and regulations that permit and promote private sector development.

- The “administrative” sub-dimension “public sector capacity” has only one indicator, namely
 - the government effectiveness developed by the World Bank.

This index mainly reflects the level of effectiveness of government in terms of the quality of public service, the quality of civil service, the quality of policy formulation and implementation and the credibility of the government’s commitment to such policies.

- The Financial-Economic indicator, despite its name, measures more than just the macro-economic and macro-financial context of a country, but more broadly the *business environment* and can be seen as a proxy of *the level of productivity of a country*. As described in the Deliverable D3.1, the Global Competitiveness Index of the World Economic Forum, was selected to describe this dimension of the implementation context. The overall “competitiveness index” of the World Economic Forum aims to measure *the capacity of the national economy to achieve sustained economic growth over the medium term, controlling for the current level of economic development*. It includes predominantly:

- A macro-economic dimension, capturing the government budget balance, gross national savings, inflation, general government debt and the country credit rating,
- A financial market development pillar (measuring among others the availability and affordability of financial services, ease of access to loans, soundness of banks, and venture capital availability).

But also:

- Information on supporting contextual elements and policies, including the goods market efficiency, labour market efficiency, technological readiness, market size, business sophistication and innovation in a country.
- The availability of some basic requirements in terms of education, health of the population and overall infrastructure, as well as
- Limited business-oriented aspects of the institutional environment (like property rights, intellectual property protection, efficiency of legal framework in settling disputes, strength of auditing and reporting standards)³.

In this context, a high value of the FEI is supportive of a high Revenue Support Indicator, as implementation context conditions would allow for business initiatives.

The Institutional Indicator (InI) encompasses factors ranging from political stability to government efficiency as described by the respective score of the global competitiveness index. This has two ramifications:

- On the one hand, both InI and FEI include the notion of competitiveness since they both stem from the same global competitiveness index and bear a degree of correlation as identified by the econometrics analysis.
- On the other hand, the InI includes many features supporting project governance and minimizing stakeholder strategic behavior.

Therefore, a high value of FEI suggests high global competitiveness in terms of macro-economic conditions and financial market development, while a high value of the InI suggests support to project governance, political stability, political support for competitiveness and transparency in stakeholder strategies.

Notably, the two indicators, and especially the Institutional one, address key concerns raised at both Policy Dialogue sessions with respect to strategic behaviour and political support (see Deliverable D5.2).

Finally, it is evident that while financial-economic shocks will influence the FEI, a high InI still provides positive conditions for project development.

2.3.2 Indicators Endogenous to the Project⁴

Indicators endogenous to the project could be categorised as those related to the project structure and those that are commonly used as policy tools. This distinction is based on the fact that once the project has progressed in its life cycle, there are few indicators decision-makers may still act upon. In this context the indicators that could be categorised as “policy tools” are:

- the Remuneration Attractiveness
- the Revenue Robustness
- the Financing Scheme Indicators

2.3.2.1 Business Model

Core in the development and successful implementation of a project is its business model. In the BENEFIT Matching Framework it is described by two composite indicators: the Cost Saving (CSI) and the Revenue Support Indicator (RSI) (see Deliverables D2.2.; D3.1; D4.2; and D4.4). The former (CSI) represents a project’s ability to be efficient both in construction and in operation/maintenance. The latter (RSI) represents its ability to generate revenues and create demand (attract traffic).

Cost Saving Indicator

The Cost Saving Indicator is a composite indicator including:

³ There is some limited overlap with the institutional indicator we use, particularly in the sub-dimension of legal and regulatory framework, as the ‘global competitiveness index’ captures some institutional aspects with direct bearing on the business environment in a country.

⁴ Section taken as is from Deliverable 3.2

- Ability to construct
 - Level of civil works/ technical difficulty;
 - Capability to construct based on the market position of the contractor with respect to construction or respective project delivery capability (example for rolling stock);
 - Construction risk allocation as per contractual agreement;
 - Assessment of optimal construction risk allocation based solely on the capability to construct.
- Ability to monitor/control/plan and provide political support of the respective (public) contracting authority
- Adoption of Innovation and its successful application
- Life Cycle Planning and operation
 - Life cycle planning verification;
 - Capability to operate based on the market position of the operator;
 - Operation risk allocation as per contractual agreement;
 - Assessment of optimal operational risk allocation based solely on the capability to operate.

It is evident, based on the above description, that the CSI, in all practical terms, illustrates a *measure of a project's efficiency* during construction and operation. In addition, many of its constituent factors are specified before and/or during project award and include all directly involved actors: the constructor; the operator; and the contracting authority. If the project is promoted and implemented on a national level, the Institutional indicator and the Cost Saving Indicator bear limited overlap with reference to the contracting authority, as both indicator include address institutional maturity. However, the assessment is based on a different approach and for CSI concerns the ability of the contracting authority to monitor the project and provide the respective political support.

Table 2.3.2.1 illustrates the relevant project phase within which the factors that constitute CSI are originally set. The Table also suggests whether and how the value of each factor may be improved.

Table 2.3.2.1: Origin of the Cost Saving Indicator Factors

Key Factor	Origin Relevant Project Phase	Mitigation / Improvement Measures
Level of civil works/ technical difficulty	Project planning phase	Systematic review during construction
Capability to construct ⁵	Procurement & Award Phase	
Construction risk allocation	Contract design & negotiation	Through contract re-negotiation
Ability of the contracting authority ⁶	Exogenous to project	May be improved through training throughout the project life cycle and continuous support to the project
Adoption of Innovation	All project phases	Continuously
Life cycle planning	Project planning phase	
Capability to operate & maintain ⁷	Procurement & Award Phase	
Operation risk allocation	Contract design & negotiation	Through contract re-negotiation

⁵ Please look up D3.1 and D4.2 on the definition and formulation of the sub-indicator

⁶ Following indicator revision (see Deliverable D4.4). Please see D4.4. on the construction of the contracting authority's capability sub-indicator

⁷ Please look up D3.1 and D4.2 on the definition and formulation of the sub-indicator

The above analysis also shows how closely related the Cost Saving Indicator is to the Governance indicator, as well as the importance of the procurement process in achieving a high value of the CSI.

Revenue Support Indicator

The Revenue Support Indicator is also a composite indicator that includes:

- The influences of the new (greenfield) and existing (brownfield) parts of the project. This indicator reflects:
 - The level of business development scope, designed to attract demand (e.g. airports etc.);
 - The level of project exclusivity with respect to its position in the transport network (e.g. metros, bridge and tunnel projects, ports airports under certain conditions). Notably, exclusivity may also be contractually induced.
 - The level at which a transport network which supports the project's exclusivity

- Revenue sources from traffic from new and brownfield operation, from other transport infrastructure bundled in the project, and other non-transport related activities in relation to:
 - Capability to manage demand
 - Demand risk allocation
 - Assessment of demand risk allocation based on the capability to manage demand
 - Quality of service

Overall, it can be appreciated that, the Revenue Support Indicator (RSI) is a *measure of the project's ability to generate revenues*. Table 2.3.2.2 indicates the project phase within which the above factors are set and suggests potential mitigation/improvement measures.

Table 2.3.2.2: Origin of the Revenue Support Indicator Factors

Key Factor	Origin Relevant Project Phase	Mitigation / Improvement Measures
Business development scope	Project planning phase	May be bounded by the type of infrastructure but may also be developed during the life cycle of the project depending on social and other evolution.
Exclusive position in the transport network	Project planning phase	May be bounded by the type of infrastructure but may be also contractually induced.
Transport network supporting project's exclusivity	Project planning phase	May be: <ul style="list-style-type: none"> ▪ Bounded by the type of infrastructure; ▪ Contractually induced; ▪ Changed over time due to network development.
Capability to manage demand ⁸ (prime infrastructure & brownfield)	Procurement & Award Phase	
Demand risk allocation (prime infrastructure & brownfield)	Contract design & negotiation	Through contract re-negotiation

⁸ Please look up D3.1 and D4.2 on the definition and formulation of the sub-indicator

Quality of service of prime infrastructure & brownfield	Operation phase	Continuously
Capability to manage demand ⁹ (other transport infrastructure)	Procurement & Award Phase	
Demand risk allocation (other transport infrastructure)	Contract design & negotiation	Through contract re-negotiation
Quality of service of other transport infrastructure	Operation phase	Continuously
Capability to manage demand of other non-transport activities ¹⁰	Procurement & Award Phase	
Demand risk allocation (other non-transport activities)	Contract design & negotiation	Through contract re-negotiation
Quality of service of other non-transport activities	Operation phase	Continuously

It is worth noting that Task 4.2 identified that a common result of renegotiation has been the granting of additional sources of revenues, i.e. the government grants additional revenue rights, such as new service areas or business lines.

The Table also shows how closely related the Revenue Support Indicator (RSI) is to the Governance indicator, as well as the importance of the procurement process in achieving a high value of the RSI. In addition, Table 2.3.2.2 indicates the potential importance of the “perceived” quality of service.

Finally, the above indicator apart from being a measure of the project’s ability to generate revenues, it is also a *measure of the project’s efficiency in exploiting the potential sources of revenue*.

2.3.2.2 Reliability/Availability Indicator

The Reliability/Availability Indicator represents the level of physical and operational reliability and availability of the transport service (see D2.4; D3.1; and D4.2). The quantitative analysis streams identified it as important in reaching traffic and revenue goals. However, the indicator has not been included in the development of the Transport Infrastructure Resilience Indicator because of its little variation around maximum possible values (typically 1).

Other factors connected to this indicator are: infrastructure type; size (of investment) and location. All of them are considered decisions taken prior to project award as are the project’s outcome targets.

2.3.2.3 Governance Indicator

The Governance indicator refers to factors setting the governance scene within a project (see Deliverables D2.2.; D3.1; D4.2; and D4.4). In this respect, it is defined by the contractual conditions and the process leading to them. Table 6.2.3 lists the parameters included in the Governance indicator. These are determined during the tendering and contract award stage. However, this does not necessarily mean that the GI value remains constant through the contract duration.

As shown in Table 6.2.3, many parameters of the Governance Indicator (GI) are subject to the level of enforcement and monitoring exercised by the contracting authority. Hence, the value of the GI risks is decreasing if proper contract management is not enforced by the contracting authority.

In addition, the value of Governance indicator may change through re-negotiations, with ramifications on other indicators (e.g. CSI and RSI). It should be noted that a renegotiation process will reduce by default the value of some parameters. For example, the parameter

⁹ Please look up D3.1 and D4.2 on the definition and formulation of the sub-indicator

¹⁰ Please look up D3.1 and D4.2 on the definition and formulation of the sub-indicator

“competition between bidders” will be “null” following renegotiations as the process only takes place with the one party that has been awarded the contract.

Table 2.3.2.3: Governance Indicator Factors and Conditions of Change

Key Factor	Tendering Stage	Implementation	Re-negotiations
Governance Efficiency and Effectiveness			
The client selected only one service provider [bidder] to participate in the pricing stage	√	Changes are justified and agreed upon	√
The client and the key service providers [bidders] collectively estimated the expected project cost	√	Changes are justified and agreed upon	Changes are justified and agreed upon
Encouragement of competition between bidders	Minimum number of bidders should be set based on market conditions.		No competition at re-negotiation.
Integration of design and construction	√	Subject to contract monitoring by contracting authority	Depends on the stage re-negotiations take place
The key service providers [contractor] to pay a penalty if completion dates were not met	√	Subject to contract enforcement by contracting authority	
The key service providers [contractor] solely carried the risk of rising costs	√	Subject to contract enforcement by contracting authority	√
The client and key service providers [contractor] [to share] shared equal proportions of profit due to cost under-runs	√	Subject to contract monitoring by contracting authority	√
Incentives ¹¹	√	Subject to contract monitoring by contracting authority	√
Bonding requirements	√	Subject to contract monitoring by contracting authority	√
Commercial/revenue & financial risks are not concentrated	√	Subject to contract monitoring by contracting authority	√
Contractual Flexibility			
Clauses enable updating of service and/or price changes	√	Subject to contract monitoring by contracting authority	√
Clauses indicate that client has an option to terminate the agreement without cause	√	Subject to contract enforcement by contracting authority	√

¹¹ Following indicator revision (see Deliverable D4.4)

Table 2.3.2.3 shows the relative support between the Institutional Indicator and the Governance Indicator (GI), as a high value of the Institutional Indicator may compensate for a lower value of the Governance Indicator. Also, the ability to enforce crucial factors of the Governance Indicator is captured by certain factors included in the Cost Saving Indicator. In addition, if Governance Indicator parameter values related for example to risk allocation, are not respected during project implementation, the values of the Cost Saving and Revenue Support Indicator will change respectively.

