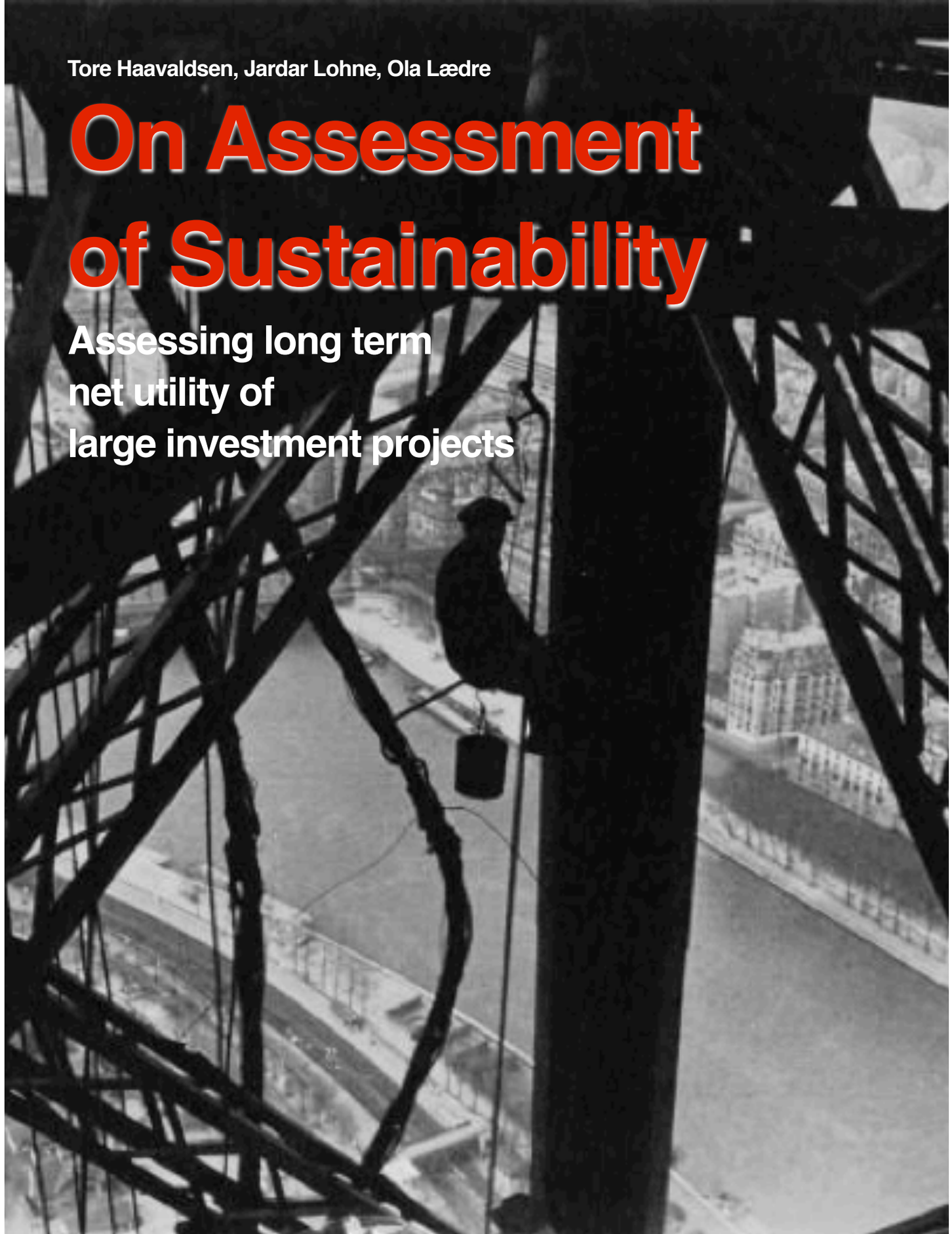
Tore Haavaldsen, Jardar Lohne, Ola Lædre

On Assessment of Sustainability

Assessing long term net utility of large investment projects



Tore Haavaldsen, Jardar Lohne, Ola Lædre

On Assessment of Sustainability

Assessing long term net utility of large investment projects

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Foreword

As professionals, we are commonly occupied with *doing projects right*. This book, however, is not about doing projects *right*, but about *doing the right projects.*

Making sure that projects are well designed and carried out to satisfy someone's needs and dreams is not an uncommon challenge for architects and engineers. We can usually trust that they will do a good job provided the purpose is clear.

Doing the right projects, however, is not about making a good design, it is about agreeing about what is the purpose of the project in the first place and choosing a conceptual solution that serves the purpose well. Often, it may also be about defining alternative concepts that also can be expected to make the difference the society need them to, so that our politicians are able to select the one that seems to have the best chances of serving the purpose in the long run. That makes it *the right project*.

When looking closer at this, we soon realize that there are a number of challenges we have to overcome before we can be certain that the project we have chosen to propose is the right one. Most of the time it is difficult to agree on what the purpose is in the first place, since we tend to have different expectations depending on who we are and what we want. We disagree on the basis of ambition and values, so arriving at the same conclusion is always hard. Furthermore, the scope of our politicians can be quite different from that of the local community that can be expected to be most affected by the project. To go on, we tend to find it virtually impossible to agree when the project is large, complex and risky, and even more so when we expect that it should prove useful not only for our generation, but when time comes even for our children and their children as well.

Nevertheless, success is possible, not only in the short term but in the long term as well. We know this if we look back at the history of large investment projects. Thinking about our history, we may be able to see several of our ancestor's projects that with time has proven to be right. Would it not be good to learn from them so we could have reason to hope that we will achieve just that for our children as well?

First, we have to accept as a fact that good decision-making in the field of large public investment projects is inherently complex, yet highly important. The larger the project, the more elements complicate the process leading up to its conception, and consequently the higher the need for methodologically sound procedures. Large investment projects, however, often go wrong, and the common sense having governed their initiation and design is often not readily found. In addition, large investment projects are commonly supposed to provide benefits over a long time and their positive impacts in a broad perspective need to be larger than the negative impacts. In other words, they need to be sustainable. Surprisingly little, however, has been published on the subject of methodological procedures aiming at assuring the sustainability of large investment projects, especially considering that such procedures are essential securing their rightfulness and at the same time assuring transparency and accountability with respect to the decision makers.

The aim of this book is to demonstrate and discuss a procedure for assessing large investment projects in the front-end phase. More precisely, we intend to show how the combination of the Logical Framework Approach (LFA) and the Sustainability Impact Assessment (SIA) can provide a platform for defining goals and prediction of important long term effects of large investment projects. The book also presents a practical approach represented by the recently established real-life Quality Assurance scheme (QA1) of the Norwegian Ministry of Finance, which is recently adopted to assist the accountability of decision makers and politicians.