2.3.2.4 Funding Scheme

The Funding Scheme includes three (3) indicators (see D2.4; D3.1; D4.2 and D4.4):

- The Remuneration Attractiveness Indicator;
- The Revenue Robustness Indicator; and
- The Market Efficiency and Acceptability Indicator

The analysis carried out in D4.4 did not identify the impact of the Market Efficiency and Acceptability Indicator and, consequently, this indicator has not been considered any further. This is not conforming to common knowledge and may be due to the level of detail of the indicator.

As before, Tables 2.3.2.4 and 2.3.2.5 present the factors included in the indicators, the project phase within which these factors are set and the conditions of change. The Table highlights how volatile both project income and revenues may be. It also shows the importance of including alternative streams of both income and revenues. It is evident that the two sub-indicators could be conditioned as well as that they may potentially be correlated or independent. Section 2.4 of the present report describes how they can be used as a driver towards reaching specific project outcomes.

Table 2.3.2.4¹²: Origin of the Remuneration Attractiveness Factors

Key Factor	Origin Relevant Project Phase	Mitigation / Improvement Measures
Expected income as % of full project costs;	Project planning phase Procurement & Award Phase	May be bounded by the type of infrastructure. May change throughout the operation phase
Share of each income stream on total income;	Procurement & Award Phase	May be: <ul style="list-style-type: none"> ▪ Bounded by the type of infrastructure; ▪ Contractually induced; ▪ Changed over time due to mobility and other social behaviour. May change overtime Restricted if only one income stream.
Risk of each income source	Operation Phase	Influenced by Acceptability of price: Low acceptability reflects in high risk associated to the income source. Adjust pricing policy

As shown in Deliverable D4.3, these are the indicators commonly adjusted as a result of a renegotiation process. More specifically, Task 4.2 identified that most common actions taken following renegotiations amongst the cases in the BENEFIT database of projects were:

- Government payments to cover cost overruns: The government agrees to pay some or the whole amount of the cost overruns.
- Operation and Maintenance (O&M) duty releases: The grantor releases some obligations to the concessionaire which will eventually reduce the O&M expenses.

¹² Following indicator revision (see Deliverable D4.4)

- Government funding support (Minimum Revenue Guarantees, MGR, or operating subsidies): The grantor agrees to fund the project with minimum revenues guarantees, for a limited period or for the whole period.
- Extension of the concession period: The grantor agrees to extend the concession period to compensate for time overruns and/or provide additional funding to the project.
- Toll/Tariffs increase that will eventually increase project revenues.

All, apart from the last action, have a direct effect (increase) on cost coverage and, consequently, all else being kept equal, lead to an increase in the values of both the Remuneration Attractiveness and Revenue Robustness Indicators. The latter, apart from possibly changing the mix of streams of sources of income increases the level of risk associated with one or both aforementioned indicators depending on the structure of the funding scheme.

Table 2.3.2.5¹³: Origin of the Revenue Robustness Indicator Factors

Expected revenues as % of full project costs	Project planning phase Procurement & Award Phase	May be bounded by the type of infrastructure. May change throughout the operation phase.
Share of each revenue stream on total revenues	Procurement & Award Phase	May be: <ul style="list-style-type: none"> ▪ Bounded by the type of infrastructure; ▪ Contractually induced; ▪ Changed over time due to mobility and other social behaviour. May change overtime Restricted if only one revenue stream.
Risk of each revenue source	Operation Phase	May change throughout the operation phase.

2.3.2.5 Financing Scheme Indicator¹⁴

The Financing Scheme Indicator (FSI) reflects an expanded version of the cost of capital included in the project both from public and private sources (see D2.4; D3.1; D4.2; and D4.4).

It is originally set at the project's financial close in the case of private involvement or prior to project procurement in the case of a publicly financed project. However, the indicator's value may change overtime reflecting changes in both the financing structure as well as the cost of capital per source of financing.

Financing Scheme is important in achieving specific project outcomes in combination with other indicators (see D2.4; D3.1; D4.2; and D4.4). Implicitly, this latter observation may also be used to identify whether and under which conditions, a project with specific indicator values could be delivered through the PPP model and with which capital structure (FSI) in order to achieve the respective outcome targets.

Following on input from task 4.2 (see Deliverable D4.3), key actions taken in re-negotiations processes amongst the BENEFIT cases were directly connected to the Financing Scheme indicator. More specifically, these included:

1. Use of financing facilities that are available for special situations (e.g. renegotiations)
2. New financing arrangements agreed with creditors for special situations (e.g. renegotiations).
3. Sponsors' financial support: Shareholder contributions usually in the form of capital or participative loans.

¹³ Following indicator revision (see Deliverable D4.4)

¹⁴ Following indicator revision (see Deliverable D4.4)

4. Financial support by the Government, through loans or subventions: The grantor provides capital grants and/or loans. This could be refunded at the end of the concession period, if possible.
5. Government funding support (MRG or operating subsidies): The grantor agrees to fund the project with minimum revenues guarantees, for a limited period or for the whole period.
6. Spontaneous additional revenues: Additional unexpected revenues from new commercial areas or non-core businesses.
7. Public/private contributions to pay off urgent debt

And also

1. Lower O&M expenses.
2. O&M duty releases: The grantor releases some obligations to the concessionaire which will eventually reduce the O&M expenses.
3. Government payments to cover cost overruns: The government agrees to pay some or the whole amount of the cost overruns.
4. Extension of the concession period: The grantor agrees to extend the concession period to compensate for time overruns and/or provide additional funding to the project.

The second group of actions have a dual effect:

- (1) A reduction in the overall contribution needed in terms of financing and therefore, making bounded sources of financing increase their respective share in the financing structure; and
- (2) They introduce less costly financing and, therefore, increase the value of the Financing Scheme Indicator.

Finally, it should be noted that the structure of the Financing Scheme Indicator allows for testing new financing instruments and the impact these may have on project performance.

2.4 Enhancing Project Performance: The BENEFIT Matching Framework Policy Guiding Tool¹⁵

2.4.1 Introduction

The BENEFIT Matching Framework considers performance following project award. Many project conditions, at this point, have already been set. These include, for example, infrastructure type, size of investment, location as well as the delivery model (fully public or including private financing). Based on studies conducted before the tendering stage, the key outcomes of a project have also been set. With respect to the BENEFIT Matching Framework these include:

- Construction *budget*
- Construction *duration*
- Anticipated level of *traffic*
- Anticipated level of *revenues*

The synthesis of findings of Deliverable 3.2 also highlights:

- The influence of the implementation context, with the Institutional Indicator also representing the level of implementation stability
- The impact of decisions made at the procurement phase on a project's ability to reach its targets.
- The limited ability to enhance performance after the procurement phase, which is mostly focused on innovation and business development opportunities

¹⁵ Section taken as is from Deliverable 3.2

- The potential role that Funding and Financing Scheme indicators may play in driving a project's outcomes under the particular conditions already set.

Within this context, by applying the BENEFIT Transport Infrastructure Resilience Indicator and its underlying rating system in an ex ante approach, project structuring scenarios may be considered during all project phases. When addressing these scenarios, the target would be to accomplish a B_{EX+} TIRI rating for all project outcomes of interest, if possible. As described previously, a B_{EX+} rating would secure a rather high likelihood of achieving a specific project outcome even under relatively adverse implementation conditions.

2.4.2 Planning Phase enhancements

The BENEFIT Matching Framework considers project characteristics after the completion of all relevant preliminary studies justifying the project's existence and defining its outcomes.

2.4.2.1 Exogenous Indicators: Implementation Context (FEI and InI)

The analysis identified that projects delivered in a implementation context characterised by a Financial-Economic indicator of FEI<0,50 should be treated with extreme caution, since their likelihood of reaching specified outcome targets is severely diminished.

However, if the Institutional Indicator has a high value (InI>> 0,65) then, a relative improvement of the odds is expected, especially if an increasing trend in the FEI is observed.

The conditions for FEI are not compulsory for urban transit projects, while a high InI is important in this case.

2.4.2.2 Endogenous Indicators: Project Structure (IRA, CSI, RSI, GI)

The design of the structure of the project together with input from all previous studies leads to the initial estimation of the corresponding indicators. Within this section, the Reliability/Availability (IRA), the Cost Saving (CSI), the Revenue Support (RSI) and the Governance (GI) indicators are considered.

IRA: This indicator is usually considered to be IRA=1 reflecting the reliability and availability of service. If, within the life cycle of the project, partial operation or staged inauguration has been planned, the IRA will take the respective values over time.

CSI: At the planning phase this indicator should reflect the actual conditions for its known parameters and assist in the investigation of plausible scenarios for those not known following the indicator estimation process (see D2.2, D3.1, D4.2, D4.4). More specifically, the CSI considers in principle the following parameters:

Technical difficulty: The technical difficulty of the project is assessed, including design maturity, land acquisition, permits etc.

Constructor Capability: The minimum construction capability to address the project should be defined, also in relation to risks to be passed on to the constructor.

Operator Capability: The minimum operator capability to address the project should be defined, also in relation to risks to be passed on to the operator. In case the public sector is to operate the project then the public's sector capability to operate in relation to the risks to be borne is assessed.

Contracting Authority's Capability: The contracting authority's capability to plan, monitor, enforce contract, manage stakeholders and support the project is assessed. Also the existing track record is considered (see D4.4).

Innovation: Concerns the assessment if innovation is included in the project. At this stage, the successful application of innovation is considered.

Life cycle planning: The degree of life cycle planning is assessed.

RSI: The Revenue Support Indicator is assessed based on the project's configuration in the transport network and the revenue sources initially planned (see D2.2, D3.1, D4.2, D4.4). The indicator considers in principle the following parameters:

Level of Competition: The project's business scope (business development vs service provision), its exclusivity in the network, and the impact of the transport network on the project's exclusivity are assessed. A scenario could also be built concerning the project's induced exclusivity through relevant contractual terms.

Sources of revenues: The project's designed sources of revenues are initially considered in combination with the estimation of the ability to manage the respective demand risk of these sources (transport and non-transport). This is important with respect to the corresponding risk allocation.

Quality of service/ user satisfaction per source of revenue: At the planning stage, this parameter may be considered to take the highest possible value. However, scenarios with respect to lower quality could be developed and considered.

GI: The Governance Indicator is composed of two sets of parameters (or sub-indicators) concerning governance effectiveness/efficiency and flexibility. It takes into account:

- The project's "needs" in capabilities as they are estimated in the construction of the CSI and RSI,
- The procurement laws and regulations applied in the contracting authority's respective level of government. At the planning stage the minimum values of the parameters are set.

2.4.2.3 Endogenous Indicators: Policy Tools (RAI, RRI, FSI)

This set of indicators reflects the contracting authority's (public sector) project implementation policy.

RAI: The Remuneration Attractiveness Indicator (see D4.4) reflects the decision with respect to the potential streams of project income or the remuneration scheme associated with the risks each source of income may present and the cost coverage ratio potentially achieved. Normally, 100% coverage should be estimated at this stage, but also respective scenarios of lower coverage may be developed.

RRI: The Revenue Robustness Indicator (see D4.4) reflects the various sources of project-generated revenues (connected to RSI) associated with their respective risk and the expected cost coverage that may be assumed. Again, 100% coverage should be estimated at this stage, but also respective scenarios of lower coverage may be developed.