We have chosen to illustrate this approach by applying the logics of these methodological procedures to the case of the historically well-documented process leading up to the construction of the Eiffel Tower (1889) and its later success. This example has been chosen both with regards to the status that this public investment project has acquired since it was completed, and to the social context into which it was launched.

An accent is placed throughout the different chapters on the role of the assessor within a political process and the challenges involved in ensuring openness in the decision-making process.

Tore Haavaldsen, Jardar Lohne and Ola Lædre,

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And the Lord came down to see the city and the tower, which the children of men had builded. And the Lord said, "Behold, the people is one, and they have all one language; and this they begin to do; and now nothing will be restrained from them, which they have imagined to do. Come, let us go down, and there confuse their language, that they may not understand one another's speech." (Holy Bible, Genesis, 11:5-7)

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Introduction

Being sensible is a prime ambition of most men, not least to researchers in the field of the construction industry. As René Descartes says, in the first part of his Discourse on Method: “Good sense is, of all things among men, the most equally distributed; for everyone thinks himself so abundantly provided with it, that those even who are the most difficult to satisfy in everything else, do not usually desire a larger measure of this quality than they already possess. [...] But it is not enough”, the philosopher continues, “to be in possession of good sense, the principal is to use it well”. (1999(1637):7)

How does one act according to good sense in the construction industry? Foremost, we argue in this work, by acting sustainable.

So, what is acting sustainable? Underlying literature studies, and interviews performed in the early stages of our work revealed that the research field concerned with sustainability lacks in coherence with respect to the signification of the very conception itself. Assessing sustainability is inherently complex, since the notion covers a multifaceted field of intentions and effects, desired and undesired, intended and unintended. This multifariousness has been tried captured in basing the analysis on what the OECD calls the three pillars of sustainability, which are economic sustainability, social sustainability and environmental sustainability. The prime ambitions of the present publication have consequently been to elucidate the different aspects of sustainability, to illustrate the inherent complexity of the notion, and to develop an understanding that permits an operational use of it. In other words, it aims at rendering a vague conception positively defined and thereby permitting inter-academic dialogue.

This book illustrates how sustainability can be assessed according to the long-term fulfilling of desired impacts, the broadness of the assessment and the accompanying risk considerations. We show how the combination of the methodological approaches Logical Framework Approach (LFA) and Sustainability Impact Assessment (SIA) in combination with proper appraisal of risk can provide a coherent and extensive basis for an assessment of sustainability. A main purpose has been to illustrate such assessments in the context of large investment projects, using the construction of the Eiffel Tower as example around which the assessment of sustainability at the front-end of investment projects is discussed. In order to obtain as true an understanding of this process as possible and to assess the available decision-making process, original 19th century contracts and other documents have been closely scrutinized.

A presentation of a present-day example of front-end assessment regime has been included in order to illustrate how methodological considerations are carried out in real-life, notably the Quality Assurance scheme (QA) instituted by the Norwegian Ministry of Finance. The combination of the historical example and the present-day scheme is in fact strikingly interesting. What was the sense in the construction of something like the Eiffel Tower? Did the decision-makers of the époque plan for the success that followed to the extent that the sustainability of this investment today is indisputable? Would the Eiffel Tower have passed through the QA-scheme? What was the sense in the construction of something like the Eiffel Tower? Such are the questions which we address at the end, using the conceptual framework that we have established to give a nuanced and clear response. Equally, we shall see how the example chosen identifies both strengths and weaknesses of the methodological approaches.

In hindsight, when considering the process leading up to the construction of the Eiffel Tower, we can describe in the following manner, using a common vocabulary in today’s project management theory:

- An *overall needs analysis* was carried out, identifying the need for French preponderance among Europe’s powers to be recognized.

- A *strategy* aiming at fulfilling this need was developed, involving the holding of a Universal Exposition of which the construction of a giant tower was a main ingredient.

- The *overall requirements* of the tower were described by the grandeur and the construction material.

- And an *analysis of alternatives* was conducted by the architectural concours.

All these steps are worthy of consideration. In fact, the process leading up to the construction of the Eiffel Tower exemplifies challenges witnessed by any organisation initiating large investment projects. We will use this particular process to illustrate methodical approaches to front-end assessment of large public investment projects today.

In the second chapter, we discuss general characteristics and the accompanying terminology relevant to front-end assessment. We introduce the vocabulary used to distinguish different aspects of investment projects, before, in the third chapter, we present a methodical approach to front-end assessment commonly used, the Logical Framework Approach (LFA). The fourth introduce the corresponding success criteria upon which the investment projects are assessed. There, we explain why the criteria of *relevance* and *sustainability* are the most significant to the front-end assessment of investment projects, and present their general characteristics.

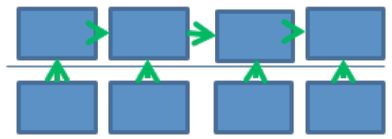
Our fifth chapter expand the approach bearing on sustainability, by examining the Sustainability Impact Analysis (SIA) as presented by the Organisation for Economic Co-operation and Development (OECD). Our sixth chapter aims at integrating risk considerations into the chosen approaches.

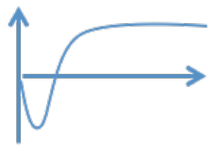
In the seventh chapter, we leave the example of the Eiffel Tower and examine how front-end assessments can be conducted in practice, namely by presenting the quality assurance scheme directed by the Norwegian Ministry of Finance (QA 1 and QA 2). The presentation of this program gives us the possibility to point out challenges to front-end assessments, and possible outlines of future methodological development.

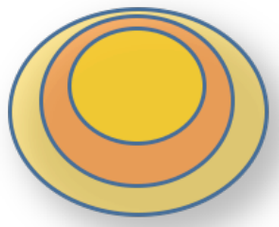
Our eight and last chapter concerns fundamental challenges to decision making, especially concerning the questions of transparency and the interface between expert analysts and politicians.

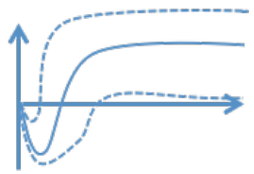
Chapter 1

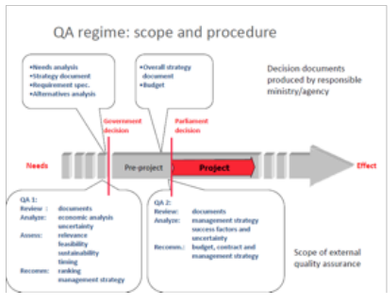
Front-end assessment











Front-end assessment

Section 1

Front-end assessment – the example of the Eiffel Tower

"In democratic nations", philosopher Alexis de Tocqueville proclaimed in 1835, "individuals are weak but the state which represents them and holds them all in the palm of its hand is powerful. [...] In democratic societies, the imagination shrinks when men think of themselves; at the thought of the state, it expands beyond all limits. Hence, men who live in the constricted condition of small houses often aspire to gigantic splendor in their public monuments" (p. 542). A few decades later, the French republican government acted in accordance to this identified need for greatness in its public monuments, and initiated the construction of a monument suitable for its ambition to augment the Gloire of the French Republic.

The first of May 1886, the Minister of Commerce and Industry of France opened a general concours, upon which all French architects and engineers were invited to participate with proposals to the general plan of the Universal Exposition of 1889. The use of iron was underlined as a main theme, limiting all other building materials to subservient roles. Of particular interest in the context of this book is the article 9 of the announcement. This article contains the invitation to propose solutions to the construction of an iron tower of 125 meters by the sides and of 300 meters height, to be placed on the Champ de Mars in Paris. The different projects were then to be exposed publicly from the 19th to the 22th of May, subsequently to be judged by a committee named and lead by the Minister himself. Of the projects proposed, the 12 judged best was to be honoured with primes of from 1000 to 4000 francs as well as with the exclusive privilege to participate in the following concours. The Minister reserved explicitly the right to choose among the final contributions.

The 8th of January the following year, an agreement between the Minister and the Prefect of the department of Seine on the one hand and Monsieur Eiffel, "engineer-constructor acting in his own name" on the other, was published. By this agreement, M. Eiffel engages himself as an entrepreneur to construct within the grounds of the Exposition a tower of 300 meters height, to be completed on the opening of the Universal Exposition.

In the article 11 of the agreement, the conditions of exploitation of the tower are outlined. After the completion, in order to pay for the expenses of the tower exceeding the guaranteed subvention of 1,500,000 francs, M. Eiffel is permitted to enjoy the benefits of the tower during the exposition and for a period of twenty years onwards. After this period, the construction was to be torn down.

The result of this agreement is observable to any visitor to Paris today, where the tower has become the iconic symbol of the French capital. More than 110 years after its construction, the Eiffel Tower must be acknowledged as a tremendous success. Several questions concerning its initial making, however, arise.

Let us put us into the position of the initial decision-makers. How did they perceive the sense in constructing the giant tower? What was it its initiators wanted to achieve? In what was a 300 meter puddle-iron structure without evident practical use relevant to the French society? And, most importantly, can its construction be said to have been sustainable?

Section 2

Characteristics of front-end assessment – information, uncertainty, control, flexibility

In his The tower of three hundred meters (1900:1), Eiffel describes the effects sought after when constructing the tower. "Without having to go back to the tower of Babel", he says, "one can observe that the idea of construction of a tower of very great height has for a long time haunted the human imagination. This sort of victory over the terrible law of gravity that fixes man to the ground has always seemed a symbol of force and surmounted difficulties."

Eiffel wrote his book on the tower eleven years after its completion, with all the knowledge of the outcome available to him. The difficulties had all been surmounted, the symbol of grandeur had been erected and the victory he describes had already been assured. This gives his presentation an allure of certainty that was most certainly not felt before the construction was initiated, especially not by the decision-makers that commissioned the work. From descriptions of the process leading up to the construction of the tower, we can observe both how certain typical features characterizing the front-end of an investment project today were also present at that time.

In general, a fundamental difference exists between assessments in forehand, so-called ex ante, and after completion, or ex post. In the latter, investment projects are examined after their completion time, whilst in assessment ex ante, investment projects are examined before they are implemented. The main differences between ex ante and ex post assessments are the level of uncertainty that characterizes the project outcome, the quality and quantity of information available, and thereby the usefulness of the assessment.

The above figure illustrates the typical development of information and uncertainty over time. We can see that the more an investment project evolves, the more reliable information it is possible to gather about it, and consequently less uncertainty is involved in the assessment. As indicated in the figure, the front-end phase stands out as the period with both the highest uncertainty and the least information available.

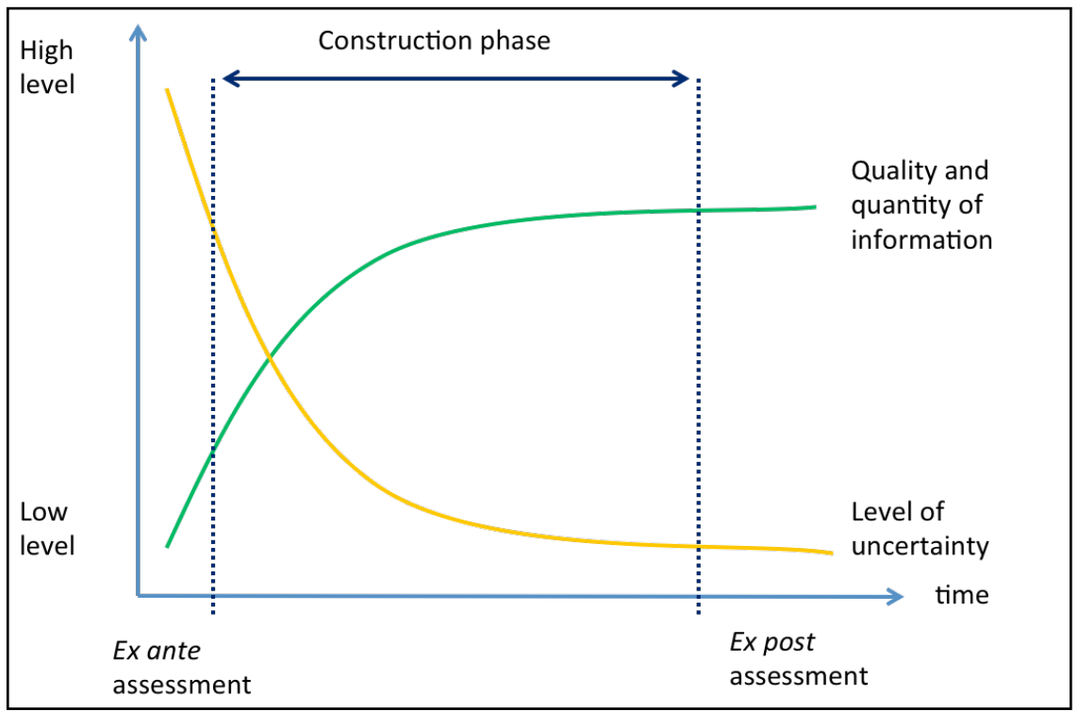


Figure 1 The relation between quality and quantity of information, and the level of uncertainty according to the progress of the investment project (Based on Olsson, 2006:12)