FSI: The Financing Scheme Indicator reflects the model of project delivery (Public or with Private Financing) as well as the potential structure of the financing in terms of cost of capital. Notably, at this stage, key scenarios may be tested: 100% public financing (FSI=1); strictly or the majority of the financing coming from the private sector (usually FSI<0,300); private financing with significant public support through guarantees, public contribution of financing etc. (usually FSI>0,600). The effect on FSI of innovative financing instruments can also be tested at this point.

2.4.2.4 Transport Infrastructure Resilience indicator: Project rating

Based on the methodology presented previously, all BENEFIT indicators would be estimated allowing for the assessment of the Transport Infrastructure Resilience Indicator. Should the resulting rating be at the B_{EX+} level or above, then the planning could be considered successful for the desired outcomes. Notably, at this stage individual stakeholder views can be considered. Each stakeholder may assess the resulting rating per outcome as well as the overall one, depending on their prevailing interests. If the result is not acceptable, then improvements to the CSI, RSI or changes in policy (RAI, RRI and FSI) should be considered.

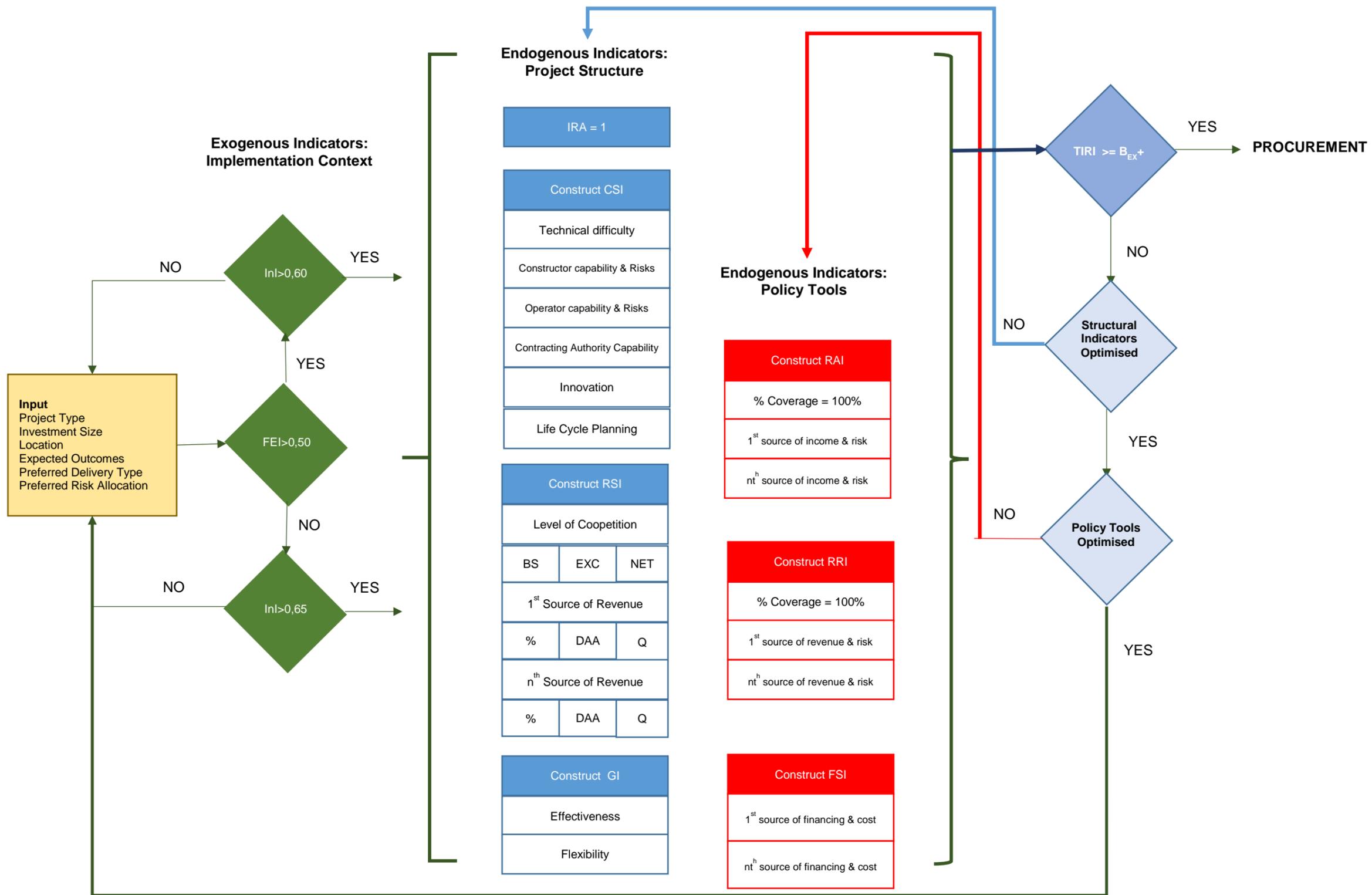


Figure 2.4.2.4: Schematic representation of iterative investigation process at the planning stage

It is evident that at the planning stage a series of iterative investigations need to be undertaken to test for various contexts of project structuring and implementation. Figure 2.4.2.4 illustrates the suggested process as described in this section.

2.4.3 Procurement enhancements

The analysis at the planning stage will define the procurement process, tendering documents and other minimum requirements so that the Governance indicator can achieve a value greater or equal to the one identified in the planning process.

As corroborated by experience, all initial estimates generated during the planning stage will, more often than not, not materialise in practice. All endogenous indicators should then be re-calculated based on the contractual agreement terms and the capabilities of the actual actors involved (constructor, operator etc.).

The TIRI may once again be assessed. Depending on the resulting rating, corresponding mitigation measures could be prepared considering the possibilities available by both Structural Indicators as well as those indicators functioning as Policy Tools.

Notably, from this stage onwards, the flexibility of the structural indicators is reduced.

2.4.4 Financial Close enhancements

Reaching financial close will finally define the Financing Scheme Indicator. At this point it is worth estimating the TIRI rating of the project in order to identify the optimum synthesis of financing sources that would lead to an improved and stable rating.

Notably, the value of the FSI has a different influence on the various outcomes and the decision-maker would need to make an overall assessment based on their own interests and priorities.

2.4.5 Implementation Phase enhancements

During the implementation phase, both exogenous and endogenous indicators may vary over time. More specifically:

- The implementation context (FEI and InI) may become more or less favourable;
- Contractual terms, especially with respect to risk allocation may be honoured to a greater or lesser extent (GI, CSI, RSI);
- Coverage and risks related to the income and revenues may vary (RAI, RRI);
- Financing sources and respective cost of capital may vary (FSI)
- etc.

The TIRI will provide a measure of the project's stability and likelihood of reaching outcomes allowing for corrective actions or mitigation measures to be introduced. As noted previously, following project award and financial close, the project system becomes less flexible.

2.4.6 Renegotiations

The BENEFIT Matching Framework may be applied to assess improvements that can be brought about during potential renegotiations. Notably, renegotiations should result in an improved rating of the TIRI for individual outcomes of interest or all of them simultaneously. However, the anticipated challenge under a renegotiation setting is whether interests and priorities are aligned, as if this does not hold true each party would be seeking the optimal settlement of its own individual interests which may not necessarily coincide with an overall optimal restructuring of the project. The use of the TIRI methodology could help identify such imbalances or misalignments of interests and help craft renegotiation solutions that are as close to the overall optimum as reasonably possible.

3 Case analyses

This section elaborates on the use of the BENEFIT TIRI rating system to assess a set of real and ongoing project cases which were chosen from the collective BENEFIT database. Next sections describe roughly the projects analysed and report particular findings for each typical stage in a project.

3.1 Project cases analysed

Table 3.1 depicts the project cases deployed to verify the use of the BENEFIT rating system. Descriptions of the projects are available from the E-BOOK reported in the Reference list of this report.

Table 3.1.1 shows a diversity of types of projects in which roads, trams and bridges are being delivered using public funding and private financing. This diversity is important to comprehensively verify the usability of the BENEFIT TIRI rating system. However, note that the BENEFIT TIRI rating system cannot be applied to rail infrastructure projects and cannot be used to inform decision making for airports and ports projects in terms of analysing traffic and revenue potential outcomes (See Deliverable 3.2).

Table 3.1.1: Project cases analysed

	Project	Award year	Country	Main mode delivered	Delivery scheme
1	BNRR (M6 Toll)	1992	UK	Road	Private Co-Financed
2	Brabo 1	2008	Belgium	Tram	Private Co-Financed
3	BreBeMi	2009	Italy	Road	Private Co-Financed
4	C-16 Terrasa Manresa toll motorway	1987	Spain	Road	Private Co-Financed
5	Combiplan Nijverdal	2006	The Netherlands	Road	Public funding
6	E-75, Section Horgos-Novi	2009	Serbia	Road	Public funding
7	Elefsina Korinthos Patra Pyrgos Tsakona Motorway	2007	Greece	Road	Private Co-Financed
8	Herrentunnel Lübeck	1999	Germany	Bridges	Private Co-Financed
9	Lusoponte - Vasco Da Gama Bridge	1994	Portugal	Tunnels	Private Co-Financed
10	Reims tramway	2006	France	Tram	Private Co-Financed
11	Warsaw's Metro II-2nd Line	2009	Poland	Metro	Public funding

3.2 Case analysis method

For the case-based analysis of the usefulness of the TIRI rating system the following steps were followed:

- Step 1: Proposition and selection of a case study project.
- Step 2: Assignment of values to each BENEFIT Matching Framework typology indicator for the project.
- Step 3: Identification of the typologies within the BENEFIT Matching Framework which need attention and represent potential opportunities for project improvement.

- Step 4: Identification of specific actions to address threats and opportunities in the project.
- Step 5: Validation of proposed specific actions.

3.2.1 Proposition and selection of a case study project

These cases were mainly selected on the basis of each project's current conditions. Most of the projects chosen exhibit either exogenous or endogenous vulnerability, as defined earlier in Table 2.1. Deliverable 3.2 reported initial evaluations of most of the projects in Table 3.1.1. Given these projects' vulnerability characteristics, the proposed case analyses should further enable the thorough evaluation of the BENEFIT TIRI rating system. For instance, in a vulnerable project it can be assumed that there could be opportunities for improvement. The identification of project improvements to support decisions is the ultimate goal of the ex-ante assessment within BENEFIT, as discussed in section 2.1.

3.2.2 Assignment of values to each BENEFIT Matching Framework typology indicator for the project

Every case researcher (henceforth 'owner') used existing values for the GI, CSI, RSI, RAI, RRI and FSI for different stages in each project. For the case analyses the required information originates from a review of the pre- and post- contract transactions and was complemented with personalized semi-structured interviews held with the management of the projects. These activities were done earlier in BENEFIT research project (see Deliverables D2.2; D3.1; and D4.2).

3.2.3 Identification of the typologies within the BENEFIT Matching Framework which need attention and represent potential opportunities for project improvement

In Task 3.2, thresholds which distinguish between low and high values for each indicator have been estimated per outcome and infrastructure mode. Tables 2.3 to 2.6 in this report present the respective threshold values for road infrastructure projects per mode and by project outcome type considered in BENEFIT. By comparing the actual indicator value of a project under investigation with the respective threshold value, case owners were able to identify specific project characteristics which could possibly be improved.

3.2.4 Identification of specific actions to address threats and opportunities in the project

Through the previous steps the case owners were in position to further investigate which specific and suitable actions could be implemented in the project under analysis in order to treat the identified weaknesses and opportunities. The BENEFIT Matching Framework offers a set of management actions described in section 2.3 of this report. Case owners were asked to provide evidence on the particular constraints which impeded those management actions to be implemented in the project. These included the project arrangements already set in place at each stage of the project analysed. Results were registered in forms available in Annex 1 (Case Applications) of this report.

3.2.5 Validation of specific actions

By contrasting the suggestions made by case analysts and the possibilities provided by the BENEFIT Matching Framework, further validation of the actual possibility of implementation of these specific actions was undertaken.