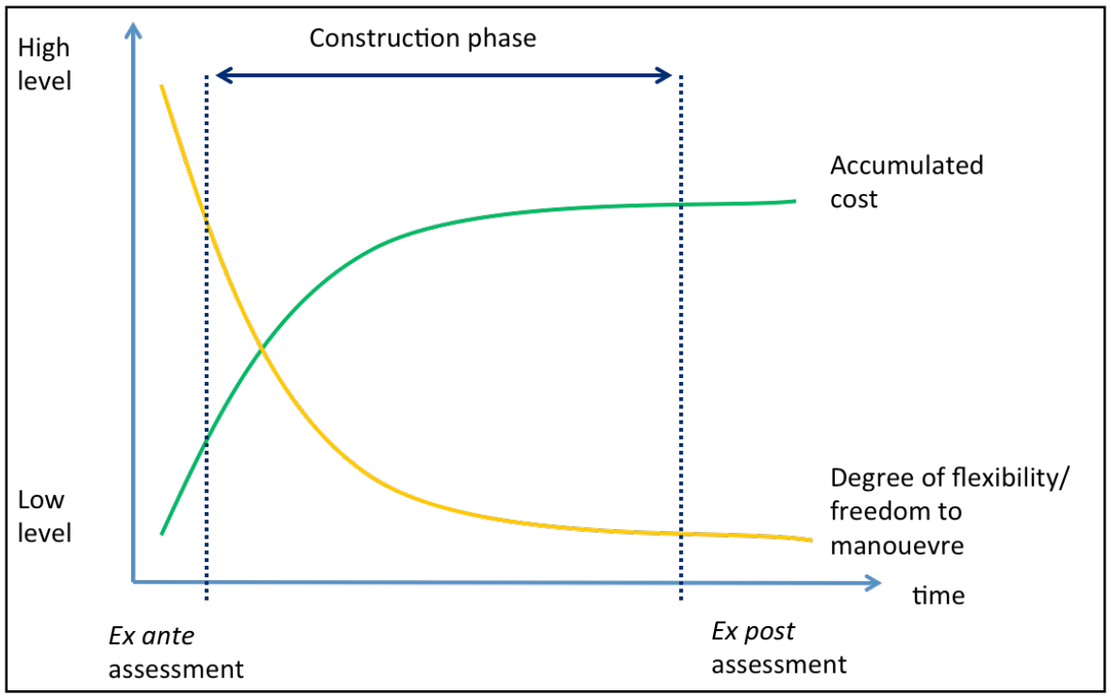


Figure 2 The relation between cost and flexibility over time (Based on Olsson, 2006:12)

The interest of such front-end assessments reveals itself, however, if we couple this figure with another, showing the relationship between accumulated cost and flexibility (that is, the freedom to adjust) over time:

The front-end phase is the time when decision makers experience the greatest flexibility concerning the project design. Little, if any, capital is invested and the decision maker is generally at great liberty to choose among different alternatives or even to abandon the investment project entirely. Assessments conducted at a late stage can only influence the outcome of a project on a limited scale, since the investment project then has come too far to change its fundamental strategy. Ex post assessments can document lessons learned, but can rarely influence the outcome of the investment project realized.

It is therefore not surprising that the ex ante assessments stands out as more useful than the ex post assessments, since its conclusions will not limit themselves to give lessons to future investment projects. Rather, it focuses on the expected outcome of the actual investment project or of project alternatives before the investment is approved.

Both the flexibility and the lack of information characteristic to the front-end of investment projects are illustrated in the architectural concours held in order to bring forth projects of a tower of 300m. In this concours, the members of the jury were affronted with mere prototypes of towers, since the short time-frame would not have permitted anything near a full technical analysis of the different projects. The choice of which concept to choose, however, is made at this time; the flexibility did in this way not only concern the design of the project or whether or not to proceed with the project, but also which fundamental concept to choose.

Remark that the jury was fully conscious of the fact that the initial selection of concepts dealt with proposals not sufficiently elaborated. The concours was therefore divided into a first and a second stage. By dividing the concours, the committee obtained not only concentration on the most promising proposals, but also achieved a further assessment of their technical feasibility.

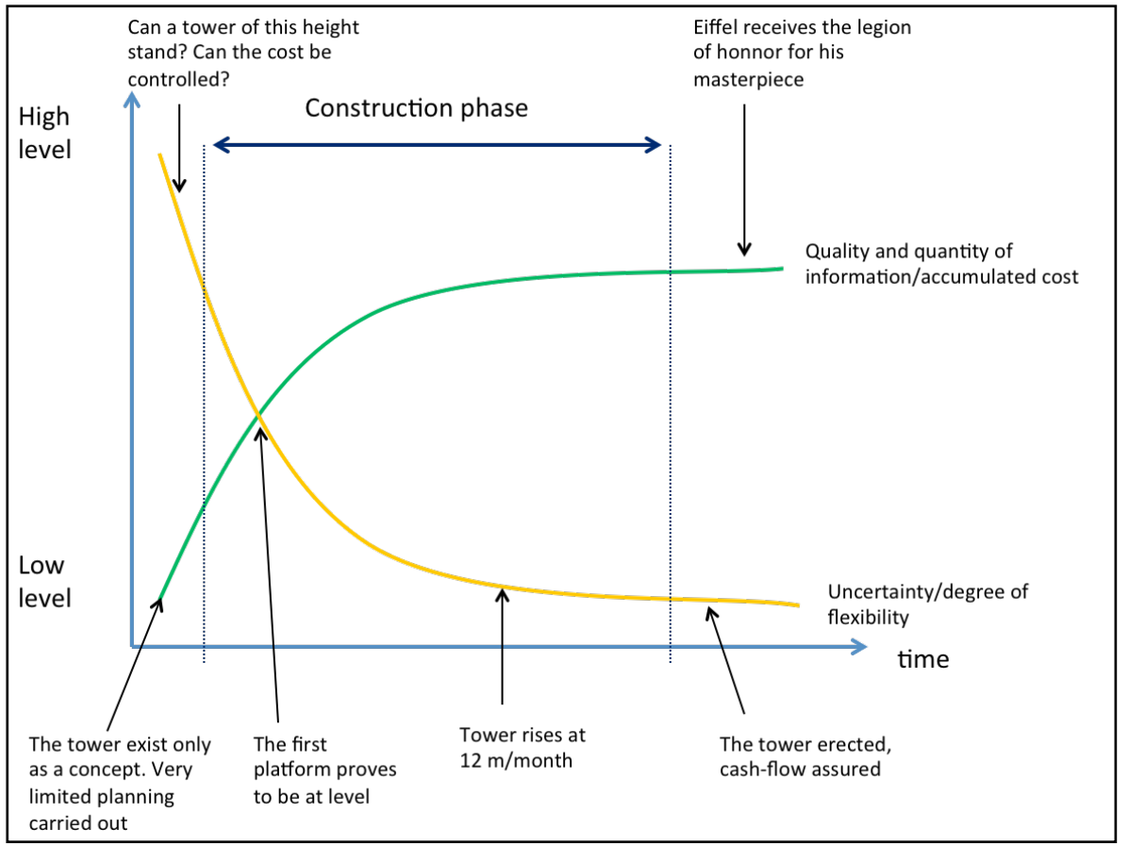


Figure 3 The relation of information and uncertainties, exemplified by the Eiffel Tower

Front-end assessment – evaluating in a fuzzy environment

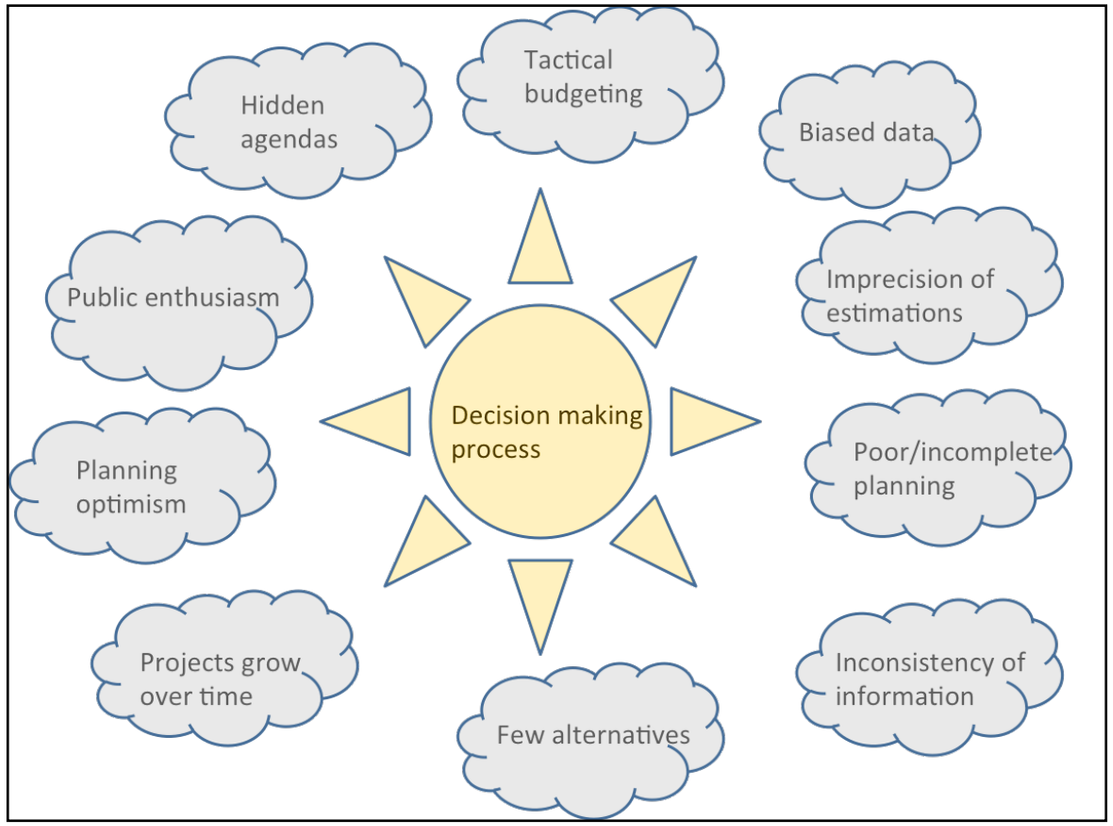


Figure 4 Challenges threatening to overshadow the decision making process.

Also today, it is quite common that the flow and lack of information renders the decision-making process uncertain. In addition, it is worth remarking that the quality of the information obtained can often be quite dubious. The information obtained at early stages of a process will often be biased by lack of data, as well as inconsistency and imprecision of estimations. We are thus facing not only limited information, but information of limited quality.

Also, during the initial phase of large public investment projects, special interest groups often strive to influence the decision-making process, and both hidden agendas and tactical budgeting might influence the involved parties. Public enthusiasm for particular projects often overshadows their actual significance, and might lead to planning optimism and the assessment of too few alternatives. The decision-making process can thus consciously or unconsciously be based on incomplete information.

Given these general characteristics, it is not surprising that the front-end phase of large investment projects often is fuzzy.

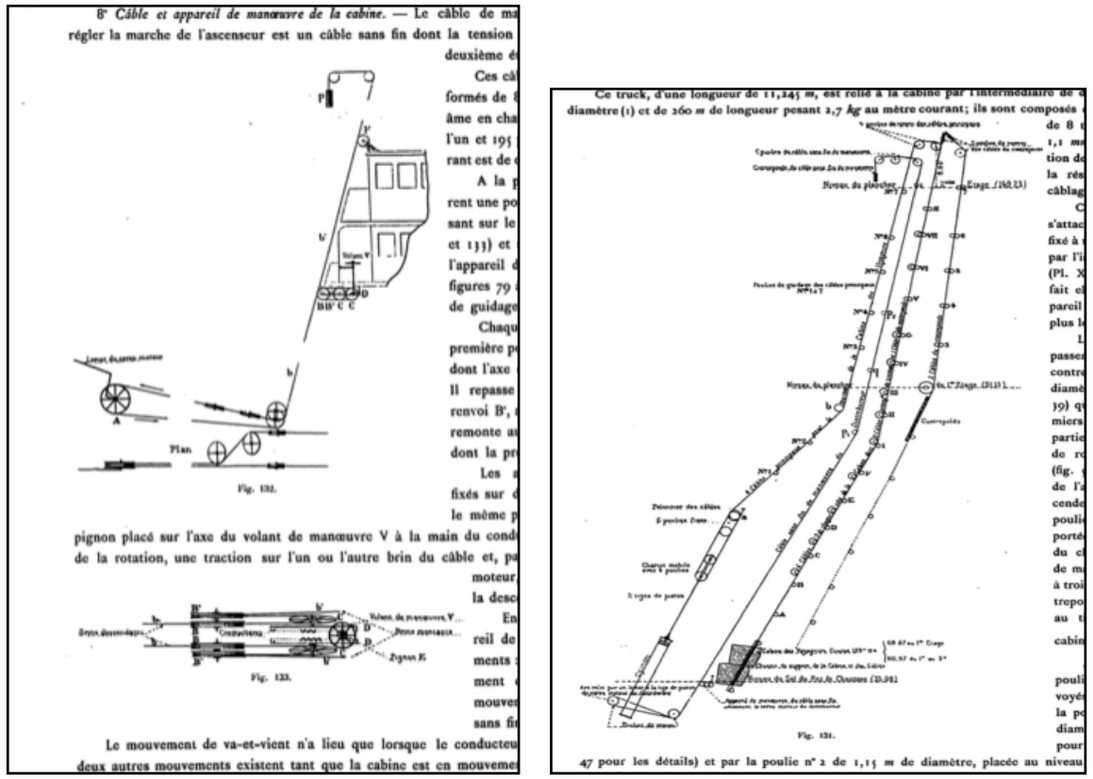
It is not difficult to find examples of such challenges within the process leading up to the construction of the Eiffel Tower. As Jonnes points out, the Washington Monument (169 meters, initiated in 1848, finished in 1885) had only recently been completed as the world's highest man-made structure, and "many French were swelling with pride at the mere prospect of dwarfing the giant American obelisk" (2009:8).