3.3 Case analysis example - The Elefsina Korinthos Patra Pyrgos Tsakona Motorway project (EKKPT Motorway)

The Elefsina Korinthos Patra Pyrgos Tsakona Motorway project (EKKPT Motorway) case is used here to illustrate the case analyses performed for Task 5.1. Note that every indicator, its value, and the way to calculate it have been reported in Deliverables D2.2; D2.3; D2.4; D3.1; D4.2; and D4.4. However rough details of the indicators forming the BENEFIT Matching Framework were provided in section 2.3 of this report. Likewise, the BENEFIT TIRI rating system and its use was described in section 2.1. Full details of the application of the TIRI rating system are reported in Deliverable D3.2.

Ex-ante analysis of EKKPT Motorway

The call for tender for the EKKPT Motorway was issued in 2001. The project was finally awarded in 2007, and the financial close was reached in 2008. These dates constitute the principal milestones considered in the “ex-ante” approach to the project.

Planning Phase - 2001

During this phase, exogenous (see section 2.3.1), endogenous structural and endogenous policy indicators (see section 2.3.2) are considered. At this stage, the effort is to construct the project, accordingly the Transport Infrastructure Resilience Indicator-TIRI (see section 2.1) is rated with at least B_{EX+} for each project outcome. B_{EX+} rating means that endogenous structure increases project vulnerability but in a limited fashion (see Table 2.1 of this report). The exogenous indicators are indicators upon which action cannot be taken by the project management (see section 2.4.1). For the year 2001, these the FEI and InI indicator values (see section 2.3.1) for Greece where:

FEI = 0,543
InI = 0,60

These values are below the thresholds defined in Table 2.1. and suggest exogenous vulnerability of the project. Further, the historical trend shows unstable but increasing values for exogenous indicators, suggesting that the delivery of the project, at least for the first years would be implemented with some degree of exogenous vulnerability (see section 2.1 and Table 2.1). Hence, endogenous indicators values would need to be increased in order to increase the respective TIRI rating.

In addition, with respect to the endogenous policy indicators, the input decisions suggest:
FSI < 0,500
RAI < 0,500

These values mainly indicate the focused use of demand based remuneration schemes (user tolls) and costly financing schemes or lack of public subventions in the project.

First Pass of the Planning Phase

Here, estimates on each indicator input that would generate the highest possible values of the endogenous indicators given that FSI < 0,500 are provided. These are depicted as Snapshot 0-1 in Table 3.1.3. A key consideration, was the improvement of the revenue sources and streams by considering a mix of revenues as follows: 60% user tolls, 10% services (e.g. service stations) and 20% real estate development (e.g. real estate taxation).

As noted in Table 3.1.3, this last proposed project configuration does not yield acceptable TIRI ratings, especially for cost-to-completion and actual vs forecast revenue.

Second Pass of the Planning Phase

A second iteration involved two major changes:

- Relaxing FSI, with FSI > 0,600 which might involve the adoption or strengthening of low cost financing schemes for debt in conjunction with the use of public sector funds or government subsidies.
- Increasing the potential revenue sources by setting real estate revenues at 30%

Under this configuration indicator values are illustrated as snapshot 0-2 in Table 3.1.3.

The changes introduced improved the RSI, RAI, and RRI indicator values and lead to changes in TIRI outcome rating. Another point to be made, is the fact that setting 30% revenues from real estate (land value capture) is rather improbable, rendering the potential for the depicted TIRI values unachievable. In other words, the project had a limited outlook.

Award Phase - 2007

Following award, next to the exogenous indicators, other indicators also become unalterable. The key indicators that assume a terminal value at this stage are the GI as well as CSI, RSI and RAI unless the contract allows for respective flexibilities. After award and given the actual conditions of the project set in place, the indicator values are acceptable with the exception of RAI = 0,400 (<0,500). However, under the conditions the project was planned, procured and awarded the TIRI rating for the cost-to-completion target has dropped to C+. C+ means low likelihood of reaching the expected outcomes.

Overall, exogenous indicator values have slightly improved.

Mitigation measures

The potential to improve lies in relaxing the RAI, i.e. including low risk income sources. (see Table 3.1.3, snapshot 1-0).

Award Phase – 2008 / Financial Close

The project financial close is reached with the exogenous indicators, InI and FEI, showing a marginal drop. In compensation, it is reasonable that the FSI value is set at a far higher value than one would expect for a PPP project, which according to the BENEFIT Matching Framework the associated value for FSI is 0,796), i.e. by means of heavy government support, contribution and guarantees (see Table 3.1.3, snapshot 1-2). The adoption of these measures actually happened in this project.

The TIRI rating for all outcomes remains unfavorable (B_{EX}).

Mitigation Measures

The potential to improve lies in relaxing the RAI, i.e. including low risk income sources. RAI-related specific actions can be found in section 2.3 of this report (see Table 3.2.1, snapshot 1-2).

Pause of Works – 2010

In 2010, the exogenous indicators drop to values suggesting a C TIRI rating for all outcome targets. The RRI indicator is 0.667. GI is still appropriately high (0.625), but CSI has dropped considerably (-0.021) due to the evidenced shortcomings in the public contract authority ability to function. More particularly, this decrease in CSI is reflected in the situations which the following mitigation should address:

- Provision of external support could be suggested at this point to the public contracting authority.
- Increase of low risk revenue streams
- Allocation of other business activities to the concessioner.

These measures would increase some of the outcome TIRI ratings to B_{EX}. This is illustrated as snapshot 2-1.

Restart – 2013

Following renegotiations, the project is under worse implementation conditions: the exogenous indicators have further dropped.

Table 3.1.3: Ex-ante analysis of EKKPT Motorway

MF Indicators	Exogenous factors		Project Planning-Procurement			Project Construction-Operation			Cost Overrun		Time Overrun		Actual vs Forecasted Traffic		Actual vs Forecasted Revenue	
	InI	FEI	GI	CSI	RSI	RAI	RRI	FSI	Value	Rating	Value	Rating	Value	Rating	Value	Rating
Snapshot 0-1: Planning (2001) 1st approach	0,60	0,543	0,813	0,673	0,312	0,467	0,733	<0,500	-	C+	-	B _{EX} ⁻	-	C+	-	B _{EX} ⁻
Snapshot 0-2: Planning (2001) 2nd approach	0,60	0,543	0,813	0,673	0,321	0,533	0,767	>0,600	-	B _{EX} ⁻	-	B _{EX} ⁻	-	B _{EX} ⁻	-	B _{EX} ⁻
Snapshot 1: Award (2007)	0,61	0,558	0,625	0,514	0,255	0,400	0,667	>0,600	-	B _{EX} ⁻	-	B _{EX} ⁻	-	B _{EX} ⁻	-	B _{EX} ⁻
Snapshot 1-0: Award (2007)-Improved	0,61	0,558	0,625	0,514	0,255	0,500	0,667	>0,600	-	B _{EX} ⁻	-	B _{EX} ⁻	-	B _{EX} ⁻	-	B _{EX} ⁺
Snapshot 1-1: Financial Close (2008)	0,60	0,558	0,625	0,514	0,255	0,400	0,667	0,796	-	B _{EX} ⁻	-	B _{EX} ⁻	-	B _{EX} ⁻	-	B _{EX} ⁻
Snapshot 1-2: Financial Close (2008)-Improved	0,60	0,558	0,625	0,514	0,255	0,500	0,667	0,796	-	B _{EX} ⁻	-	B _{EX} ⁻	-	B _{EX} ⁻	-	B _{EX} ⁺
Snapshot 2: Pause (2010)	0,58	0,458	0,625	-0,021	0,244	0,400	0,667	0,796	-1	C+	-1	C+	-2	C+	-1	C+
Snapshot 2-1: Pause (2010)-Improved	0,58	0,458	0,625	-0,021	0,244	0,400	0,667	0,796	-1	B _{EX} ⁻	-1	C+	-2	C+	-1	B _{EX} ⁻
Snapshot 3: Re-start (2013)-Improved	0,57	0,308	0,500	-0,021	0,222	0,400	0,667	0,644	-1	C+	-1	C+	-2	C+	0	C+
Summarized actions of improvement considered (in bold those most effective and applied for improved scenarios according the algorithms of the BENEFIT MF)			GI: Incentives for performance			RAI/RRI: Allocation of non-transport revenue sources to contractor via advertisements and real state taxation										
			GI: Termination clauses			FSI: Use of public subsidies										
			CSI: Optimizing construction risk allocation via enhanced contractor selection													
			CSI: Enhanced project management and monitoring by public party via consultancy by a third party													
			RSI: Control of service demand by generating an exclusive use of the infrastructure													
			RSI: Allocation of non-transport revenue sources to contractor via advertisements and real estate taxation													

GI has by default dropped as the new arrangement is not carried out under competitive conditions as they take place only with the established concessioner. Note that GI as proposed by the BENEFIT Matching Framework is based on the tested assumption that a competitive environment, represented by the participation of a number of bidders, likely will generate satisfactory project performance in terms of costs expectations. Furthermore, the policy indicator FSI has now a less favorable value.

The TIRI rating for all outcome targets is C suggesting a low likelihood of achieving outcome targets.

All these assessments above can be represented in a flow diagram like the one shown in Figure 2.4.2.4. of this report.

Conclusion

The EKKPT Motorway has been a project with marginally resilient internal structure which was from its planning phase vulnerable to the external context. The decision to structure it as a PPP with the remuneration scheme totally relying on user tolls added to the project's vulnerability.

The outcome of the renegotiations did not improve the project's outlook on any outcome target. TIRI ratings were able to predict potential likelihood of outcomes.

3.4 Using the BENEFIT Matching Framework Policy Guiding Tool – Results from cross-case analyses

Within Task 5.1, the analysis of the 11 cases was undertaken based on the TIRI rating system. In the Annex 1, similar Tables to Table 3.2.1 are presented for each project case. In the following sections we discuss the findings of these analyses, this is done for each typical stage in the project life-cycle.

3.4.1 Planning Phase enhancements

Based on the elements considered by the BENEFIT Matching Framework, feasible characteristics for a specific project were identified by each case owner. The BENEFIT Matching Framework in combination with BENEFIT TIRI Rating system helped to detect those elements which can be adopted for a project since its very beginning. Accordingly, projects could be set at their optimal potential conditions to likely deliver a project according to cost, time, traffic and revenue expectations. Table 3.2.3 reflects the maximum achievable values for GI, CSI, RSI, RAI, RRI and FSI for the planning and procurement stages. According to BENEFIT TIRI Rating system not all indicators can be set at their maximum. This is mainly because of the influence of exogenous vulnerabilities (e.g. values of InI and FEI). Further, other factors limiting performance have to do with typical constraints and circumstances, such as little knowledge and adoption of cooperation-based approaches to project delivery (e.g. PPP), reliance on traditional procurement and transport business provision (instead of transport business developing), and limitations of national regulations. As reported by the case owners, some endogenous vulnerabilities also constrained project performance.

According to the case owners, in general many of the governance characteristics reflected in GI could have been implemented in Private Co-Financed projects from the planning phase. This is also evident from GI high values in Table 3.2.3 (note that all indicators take values from the interval [0,1], with the exception of CSI whose interval of possible values goes from -0.33 to 1.00). For publicly funded cases this is somewhat limited (e.g. cases 5, 6, 11 in Table 3.2.3) due to the constraints mentioned before.

Table 3.2.3: Actual and maximum values achievable for GI, CSI, RSI, RAI, RRI and FSI for planning (1 year before tendering) according to the BENEFIT Matching Framework

	Project	Award year	GI	CSI	RSI	RAI	RRI	FSI
1	BNRR (M6 Toll)	1992	0.81	0.52	0.05	0.67	0.84	<0.50
2	Brabo 1	2008	0.81	0.65	0.17	0.67	0.64	0.72
3	BreBeMi	2009	0.63	0.51	0.15	0.56	0.83	0.74
4	C-16 Terrasa Manresa toll motorway	1987	0.81	0.76	0.20	<0.50	0.67	<0.50
5	Combiplan Nijverdal	2006	0.52	0.32	0.21	1.00	0.00	1.00
6	E-75, Section Horgos-Novi	2009	0.57	0.26	0.26	1.00	0.67	1.00
7	Elefsina Korinthos Patra Pyrgos Tsakona Motorway	2007	0.81	0.67	0.31	<0.50	0.77	<0.50
8	Herrentunnel Lübeck	1999	0.69	0.67	0.11	0.67	0.00	0.85
9	Lusoponte - Vasco Da Gama Bridge	1994	0.88	0.42	0.44	0.40	0.70	0.80
10	Reims tramway	2006	0.82	0.47	0.17	0.78	0.59	0.87
11	Warsaw's Metro II-2nd Line	2009	0.75	0.76	0.20	0.80	0.45	1.00

In comparison to GI characteristics, some characteristics of CSI and RSI were or are more limited to set in place. This is reflected in the values obtained in Table 3.2.3 (maximum values should be 1). Notably a key factor limiting CSI (maximum values should be CSI=1.00) is the capability of the contracting authority while RSI is limited by the potential of the transport mode (e.g. maximum value for road infrastructure is RSI = 0,400 but for urban transit RSI = 0.933)¹⁶. Conversely, most of the instruments reflected in RAI, RRI, and FSI can be implemented.

Within the GI arrangements proposed by the BENEFIT Matching Framework, the granting of incentives for performance and the collective investments estimation were commonly feasible actions to undertake in early stages in a project. As to CSI factors, the possibility of having more optimal project management and monitoring capacities by the public body was often suggested by the case owners. The adoption of innovative technologies was also considered for CSI. In relation to the indicator RSI, the control of demand by generating an exclusive use of the infrastructure and the integration of the project to the transport network were options considered. However, in few cases, the bundling of activities (revenue generated by different type of infrastructure combinations) was proposed. Consequently, little emphasis could be placed on enhancing the business model.

As to RAI characteristics in the projects, many of the projects considered rely on demand-based remuneration. Availability-based remuneration was the second used or recommended option. RRI thresholds also informed on the possibility to better implement projects. In addition to demand-based revenue instruments, other typical sources considered or recommended to be deployed correspond to advertisement, services (e.g. service stations) and real estate taxation. Before contract award, FSI elements considered as feasible in the projects consist of the adoption of low cost financing schemes for debt such as from EIB and other multilateral banks and national or international development banks in conjunction with public sector funds or

¹⁶ See chapter 4 of deliverable D3.2

government subsidies. This also implied, at some instances, the change of the original proportions of equity and debt.

3.4.2 Procurement enhancements

The actual values of indicators during procurement (numerators in Table 3.2.4) show that in the majority of the projects, project characteristics proposed by the BENEFIT Matching Framework for the planning failed to be implemented in full. Values of the indicators dropped between those proposed for the planning and those registered after the award of the projects. However and in general, a high degree of implementation was secured, taking into account the thresholds identified for each indicator. To a lesser degree this occurred to CSI and RSI characteristics. This is also evident from the differences in ratings obtained for the projects between originally anticipated and actual implementation conditions. By assuming optimal implementation of the endogenous elements of BENEFIT Matching Framework, the cases 1, 4, 9 and 10 can be upgraded to the immediate superior rating category (see respective cases in Annex 1: Case Applications) but in a limited fashion. This shows that the impact of the exogenous conditions (FEI and InI) remains highly unmanageable by the project management. Only in very limited cases an intensive combination of improvements resulted in an upgrading of the project.

Table 3.2.4: Actual (numerator) and optimal values (denominator) of GI, CSI, RSI, RAI, RRI and FSI for award time according to the BENEFIT Matching Framework and the data provided by the case owners

	Project	Award year	GI	CSI	RSI	RAI	RRI	FSI
1	BNRR (M6 Toll)	1992	<u>0.81</u> 0.81	<u>0.52</u> 0.52	<u>0.05</u> 0.05	<u>0.35</u> ↓ 0.67	<u>0.67</u> ↓ 0.84	<u>0.64</u> ↑ 0.64
2	Brabo 1	2008	<u>0.69</u> ↓ 0.69	<u>0.52</u> ↓ 0.52	<u>0.16</u> ↓ 0.17	<u>0.67</u> 0.67	<u>0.46</u> ↓ 0.64	<u>0.72</u> 0.72
3	BreBeMi	2009	<u>0.56</u> ↓ 0.56	<u>-0.09</u> ↓ 0.77	<u>0.12</u> ↓ 0.15	<u>0.33</u> ↓ 0.55	<u>0.67</u> ↓ 0.83	<u>0.74</u> ↓ 0.74
4	C-16 Terrasa Manresa toll motorway	1987	<u>0.56</u> ↓ 0.56	<u>0.51</u> ↓ 0.51	<u>0.20</u> 0.21	<u>0.33</u> 0.40	<u>0.67</u> 0.70	<u>0.41</u> 0.47
5	Combiplan Nijverdal	2006	<u>0.48</u> ↓ 0.48	<u>0.15</u> ↓ 0.15	<u>0.20</u> 0.20	<u>1.00</u> 1.00	<u>0.00</u> 0.00	<u>1.00</u> 1.00
6	E-75, Section Horgos-Novti	2009	<u>0.19</u> ↓ 0.19	<u>-0.05</u> ↓ 0.26	<u>0.26</u> 0.26	<u>1.00</u> 1.00	<u>0.67</u> 0.67	<u>1.00</u> 1.00
7	Elefsina Korinthos Patra Pyrgos Tsakona Motorway	2007	<u>0.63</u> ↓ 0.63	<u>0.51</u> ↓ 0.51	<u>0.26</u> ↓ 0.26	<u>0.40</u> ↓ 0.50	<u>0.67</u> ↓ 0.67	<u>>0.60</u> <u>>0.60</u>
8	Herrentunnel Lübeck	1999	<u>0.56</u> ↓ 0.56	<u>0.43</u> ↓ 0.67	<u>0.11</u> 0.11	<u>0.00</u> ↓ 0.67	<u>0.44</u> ↑ 0.00	<u>0.85</u> 0.85
9	Lusoponte - Vasco Da Gama Bridge	1994	<u>0.75</u> ↓ 0.75	<u>0.19</u> ↓ 0.42	<u>0.42</u> ↓ 0.44	<u>0.33</u> ↓ 0.40	<u>0.67</u> ↓ 0.70	<u>0.80</u> 0.80
10	Reims tramway	2006	<u>0.81</u> 0.81	<u>-0.02</u> ↓ 0.47	<u>0.16</u> ↓ 0.17	<u>0.92</u> ↑ 0.78	<u>0.39</u> ↓ 0.59	<u>0.87</u> 0.87
11	Warsaw's Metro II-2nd Line	2009	<u>0.63</u> 0.63	<u>0.76</u> 0.76	<u>0.19</u> ↓ 0.19	<u>0.87</u> ↑ 0.84	<u>0.45</u> ↓ 0.44	<u>1.00</u> 1.00

Commonly, across the projects considered, case owners suggested the feasibility to enforce incentives for performance, the involvement of a plural number of bidders, the collective estimation of investments, and the allocation of risk or the sharing thereof by the party(ies) who has(ve) experience in coping with the specific type of risk as proposed characteristics of governance and which are reflected in GI. This would include the involvement or management of third parties such as consultancy firms with experience.

Suggested improvements for award stage for CSI considered as feasible by case owners entailed the increasing of project, stakeholders and monitoring management capabilities of the contracting authority.

In relation to the indicator RSI, the integration of the project to the transport network and the control of service demand by generating and exclusive use of the infrastructure were options considered by some case owners as feasible for the projects for award time.

Overall, changes in RAI and RRI indicators can be achieved by resourcing projects by means of allocating other non-transport revenue sources to the contractor. Typical optional sources of revenue recommended to be deployed correspond to advertisement, services, and real estate taxation. For FSI, it is encouraged the adoption or strengthening of low cost financing schemes for debt such as from EIB and other multilateral banks and national or international development banks in conjunction with public sector funds or government subsidies.

3.4.3 Implementation Phase enhancements

During the implementation phase, both exogenous and endogenous indicators may vary over time. More specifically:

- The implementation context (FEI and InI) may become more or less favourable;
- Contractual terms, especially with respect to risk allocation may be honoured to a greater or lesser extent (GI, CSI, RSI);
- Coverage and risks related to the income and revenues may vary (RAI, RRI);
- Financing sources and respective cost of capital may vary (FSI)

In this section the above potential developments are verified by using the BENEFIT Matching Framework in combination with BENEFIT TIRI Rating system.

Table 3.2.5 shows a number of changes of the values of indicators. In terms of variations of ratings over time, most of the projects were downgraded or kept the award rating (see respective cases in Annex 1: Case Applications). Although variations might be explained by factors mentioned above, specific drivers of change were identified by the case owners. The reduction of capacity (e.g. to project managing and monitoring) of contractors and operators (element of CSI) and the absence of a competitive environment to incentive cost-effective delivery and engagement optimal technical competence, experience and decision making (elements considered by GI) are typical problems in projects in which construction is commissioned to a private party but operation is assigned to public bodies. In two instances, namely in cases 3 and 5, it was mentioned that project governance changes during implementation were hampered by the impossibility of modifying the organizational structure in the project. Reallocation of risks was highly disregarded in the projects. Exceptionally project case 9 managed to increase many indicators during implementation but this did not result in improved chances of expected outcomes as reflected in the respective ratings.

Table 3.2.5: Actual (numerator) and optimal values (denominator) of GI, CSI, RSI, RAI, RRI and FSI for implementation stages according to the BENEFIT Matching Framework and the data provided by the case owners

	Project	Award year	GI	CSI	RSI	RAI	RRI	FSI
1	BNRR (M6 Toll)	1992	<u>0.81</u> 0.81	<u>0.61</u> ↑ 0.61	<u>0.05</u> 0.05	<u>0.33</u> ↓ 0.67	<u>0.67</u> ↑ 0.84	<u>0.30</u> ↓ 0.30
2	Brabo 1	2008	<u>0.69</u> ↓ 0.69	<u>0.21</u> ↓ 0.21	<u>0.14</u> ↓ 0.17	<u>0.67</u> 0.67	<u>0.46</u> 0.64	<u>0.72</u> 0.72
3	BreBeMi	2009	<u>0.56</u> 0.56	<u>0.00</u> ↑ 0.00	<u>0.12</u> 0.15	<u>0.33</u> 0.47	<u>0.67</u> 0.77	<u>0.74</u> 0.74
4	C-16 Terrasa Manresa toll motorway	1987	<u>0.56</u> ↓ 0.56	<u>0.20</u> ↓ 0.20	<u>0.20</u> 0.21	<u>0.33</u> 0.40	<u>0.67</u> 0.70	<u>0.30</u> ↓ 0.47
5	Combiplan Nijverdal	2006	<u>0.48</u> 0.50	<u>0.25</u> ↑ 0.31	<u>0.20</u> 0.21	<u>1.00</u> 1.00	<u>0.00</u> 0.00	<u>1.00</u> 1.00
6	E-75, Section Horgos-Novi	2009	<u>0.19</u> ↓ 0.19	<u>0.22</u> ↑ 0.33	<u>0.26</u> 0.26	<u>1.00</u> 1.00	<u>0.67</u> 0.67	<u>1.00</u> 1.00
7	Elefsina Korinthos Patra Pyrgos Tsakona Motorway	2007	<u>0.63</u> 0.63	<u>-0.02</u> ↓ -0.02	<u>0.24</u> ↓ 0.24	<u>0.40</u> 0.40	<u>0.67</u> 0.67	<u>0.79</u> 0.79
8	Herrentunnel Lübeck	1999	<u>0.56</u> ↓ 0.56	<u>0.33</u> ↓ 0.67	<u>0.11</u> 0.11	<u>0.00</u> 0.67	<u>0.27</u> ↓ 0.00	<u>0.85</u> 0.85
9	Lusoponte - Vasco Da Gama Bridge	1994	<u>0.88</u> ↑ 0.88	<u>0.58</u> ↑ 0.58	<u>0.42</u> ↑ 0.44	<u>0.43</u> ↑ 0.50	<u>0.66</u> ↓ 0.69	<u>0.80</u> 0.80
10	Reims tramway	2006	<u>0.87</u> ↑ 0.87	<u>0.00</u> ↑ 0.30	<u>0.18</u> ↑ 0.20	<u>0.85</u> ↑ 0.78	<u>0.39</u> 0.59	<u>0.87</u> 0.87
11	Warsaw's Metro II-2nd Line	2009	<u>0.63</u> 0.63	<u>0.69</u> ↓ 0.69	<u>0.18</u> ↓ 0.19	<u>0.87</u> 0.84	<u>0.45</u> 0.44	<u>1.00</u> 1.00

The reliance on demand-based approaches to resource remuneration and revenue, and the unexpected demand of the infrastructure are frequent situations mentioned as occurring. In addition, addressing the issue of public acceptance of the project, the possibility of introducing more public support for funding (e.g. subsidies) the project (element of FSI), the allocation of other non-transport business to the operator, and optimizing cost coverage for revenue (elements of RSI, RAI and RRI indicators) are possibilities commonly neglected in the projects but suggested by case owners. Contract renegotiations were invoked in places to improve project performance.