Envisaging a prestigious monument inevitably leads to enthusiasm and optimism within certain parts of the opinion. It is important not to underestimate the influence of such popular enthusiasm. Equally, the initial decision to construct a tower as the emblem to the Exposition limited the alternatives to the jury, and the later cost-overruns indicate that the cost estimations were quite insufficient. Important decisions were in this manner based on poor and incomplete planning.

Later, the outcry from leading artists on the sheer ugliness of the structure threatened the very project itself. One of the main points of contagion concerning the construction of the Eiffel Tower was whether this construction corresponded to the identity of France in general and Paris in particular. Critics argued that the Paris after the Exposition would become the metallic one of the Eiffel Tower, whilst the Paris of before the Exposition, with its beautiful stone palaces and lustrous gardens.

Even today, when considering the processes leading up to different contemporary large investment projects, a large portion of them are in fact strikingly similar. It is not uncommon to see the lack of information as well as its relative poor quality being used as tactical weapons by different stakeholders and interested parties in order to disqualify proposed investment alternatives. Industrialists wanting to construct a nuclear power plant might seek to undermine environmentalist arguments by pointing out that nuclear fission provides clean, green, carbon-free energy. Environmentalists might hammer relentlessly on the risks involved in nuclear power plants, even though these risks statistically are infinitesimal. It is neither uncommon that unions try to disqualify major plans to change work organisation (moving of workplace, privatisation, outsourcing, etc.) by referring either to uncertainty concerning the delivery of services due to such factors as abandoning personnel, or to secondary effects, such as patient security.

Neither Eiffel nor his main competitors were unfamiliar with this game. In his book, Eiffel criticise at length the alternative project of a granite tower, and argues that the uncertainty involved in such a project largely outdoes what would be reasonable to be undertaken by any sane government. Even though written long after the strife, the vehemence with which the engineer attacks the alternative project of the tower in granite evokes the temperature of the argument at the front-end of the investment project. Bourdais, the architect-planner of the granite tower, responded at the time on his side by challenging Eiffel on how elevators could go up and down inside his tower's curved legs. That, he argued, was a real impossibility! The question of the elevators was in fact a point of contagion for the project. Eiffel uses two entire chapters of his book in order to explain how technically well founded his project was from the start. The fact that the question of the elevators also stretched the planning capacity of the Eiffel factory to its utmost limits, on the other hand, is kept quiet about (Jonnes, 2009:16).


8° *Câble et appareil de manœuvre de la cabine.* — Le câble de ma
régler la marche de l'ascenseur est un câble sans fin dont la tension
deuxième é
Ces câ
formés de
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l'un et 195
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rent une po
sant sur le
et 133) et
l'appareil
figures 79
de guidage
Chaqu
première p
dont l'axe
Il repasse
renvoi B',
remonte au
dont la pr
Les
fixés sur
le même p
Fig. 132.
pignon placé sur l'axe du volant de manœuvre V à la main du cond
de la rotation, une traction sur l'un ou l'autre brin du câble et, p
moteur
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En
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Fig. 133.
Le mouvement de va-et-vient n'a lieu que lorsque le conducteu
deux autres mouvements existent tant que la cabine est en mouveme

Ce truck, d'une longueur de 11,245 *m*, est relié à la cabine par l'intermédiaire de
diamètre (1) et de 260 *m* de longueur pesant 2,7 *kg* au mètre courant; ils sont composés
de 8
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porté
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trepo
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cabin
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voyé
la p
diam
pour
Fig. 131.
47 pour les détails) et par la poulie n° 2 de 1,15 *m* de diamètre, placée au niveau

Illustration 1 Reproduction in The tower of 300 meters (La tour de trois cents metres) of two of the original technical drawings of the elevators.

In general, we can say that there are good reasons for such controversies. Firstly, there is usually much at stake. Investment projects take up large resources, often at the expense of other possible investments. Secondly, there are many different people concerned with the usefulness of the project, often with conflicting interests. A large number of different needs and expectations are to be met. And last, there is no easy way to agree on how to design an investment project to secure that all demands are met, or perhaps more appropriate, to which extent they should be met respectively.

Reasons for controversies at the front-end phase:

- Much at stake
- Conflicting interests
- Not all demands can be fully met

Not surprisingly, international experience with large investment projects shows that they often go very wrong. They commonly become much more expensive than originally planned, they fall short of providing the solutions to the public that they were designed to provide, and sometimes it becomes obvious even at early stages that the project should not have been undertaken in the first place.

How – in the uproar of enthusiasm, protest and intrigue – can those who assess any proposed investment project find the proper information onto which to substantiate the front-end assessment? The answer lies in a proper methodological approach

Section 4

Precise vocabulary as a necessary condition for proper methodological approach

Proper methodological approach:

- Methodological procedures
- Precise vocabulary

Without a proper methodological approach that assures the reliability and validity of information, the possibilities for proper weighing of pros and cons of an investment project are in fact meagre. In general, we can say that a lack of methodical approach can encourage manipulation, and wrong decisions as well as squander might follow. As a response to such challenges, a pivotal concern has been to develop firm methodological tools that assure the quality of information used in the decision-making process.
Note that proper methodological approaches alone are not enough to secure reliability and validity. For that such approaches can be operational according to wishes, they need to be based on a firm, precise vocabulary clearly differentiating the different elements of the information onto which the methodological approach is based. The assessor needs to be able to sort the information properly before judging of its quality and its relevance to the purposes and goals of the investment project. This sorting is carried out according to what the information is about, i.e., what aspect of the investment project it concerns.

One major concern of contemporary theory on front-end assessment is the scope of the assessment. Traditional assessment of investment projects tended to focus only on the cost, time and quality of the actual project, leaving broader aspects out. Today, it is common is to include these. An investment project can, in effect, be considered from a considerable number of angles.

Firstly, we can divide the investment project according to which phases we consider. It is conceived and planned in the front-end phase and executed in the project implementation phase, and finally there is an operational phase, in which it is intended to provide the intended effect, lasting into the time when the investment project is not longer in use.

Secondly, considerations on which context one is referring to, i.e. whose perspective that should be considered, are superposed on the timeline. Investment project are normally realised with specified demands concerning time, cost and quality. No project, however exists within a vacuum, but is always conceived within a specific context. Roads are built, for instance, to ameliorate traffic flow in an area or between regions. The improved roads are means to reduce travel time and cost and thereby to strengthen the trade and industry of the actual region or regions.

Firstly, the actual road construction, the project, is assessed according to criteria such as time, quality and cost. This is what we call the output of the project. Secondly, the immediate function of the road aims at assuring that the users of the road experience the roads as adequate, i.e. the first-order effects of the project or the desired state that the project is intended to contribute to. This is what we call the goal of the project.

Thirdly, when evaluating if the higher-level objective of the investment project, i.e. whether it responded adequately to the need identified by the societal process from which it sprang out, the evaluator must consider whether the overall purpose of the investment project is accomplished, this being a ambition for economic development, bettering of social interaction, reducing environmental pressure or other.

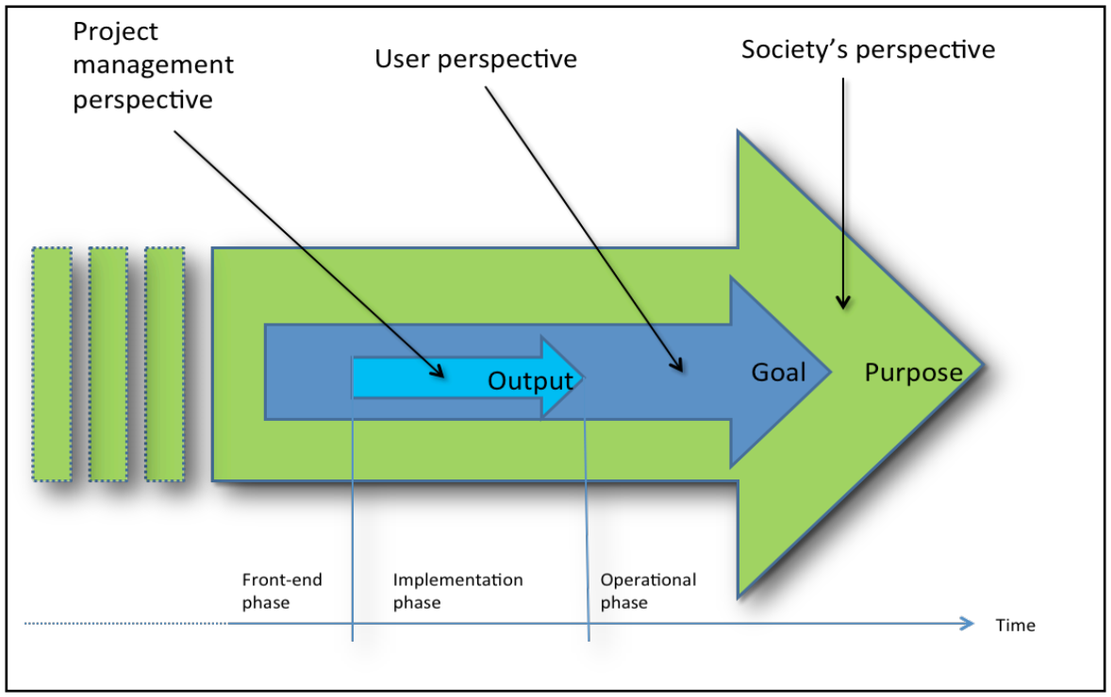


Figure 5 Illustration of the relationship between the different perspectives on an investment project and the corresponding objectives it is thought accomplishing (based on Samset, 2003:21).

We can define the conceptions in the following manner (Samset, 2003:216-227):

Output: The tangible immediate and intended results to be produced through sound management of the agreed inputs. Examples of outputs include goods, services or infrastructure produced by a project, meant to realize its purpose. Synonyms: results, deliverables, operational objectives.

Goal: The higher-order program or sector objective to which a project contributes. Common synonym: strategic objective.

Purpose: The positive improved situation which a project is expected to contribute significantly to if completed successfully and on time. the purpose is the central objective expressed in terms of benefits to be achieved by the target group. It does not refer to the services provided by the project/program (these are outputs), but to the benefits, which beneficiaries derive as a result of using these services.

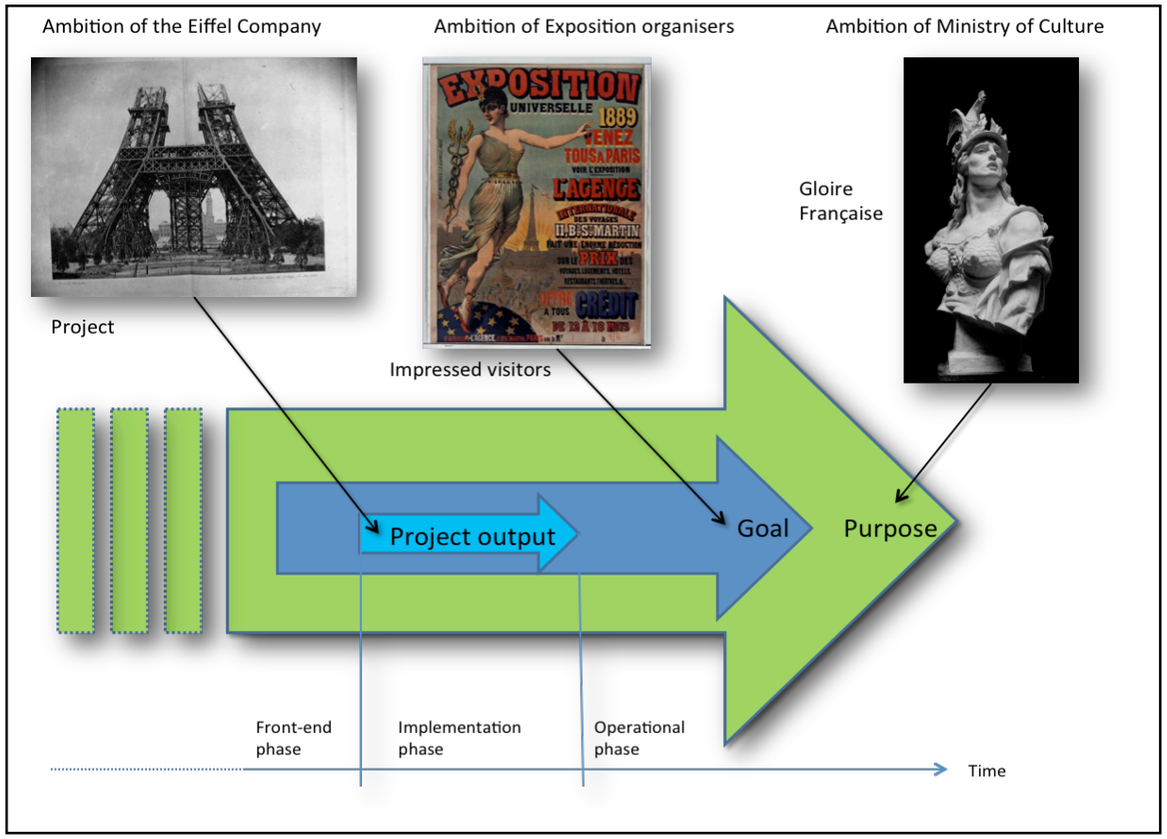


Figure 6 The different perspectives on the investment project and their corresponding objectives illustrated by the Eiffel Tower.