Incentives for performance (from GI), the adoption of innovation technologies (from CSI), the introduction of project management assistance (of CSI), reducing toll rates to increase demand (of RAI), the implementation of non-transport sources of revenues such as advertisement and subsidies (of RAI) appeared to be flexible instruments to set in place at any stage of the project. These options were also considered during implementation of the projects. In terms of funding schemes (reflected in FSI) to be adopted, not many options were available since most of the projects deployed either low cost financing schemes for debt or public sector funds or government subsidies.

3.4.4 Renegotiations

Among the cases analysed, the cases 9, 10, and 11 experienced renegotiations. Using the BENEFIT Matching Framework indicators values for renegotiations, insignificant changes of indicators values were obtained (see respective cases in Annex 1: Case Applications). Typically, renegotiations were about the introduction of measures related to RAI and FSI, such as the use of subsidies and reduction of toll fares (case 9), the increase of fares and modification of the services scope (case 10), and the extension of the time to delivery of the contract (case 11). In the set of cases analysed, during renegotiations, the introduction of potential mechanisms proposed by the BENEFIT Matching Framework to improve performance is limited. For instance, the granting of incentives for performance (of GI), the reallocation of risks (of GI), and the allocation of other sources of revenue to the contractor (of RSI) were not seen during renegotiations in the project analysed.

4 Conclusions

4.1 General considerations

Conclusions with respect to the BENEFIT Matching Framework and its applicability are presented in the following section. In the process of developing the Transport Infrastructure Resilience Indicator and its underlying rating system, key findings with respect to infrastructure development and delivery were identified and obtained from previous analysis streams within BENEFIT research project. These are presented separately. Finally, the chapter ends with recommendations for future research.

The BENEFIT Matching Framework reflects the system of transport infrastructure delivery performance, comprising both construction and operation, through a number of indicators.

In essence, the key indicators to be improved are those describing the business model which needs to be determined at the front end of the project, while the indicators that may be manipulated throughout the life cycle of the project, i.e. the indicators related to the Funding and Financing Scheme typologies, are more appropriately called here policy tools.

4.2 Lessons learnt from the case analyses

From its original concept¹⁷, the emphasis of the BENEFIT Matching Framework has been on modelling the implementation system of transport infrastructure. Under the proposed approach, the BENEFIT Matching Framework considers as input to its system all decisions taken before project award, while its outputs correspond to the level of achievement of pre-specified goals of various types of project outcomes (e.g. transport-related, project management, related, social, economic, environmental, institutional or other). In its final working version, the BENEFIT Matching Framework focused on four key outcomes:

- Two pertaining to project management criteria: cost- and time-to-(construction) completion, and
- Two pertaining to transport business model criteria: actual vs forecast traffic and revenues.

¹⁷ BENEFIT proposal to H2020 call H2020 MG 9.3

The BENEFIT Matching Framework renders information on the possibilities of the procurement phase to be improved despite limiting decisions made or inappropriate regulations among others. Open options for enhanced project governance reflected in GI and proposed by the BENEFIT Matching Framework include the collective estimation of investments, the involvement of many bidders, the integration of design and construction, the allocation of rising cost risk to the contractor, the enforcement of penalties if completion dates are not met, the setting of incentives for performance, the setting for the contracting part the option to terminate the agreement prematurely without cause, and the setting of the flexibility of the contract by clauses that specify updating of service terms and enabling price changes.

In terms of cost savings in the investments, the BENEFIT Matching Framework also suggests a number of actions to set in place to increase the chance of expected project outcomes occurring (reflected in CSI). These focus on the allocation of risk or the sharing thereof by the party(ies) who has(ve) experience in coping with the specific type of risk. Types of risks considered are construction, operation, demand risks. Project management, monitoring and stakeholders management is considered by the BENEFIT Matching Framework provided that their allocation to an experienced parties, including third parties. The introduction of technological innovations is an opportunity for transport projects and is one of the elements of the BENEFIT Matching Framework.

Prioritising new transport projects in the greenfield, evaluating the potential of providing either transport business development or other kind of business rather than transport business provision, the control of service demand by generating an exclusive use of the infrastructure, the integration of the project to the transport network, and the demand risk allocation on the party who has managed this risk in equivalent projects; were the alternatives investigated in BENEFIT project for securing revenue to the transport projects, and were described by the RSI.

In terms of project remuneration attractiveness (RAI) and revenue robustness (RRI) the BENEFIT Matching Framework provides information on options to a project. This is reflected on the suggested actions such as the adoption or strengthening of revenue schemes towards subventions, value capture, earmarking, the adoption or strengthening of pricing schemes that capture the internalization of external environmental and infrastructure (wear & tear) costs, the adoption or strengthening of pricing schemes that capture scarcity (airports and ports) or congestion costs (roads and railways), the adoption or strengthening of pricing schemes that capture the effect of competitive infrastructure.

The adoption or strengthening of low cost financing schemes for equity, debt and public sector financing contributions are also part of the BENEFIT Matching Framework.

In section 3.4 and Annex 1, evidence on the use and usefulness of the BENEFIT Matching Framework has been provided. More specifically, evidence was gathered showing the extent to which the BENEFIT Matching Framework can be used to inform decisions at different stages and moments in a transport project.

The BENEFIT Matching Framework proven to be useful in the planning phase of transport projects. Although some decisions in a given project have been made, this stage is yet open to a number of alternative decisions of procurement options, implementation conditions, as well as funding and financing schemes. At this stage and to likely deliver a project according to cost, time, and traffic and revenue expectations, projects could be set at their optimal potential conditions provided existing constraints. Many, if not all, the factors considered by the BENEFIT Matching Framework were shown to be feasible of being implemented in the 11 project cases analysed for the planning stage. This irrespectively of each country's level of maturity of the different approaches of project delivery. This is further reflected in the fact that some projects

which started in the 1990ies incorporated many of the factors proposed by the BENEFIT Matching Framework.

The BENEFIT Matching Framework was useful to identify the most effective actions to set in place during procurement and implementation phases. This was achieved using the elements provided by the BENEFIT Matching Framework and the use of project-specific information reported by the case analysts. Constraints for the implementation of the open options to a project were considered in the analysis of the projects during this phase. Notably, a number of factors are hampering an optimal implementation of all the elements integrated by the BENEFIT Matching Framework. Typically the hampering factors are the exogenous vulnerabilities influence (e.g. values of InI and FEI), the little knowledge and adoption of cooperation based approaches to project delivery (e.g. PPP), reliance on traditional procurement and transport business provision (instead of transport business developing), and inappropriate country regulations.

Notably, incentives for performance, the adoption of innovation technologies, the introduction of project management assistance, the implementation of non-transport sources of revenues such as advertisement and subsidies appeared to be flexible instruments to set in place at any stage of the project. These options were also considered during implementation of the projects.

In the set of cases analysed, during renegotiations, the introduction of potential mechanisms proposed by the BENEFIT Matching Framework to improve performance is limited. For instance, the granting of incentives for performance, the reallocation of risks, and the allocation of other sources of revenue to the contractor were not seen during renegotiations in the project analysed.

Finally, and since life-cycle evaluations were performed including assumed future scenarios on the 11 cases, it was potentially confirmed that the BENEFIT Matching Framework might be employed as a monitoring instrument. The BENEFIT TIRI rating may assist in predicting project performance and adopting measures during the project life in order to minimize adverse effects of the implementation context or exploit opportunities.

Another interesting finding is that the impact of the modification of the endogenous elements of the BENEFIT Matching Framework remains somewhat limited. For instance, cases 1, 4, 9 and 10 are the only ones, within the cases analysed, in which projects were upgraded to the immediate superior rating category through such modifications. This shows that the impact of the exogenous conditions (FEI and InI) remains dominant and highly unmanageable by the project management

4.3 Recommendations for Future Research

The limitations of the BENEFIT Matching Framework that have been identified previously constitute the basis for future research.

Clearly, the BENEFIT Matching Framework provided information on which project characteristics can be influenced to increase the chance of enhanced project outcomes occurring. The BENEFIT Matching Framework can desirably be more optimized by including more detailed actions to inform practitioners. For instance, practitioners would like to know which and how specific technology innovations can be introduced into a project, or which most effective non-transport revenues can be set in place. This might be a subject for further research.

Doubts about how elements in the BENEFIT Matching Framework effectively influence traffic project outcomes have been mentioned by case analysts. Further research can provide more evidence on the actual influence of the factors considered in the BENEFIT Matching Framework on traffic outcomes.

The revenue robustness indicator deserves further optimization. Difficulties in its understanding and use should be addressed as mentioned by some case analysts.

Further investigation on the issues of public acceptability in transport projects is required. Although in the BENEFIT research project a set of sub-indicators were analysed measuring public acceptance none of the analysed ones provided relatively sufficient explanation of the outcomes considered.



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Annex 1: Case Applications

In this annex the results of the assessments made for 11 case projects reported in section 3.1. are presented. The assessments made are fully illustrated in section 3.3 by the analysis example of the The Elefsina Korinthos Patra Pyrgos Tsakona Motorway project.



Case 1: BNRR (M6 Toll)

MF Indicators	Exogenous factors		Project Planning-Procurement			Project Construction-Operati			Cost Overrun		Time Overrun		Actual vs Forecasted Traffic		Actual vs Forecasted Revenue	
	Inl	FEI	GI	CSI	RSI	RAI	RRI	FSI	Value	Rating	Value	Rating	Value	Rating	Value	Rating
Snapshot Planning - 1 year before tender	~0,82	~0,635	0.813	0.522	0.045	0.673	0.837	<0,500	-	B _{EN} ⁺	-	A	-	B _{EN} ⁺	-	B _{EN} ⁻
Snapshot Award	0.82	0.635	0.813	0.522	0.045	0.347	0.673	0.640	-	B _{EN} ⁻	-	A	-	B _{EN} ⁺	-	B _{EN} ⁻
Snapshot Award - Improved	0.82	0.635	0.813	0.522	0.045	0.673	0.837	0.640	-	B _{EN} ⁺	-	A	-	B _{EN} ⁺	-	B _{EN} ⁻
Snapshot Construction completion - Operation	0.81	0.665	0.813	0.172	0.045	0.347	0.673	0.640	0.00	B _{EN}	0.00	A	-1.00	B _{EN} ⁺	0.00	B _{EX} ⁻
Snapshot Construction completion - Operation - Improved	0.81	0.665	0.813	0.172	0.045	0.673	0.837	0.640	-	B _{EN}	-	A	-	B _{EN} ⁺	-	B _{EX} ⁻
Snapshot before crisis	0.80	0.742	0.813	0.611	0.045	0.333	0.667	0.300				-1.00	B _{EN} ⁺	0.00	B _{EX} ⁻	
Snapshot before crisis - Improved	0.80	0.742	0.813	0.611	0.045	0.673	0.837	0.300				-	B _{EN} ⁺	-	B _{EX} ⁻	
Snapshot Crisis peak	0.79	0.600	0.813	0.611	0.045	0.333	0.667	0.300				-1.00	B _{EN} ⁺	0.00	B _{EX} ⁻	
Snapshot Crisis peak - Improved	0.79	0.600	0.813	0.611	0.045	0.673	0.837	0.300				-	B _{EN} ⁺	-	B _{EX} ⁻	
Snapshot last reported	0.79	0.600	0.813	0.611	0.045	0.333	0.667	0.300				-1.00	B _{EN} ⁺	0.00	B _{EX} ⁻	
Snapshot last reported - Improved	0.79	0.600	0.813	0.611	0.045	0.673	0.837	0.300				-	B _{EN} ⁺	-	B _{EX} ⁻	
Summarized actions of improvement considered (in bold those most effective and applied for improved scenarios according the algorithms of the BENEFIT MF)			GI:Incentives for performance			RAI/RRI: Availability-based remuneration/revenue										
			GI:Penalty for time completion			RAI: Public subventions										
			RSI: Rising demand of the infrastructure			RAI/RRI: Usage payment reduction via reducing toll rate										

Case 2: Brabo 1

MF Indicators	Exogenous factors		Project Planning-Procurement			Project Construction-Operation			Cost Overrun		Time Overrun		Actual vs Forecasted Traffic		Actual vs Forecasted	
	Inl	FEI	GI	CSI	RSI	RAI	RRI	FSI	Value	Rating	Value	Rating	Value	Rating	Value	Rating
Snapshot Planning - 1 year before tender	0.76	0.69	0.813	0.654	0.167	0.667	0.644	0.719	-	B _{EN} ⁻	-	B _{EN} ⁻	-	B _{EN} ⁻	-	B _{EN} ⁺
Snapshot Award	0.74	0.69	0.688	0.518	0.160	0.667	0.462	0.719	-	B _{EN} ⁻	-	B _{EN} ⁻	-	B _{EN} ⁻	-	B _{EN} ⁺
Snapshot Award - Improved	0.74	0.69	0.688	0.518	0.167	0.667	0.644	0.719	-	B _{EN} ⁻	-	B _{EN} ⁻	-	B _{EN} ⁻	-	B _{EN} ⁺
Snapshot Last report	0.77	0.60	0.688	0.213	0.142	0.667	0.462	0.719				0.00	B _{EN} ⁻	0.00	B _{EN} ⁺	
Snapshot Last report - Improved	0.77	0.60	0.688	0.213	0.167	0.667	0.644	0.719				-	B _{EN} ⁻	-	B _{EN} ⁺	
Summarized actions of improvement considered (in bold those most effective and applied for improved scenarios according the algorithms of the BENEFIT MF)			GI: Collective estimation of investments			RRI: Attracting non-transport revenues (such as advertisements)										
			GI: Involvement a plural number of bidders			RAI: Public subventions										
			GI: Incentives for performance			RAI: Earmarking										
			GI: Sharing revenue risk			FSI: Adoption or strengthening of low cost financing schemes for equity										
			CSI: More optimal selection of the contractor			FSI: Adoption or strengthening of low cost financing schemes for debt										
			CSI: Monitoring by the public authority													
			CSI: Project management by the public authority													
			CSI: Training of the public authority													
			RSI: Increased control of demand via integration into transp. net													

Case 3: BreBeMi

MF Indicators	Exogenous factors		Project Planning-Procurement			Project Construction-Operation			Cost Overrun		Time Overrun		Actual vs Forecasted Traffic		Actual vs Forecasted	
	InI	FEI	GI	CSI	RSI	RAI	RRI	FSI	Value	Rating	Value	Rating	Value	Rating	Value	Rating
Snapshot Planning - 1 year before tender	0.60	0.53	0.63	0.50	0.15	0.55	0.83	0.74	-	BEX-	-	BEX-	-	BEX	-	BEX+
Snapshot Award	0.60	0.49	0.56	-0.090	0.124	0.333	0.667	0.735	-	BEX-	-	C+	-	C+	-	BEX-/C+
Snapshot Award - Improved	0.60	0.49	0.56	0.08	0.15	0.55	0.83	0.74	-	BEX-	-	C+	-	C+/BEX-	-	BEX-
Snapshot last reported	0.60	0.45	0.56	0.000	0.124	0.333	0.667	0.735					-1.00	C+	0.00	BEX-/C+
Snapshot last reported - Improved	0.60	0.45	0.56	0.000	0.154	0.467	0.767	0.741					-	C+	-	BEX-/C+
Summarized actions of improvement considered (in bold those most effective and applied for improved scenarios according the algorithms of the BENEFIT MF)			GI:Collective estimation of investments			RAI/RRI:Optimizing toll rates										
			CSI:Monitoring by the public authority			RRI: Optimizing revenue risk allocation										
			CSI:Enhanced construction and operation risk allocation			RAI:Use of public subventions										
			CSI:Stakeholders management by public authority			RAI/RRI: Extension of the concession										
			CSI:Introduction of technology innovations			FSI: Adoption of a low cost financing scheme for debt										
			RSI:Physical network integration			FSI: Adoption or strengthening of a low cost financing scheme via public funds or government subsidies										
			RSI:Rising demand of the infrastructure													
		RSI:Optimizing revenue risk allocation														

Case 4: C-16 Terrasa Manresa toll motorway

MF Indicators	Exogenous factors		Project Planning-Procurement			Project Construction-Operation			Cost Overrun		Time Overrun		Actual vs Forecasted Traffic		Actual vs Forecasted Revenue	
	InI	FEI	GI	CSI	RSI	RAI	RRI	FSI	Value	Rating	Value	Rating	Value	Rating	Value	Rating
Snapshot Planning - 1 year before tender	<0,70	<0,637	0.813	0.761	0.201	<0,500	0.667	<0,500	-	A	-	A	-	A-	-	A-
Snapshot Award	<0,70	<0,637	0.563	0.511	0.201	0.333	0.667	0.406	-	A	-	B _{EN} ⁻	-	A-	-	A-
Snapshot Award - Improved	<0,70	<0,637	0.563	0.511	0.206	0.400	0.700	0.466	-	A	-	A	-	A-	-	A-
Snapshot Construction completion - Operation	<0,70	<0,637	0.563	0.133	0.201	0.333	0.667	0.300	-1	B _{EN} ⁻	0	A	-1	B _{EN} ⁻	0	B _{EN} ⁻
Snapshot last reported	0.69	0.467	0.563	0.200	0.201	0.333	0.667	0.300					-1	C+	0	B _{EN} ⁻
Snapshot last reported - Improved	0.69	0.467	0.563	0.200	0.206	0.400	0.700	0.466					-	C+	-	B _{EN} ⁻
Summarized actions of improvement considered (in bold those most effective and applied for improved scenarios according the algorithms of the BENEFIT MF)			GI:Collective estimation of investments			RAI/RRI: Allocation of non-transport revenue sources to contractor										
			GI:Involvement a plural number of bidders			RAI: Use of public subventions										
			GI:Optimizing revenue risk allocation			FSI: Adoption of a low cost financing scheme for equity										
			CSI:Introducing technology innovations			FSI: Adoption of a low cost financing scheme via public funds or government subsidies										
			CSI: Enhanced project management by public party													
			RSI: Allocation of non-transport revenue sources to contractor													

Case 5: Combiplan Nijverdal

MF Indicators	Exogenous factors		Project Planning-Procurement			Project Construction-Operation			Cost Overrun		Time Overrun		Actual vs Forecasted Traffic		Actual vs Forecasted Revenue		
	Inl	FEI	GI	CSI	RSI	RAI	RRI	FSI	Value	Rating	Value	Rating	Value	Rating	Value	Rating	
Snapshot Planning - 1 year before tender	0.83	0.710	0.521	0.315	0.202	1.000	0.000	1.000	-	B _{EN} ⁻	-	A	-	B _{EN} ⁺	-	B _{EN} ⁺	
Snapshot Award	0.82	0.760	0.479	0.148	0.202	1.000	0.000	1.000	-	B _{EN} ⁻	-	B _{EN} ⁻	-	B _{EN} ⁻	-	B _{EN} ⁺	
Snapshot Award - Improved	0.82	0.760	0.479	0.148	0.202	1.000	0.000	1.000	-	B _{EN} ⁻	-	B _{EN} ⁻	-	B _{EN} ⁻	-	B _{EN} ⁺	
Snapshot Crisis peak	0.82	0.775	0.479	0.137	0.202	1.000	0.000	1.000	-	B _{EN} ⁻	-	B _{EN} ⁻	-	B _{EN} ⁻	-	B _{EN} ⁺	
Snapshot Crisis peak - improved	0.82	0.775	0.479	0.137	0.202	1.000	0.000	1.000	-	B _{EN} ⁻	-	B _{EN} ⁻	-	B _{EN} ⁻	-	B _{EN} ⁺	
Snapshot Construction completion	0.83	0.660	0.479	0.245	0.202	1.000	0.000	1.000	-1.00	B _{EN} ⁻	-1.00	B _{EN} ⁻	-1.00	B _{EN} ⁺	0.00	B _{EN} ⁺	
Snapshot Construction completion- Improved	0.83	0.660	0.479	0.245	0.202	1.000	0.000	1.000	-	B _{EN} ⁻	-	B _{EN} ⁻	-	B _{EN} ⁺	-	B _{EN} ⁺	
Snapshot Last report	0.83	0.650	0.500	0.313	0.202	0.833	0.000	1.000					-	B _{EN} ⁺	-	B _{EN} ⁺	
Summarized actions of improvement considered (in bold those most effective and applied for improved scenarios according the algorithms of the BENEFIT MF)			GI:Collective estimation of investments			RAI/RRI: Allocation of non-transport revenue sources to contractor											
			GI:Involvement a plural number of bidders														
			GI:Incentives for performance														
			GI: Disincentives (contractor party to bear rising costs and penalties for time completion)														
			GI: Termination clause														
			CSI:Introducing technology innovations														
			RSI: Allocation of non-transport revenue sources to contractor														

Case 6: E-75, Section Horgos-Novi

MF Indicators	Exogenous factors		Project Planning-Procurement			Project Construction-Operation			Cost Overrun		Time Overrun		Actual vs Forecasted Traffic		Actual vs Forecasted Revenue	
	Inl	FEI	GI	CSI	RSI	RAI	RRI	FSI	Value	Rating	Value	Rating	Value	Rating	Value	Rating
Snapshot Planning - 1 year before tender	0.45	0.550	0.563	0.257	0.257	1.000	0.667	1.000	-	C+	-	C+	-	C+	-	B _{EX+}
Snapshot Award 2009	0.47	0.483	0.188	-0.053	0.257	1.000	0.667	1.000	-	C	-	C	-	C+	-	B _{EX+}
Snapshot Award - Improved	0.47	0.483	0.188	0.257	0.257	1.000	0.667	1.000	-	C	-	C	-	C+	-	B _{EX+}
Snapshot Construction completion - Operation 2011	0.48	0.517	0.188	-0.030	0.257	1.000	0.667	1.000	-1	C	-1	C	-1	C+	0	B _{EX+}
Snapshot Construction completion - Operation - Improved	0.48	0.517	0.188	0.340	0.257	1.000	0.667	1.000	-	C	-	C	-	C+	-	B _{EX+}
Snapshot last reported 2014	0.48	0.417	0.188	0.222	0.257	1.000	0.667	1.000					-1	C	0	C+
Snapshot last reported - Improved	0.48	0.417	0.188	0.333	0.257	1.000	0.667	1.000					-	C+	-	B _{EX+}
Summarized actions of improvement considered (in bold those most effective and applied for improved scenarios according the algorithms of the BENEFIT MF)			GI:Incentives for performance													
			GI:Integration design and construction													
			GI:Involvement a plural number of bidders													
			GI:Optimizing revenue risk allocation													
			GI:Disincentives via penalties for time completion													
			CSI:Introducing technology innovations													
			CSI:Optimizing construction risk allocation via enhanced contractor selection													
			CSI: Enhanced project management and monitoring by public party via consultancy by a third party													
CSI: Enhanced stakeholders management and monitoring by public party																
RSI: Allocation of non-transport revenue sources to contractor via advertisements and real estate taxation																

Case 7: Elefsina Korinthos Patra Pyrgos Tsakona Motorway

MF Indicators	Exogenous factors		Project Planning-Procurement			Project Construction-Operation			Cost Overrun		Time Overrun		Actual vs Forecasted Traffic		Actual vs Forecasted Revenue	
	InI	FEI	GI	CSI	RSI	RAI	RRI	FSI	Value	Rating	Value	Rating	Value	Rating	Value	Rating
Snapshot 0-1: Planning (2001) 1st approach	0,60	0,543	0,813	0,673	0,312	0,467	0,733	<0,500	-	C+	-	B _{EX} ⁻	-	C+	-	B _{EX} ⁻
Snapshot 0-2: Planning (2001) 2nd approach	0,60	0,543	0,813	0,673	0,321	0,533	0,767	>0,600	-	B _{EX} ⁻	-	B _{EX} ⁻	-	B _{EX} ⁻	-	B _{EX} ⁻
Snapshot 1: Award (2007)	0,61	0,558	0,625	0,514	0,255	0,400	0,667	>0,600	-	B _{EX} ⁻	-	B _{EX} ⁻	-	B _{EX} ⁻	-	B _{EX} ⁻
Snapshot 1-0: Award (2007)-Improved	0,61	0,558	0,625	0,514	0,255	0,500	0,667	>0,600	-	B _{EX} ⁻	-	B _{EX} ⁻	-	B _{EX} ⁻	-	B _{EX} ⁺
Snapshot 1-1: Financial Close (2008)	0,60	0,558	0,625	0,514	0,255	0,400	0,667	0,796	-	B _{EX} ⁻	-	B _{EX} ⁻	-	B _{EX} ⁻	-	B _{EX} ⁻
Snapshot 1-2: Financial Close (2008)-Improved	0,60	0,558	0,625	0,514	0,255	0,500	0,667	0,796	-	B _{EX} ⁻	-	B _{EX} ⁻	-	B _{EX} ⁻	-	B _{EX} ⁺
Snapshot 2: Pause (2010)	0,58	0,458	0,625	-0,021	0,244	0,400	0,667	0,796	-1	C+	-1	C+	-2	C+	-1	C+
Snapshot 2-1: Pause (2010)-Improved	0,58	0,458	0,625	-0,021	0,244	0,400	0,667	0,796	-1	B _{EX} ⁻	-1	C+	-2	C+	-1	B _{EX} ⁻
Snapshot 3: Re-start (2013)-Improved	0,57	0,308	0,500	-0,021	0,222	0,400	0,667	0,644	-1	C+	-1	C+	-2	C+	0	C+
Summarized actions of improvement considered (in bold those most effective and applied for improved scenarios according the algorithms of the BENEFIT MF)			GI:Incentives for performance			RAI/RRI: Allocation of non-transport revenue sources to contractor via advertisements and real state taxation										
			GI:Termination clauses			FSI: Use of public subsidies										
			CSI:Optimizing construction risk allocation via enhanced contractor selection													
			CSI: Enhanced project management and monitoring by public party via consultancy by a third party													
			RSI: Control of service demand by generating an exclusive use of the infrastructure													
			RSI: Allocation of non-transport revenue sources to contractor via advertisements and real estate taxation													

Case 8: Herrentunnel Lübeck

MF Indicators	Exogenous factors		Project Planning-Procurement			Project Construction-Operation			Cost Overrun		Time Overrun		Actual vs Forecasted Traffic		Actual vs Forecasted Revenue	
	InI	FEI	GI	CSI	RSI	RAI	RRI	FSI	Value	Rating	Value	Rating	Value	Rating	Value	Rating
Snapshot Planning - 1 year before tender	0.800	<0,608	0.688	0.672	0.107	0.667	0.000	0.848	-	B _{EN} ⁻	-	C+	-	C+	-	C+
Snapshot Award 1999	0.81	0.608	0.563	0.428	0.107	0.000	0.444	0.848	0	B _{EN} ⁻	0	C+	-	C+	-	C+
Snapshot Award - Improved	0.810	0.608	0.563	0.672	0.107	0.667	0.000	0.848	-	B _{EN} ⁻	-	C+	-	C+	-	C+
Snapshot Construction completion - Operation 2005	0.79	0.635	0.563	0.528	0.107	0.000	0.444	0.848	0	B _{EN} ⁻	0	C+	0	C+	0	C+
Snapshot Construction completion - Operation - Improved	0.79	0.635	0.563	0.806	0.107	0.667	0.000	0.848	-	B _{EN} ⁻	-	C+	-	C+	-	C+
Snapshot last reported	0.80	0.717	0.563	0.333	0.107	0.000	0.273	0.848					-2	C+	-1	C+
Snapshot last reported - Improved	0.80	0.717	0.563	0.667	0.107	0.667	0.000	0.848					-	C+	-	C+
Summarized actions of improvement considered (in bold those most effective and applied for improved scenarios according the algorithms of the BENEFIT MF)			CSI: Enhanced project management and monitoring by public party via training			RAI/RRI: Introducing shadow toll										
			CSI: Enhanced stakeholder management by public party			RAI: Introducing availability based remuneration										
			Adressing public acceptance			FSI: Use of public subsidies										
			RSI: Introducing shadow toll													
			RSI: Optimized revenue risk allocation													

Case 9: Lusoponte - Vasco Da Gama Bridge

MF Indicators	Exogenous factors		Project Planning-Procurement			Project Construction-Operation			Cost Overrun		Time Overrun		Actual vs Forecasted Traffic		Actual vs Forecasted Revenue	
	Inl	FEI	GI	CSI	RSI	RAI	RRI	FSI	Value	Rating	Value	Rating	Value	Rating	Value	Rating
Snapshot Planning - 1 year before tender	<0,66	<0,540	0.875	0.420	0.442	0.400	0.700	0.796	-	B _{EX+}	-	B _{EX+}	-	B _{EX+}	-	B _{EX+}
Snapshot Award 1994	<0,66	<0,540	0.750	0.194	0.416	0.333	0.667	0.796	0	B _{EX+}	0	B _{EX+}	0	C+	0	C+
Snapshot Award - Improved	<0,66	<0,540	0.750	0.420	0.442	0.400	0.700	0.796	-	B _{EX+}	-	B _{EX+}	-	B _{EX+}	-	A
Snapshot renegotiation (1999)	0.660	<0,540	0.750	0.194	0.416	0.333	0.667	0.796		B _{EX-}	-	B _{EX+}	-	C+	-	C+
Snapshot renegotiation - Improved	0.66	<0,540	0.875	0.420	0.442	0.500	0.689	0.796	-	B _{EX+}	-	B _{EX+}	-	B _{EX+}	-	A
Snapshot last reported 2013	0.70	0.442	0.875	0.582	0.416	0.433	0.659	0.796	0	B _{EX-}	0	C+	0	C+	0	C+
Snapshot last reported - Improved	0.70	0.442	0.875	0.582	0.442	0.500	0.689	0.796					-	C+	-	C+
Snapshot future scenario	0.70	0.442	0.875	0.582	0.416	0.433	0.659	0.796					-1	C+	-1	C+
Snapshot future scenario - Improved	0.70	0.442	0.875	0.582	0.442	0.500	0.689	0.796					-	C+	-	C+
Summarized actions of improvement considered (in bold those most effective and applied for improved scenarios according the algorithms of the BENEFIT MF)			GI: Incentives for performance			RAI/RRI: Introducing availability based remuneration/revenue										
			GI: Optimized revenue risk allocation			RAI: Allocating other non-transport sources of revenue to the contractor such as services (e.g. service stations) and real state taxation										
			CSI: Introducing technology innovations			RAI: Use of public subventions										
			CSI: Increased project management and monitoring by public party			Adressing the issue of public acceptability										
			RSI: Allocating other non-transport sources of revenue to the contractor such as services (e.g. service stations) and real estate taxation													

Case 10: Reims tramway

MF Indicators	Exogenous factors		Project Planning-Procurement			Project Construction-Operation			Cost Overrun		Time Overrun		Actual vs Forecasted Traffic		Actual vs Forecasted Revenue	
	InI	FEI	GI	CSI	RSI	RAI	RRI	FSI	Value	Rating	Value	Rating	Value	Rating	Value	Rating
Snapshot Planning - 1 year before tender	0.74	0.650	0.813	0.467	0.173	0.780	0.592	0.868	-	A-	-	B _{EN} ⁻	-	A-	-	A-
Snapshot Award -2006	0.74	0.650	0.813	-0.018	0.162	0.923	0.393	0.868	-	B _{EN} ⁻	-	B _{EN} ⁻	-	B _{EN} ⁻	-	B _{EN} ⁺
Snapshot Award - Improved	0.74	0.650	0.813	0.467	0.173	0.780	0.592	0.868	-	A-	-	B _{EN} ⁻	-	A-	-	A-
Snapshot Construction completion - Operation - Improved	0.73	0.633	0.813	0.467	0.173	0.780	0.592	0.868	-1	A-	0	B _{EN} ⁻	-	A-	-	A-
Snapshot before renegotiation -2014	0.73	0.617	0.875	0.000	0.162	0.770	0.393	0.868				-2	B _{EN} ⁻	-1	B _{EN} ⁺	
Snapshot before renegotiation - Improved	0.73	0.617	0.875	0.300	0.173	0.780	0.592	0.868				-	A-	-	A-	
Snapshot after renegotiation -2014	0.73	0.617	0.875	0.000	0.181	0.847	0.393	0.868				-1	B _{EN} ⁻	-1	B _{EN} ⁺	
Snapshot after renegotiation - Improved	0.73	0.617	0.875	0.300	0.195	0.780	0.592	0.868				-	A-	-	A-	
Summarized actions of improvement considered (in bold those most effective and applied for improved scenarios according the algorithms of the BENEFIT MF)			CSI: Optimized operation risk allocation			RAI/RRI: Allocating other non-transport sources of revenue to the contractor such as advertisements										
			CSI: Increased project management and monitoring by public party via an experienced third party													
			CSI: Increased stakeholders management by public party													
			RSI: Allocating other non-transport sources of revenue to the contractor such as advertisements													

Case 11: Warsaw's Metro II-2nd Line

MF Indicators	Exogenous factors		Project Planning-Procurement			Project Construction-Operation			Cost Overrun		Time Overrun		Actual vs Forecasted Traffic		Actual vs Forecasted Revenue	
	InI	FEI	GI	CSI	RSI	RAI	RRI	FSI	Value	Rating	Value	Rating	Value	Rating	Value	Rating
Snapshot Planning - 1 year before tender 2008	0.61	0.633	0.750	0.764	0.200	0.803	0.450	1.000	-	C+	-	C+	-	C+	-	C+
Snapshot Award 2009	0.63	0.600	0.625	0.764	0.188	0.870	0.446	1.000	-	C+	-	C+	-	C+	-	C+
Snapshot Award - Improved	0.63	0.600	0.625	0.764	0.194	0.837	0.439	1.000	-	C+	-	C+	-	C+	-	C+
Snapshot renegotiation -2013	0.66	0.617	0.625	0.764	0.188	0.870	0.446	1.000	-	A-	-	A-	-	A-	-	A-
Snapshot renegotiation -2013 Improved	0.66	0.617	0.625	0.764	0.194	0.837	0.439	1.000	-	A-	-	A-	-	A-	-	A-
Snapshot under construction -2015	0.62	0.660	0.625	0.691	0.181	0.870	0.446	1.000	-1	C+	-1	C+	0	C+	0	C+
Snapshot under construction - improved	0.62	0.660	0.625	0.691	0.194	0.837	0.439	1.000	-	C+	-	C+	-	C+	-	C+
Summarized actions of improvement considered (in bold those most effective and applied for improved scenarios according the algorithms of the BENEFIT MF)			GI: Collective estimation of investments			RAI/RRI: Allocating other non-transport sources of revenue to the contractor such as real estate taxation										
			GI: Involvement a plural number of bidders			RAI/RRI: Allocating other non-transport sources of revenue to the contractor such as advertisements										
			GI: Integration of design and construction													
			CSI: Optimized construction risk allocation by an improved contractor selection													
			CSI: Increased project management and monitoring by public party via an experienced third party													
			RSI: Allocating other non-transport sources of revenue to the contractor such as advertisements													

End of Report