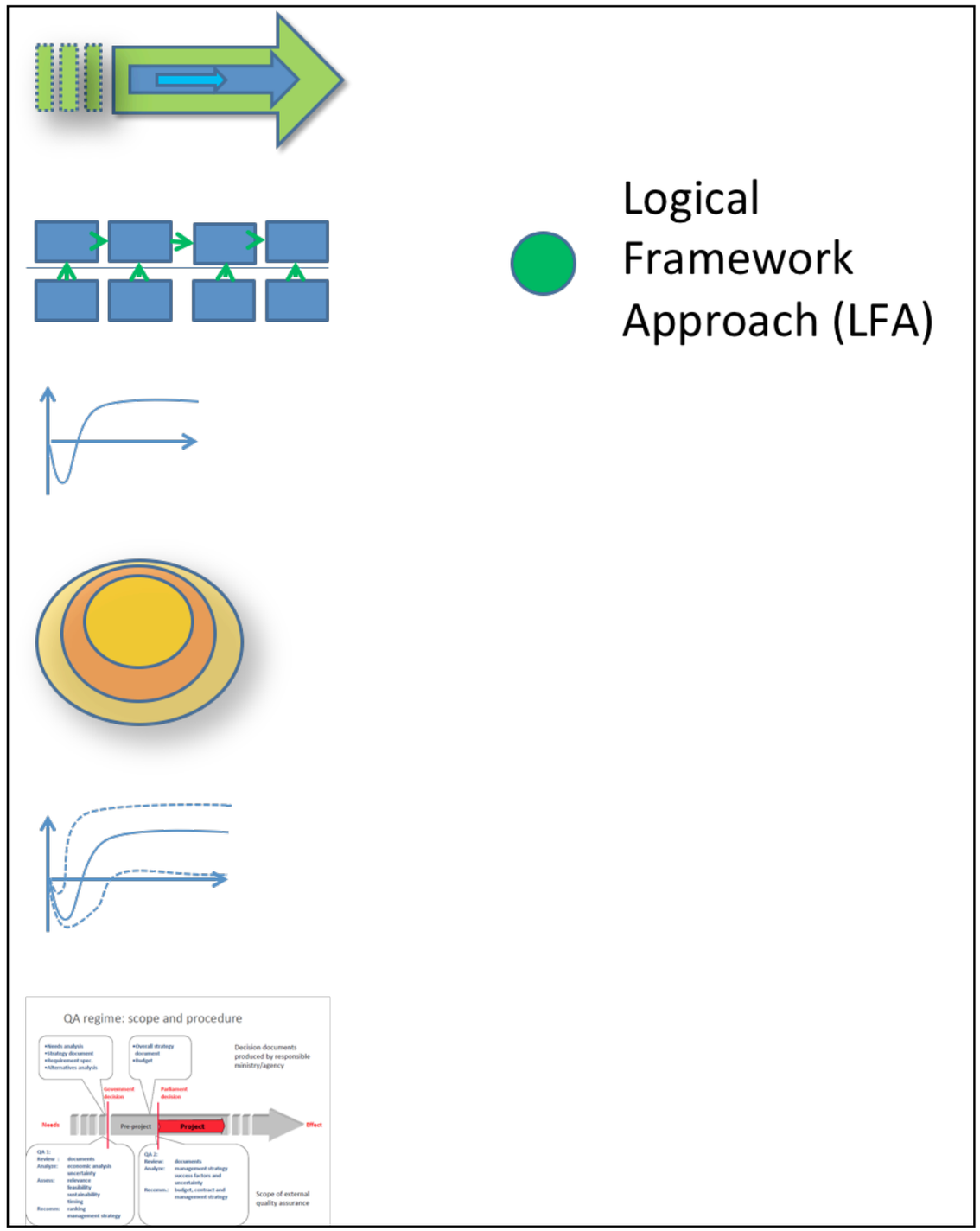
We can observe the different perspectives exemplified by the Eiffel Tower:

The societal process leading up to the Universal Exposition is conceived by the Ministry of Culture with the purpose to augment the Gloire of the French Republic (here represented by its iconographic emblem Marianne, an allegory of Liberty, Reason and the triumph of the Republic). In order that the Universal Exposition shall achieve its goals (numbers of visitors, impressiveness of the showings etc.), the exposition organizers initiate the project of the Eiffel Tower, which is conceived with the project output of constructing a tower of 300 meters.

Here, we have established a vocabulary permitting us to consider the different aspects of the investment project with respect to their perspective and their corresponding objectives. In the following chapter, we shall see how a methodological approach aiming at identifying the different objectives of the investment project is crucial to this, notably the Logical Framework Approach.

Chapter 2

Logical Framework Approach (LFA)



Section 1

Introduction – LFA as a procedure to articulate objectives and uncertainties

From the above discussion, we have seen how an investment project can be observed from a variety of perspectives. Such identifications are in fact crucial in order to make sure that the investment projects we initiate are adequately useful in the long run. As we later will see, long term utility is essential to the conception of sustainability.

In this chapter we explore the Logical Framework Approach (LFA) as a method for identifying and articulating the objectives of an investment project, as well as assessing risks from the different perspectives.

So far, we have considered the objectives of an investment project as relatively easily discernible entities. The real world, however, offers few such readymade definitions and clear frames identifying what one wants to do and achieve, and how to measure the success of the investment project. Those involved in a front-end assessment of an investment project will often meet unclear statements, stakeholders being over-ambitious on behalf of the investment project, and risks that often are unidentified or not attributed their correct importance.

In effect, what one wishes to obtain by the investment project is often unclear and the uncertainties not properly understood. Questions that need to be addressed are the likes of: What is it really one wants to achieve? How to be sure that one achieves it with the actual investment project? What are the consequences on the immediate surroundings? Will this investment project help the society to develop in a desired way?

In the following, we discuss the LFA as a methodological tool designed in order to disentangle such questions and identify their respective answers.

The main result from the LFA is the clear identification and justification of purpose and goals. In addition, the procedure helps:

- Identify information requirements
- Clearly define the key elements of an investment project
- Analyze the investment project's setting at an early stage
- Facilitate communication between all parties involved
- Identify how the success of the investment project should be measured

The LFA can be used to evaluate investment projects throughout the whole process, from front-end phase to the final assessment after the operational phase is terminated. As this book focuses on front-end assessment, we will mainly consider it from this perspective.

The logical framework

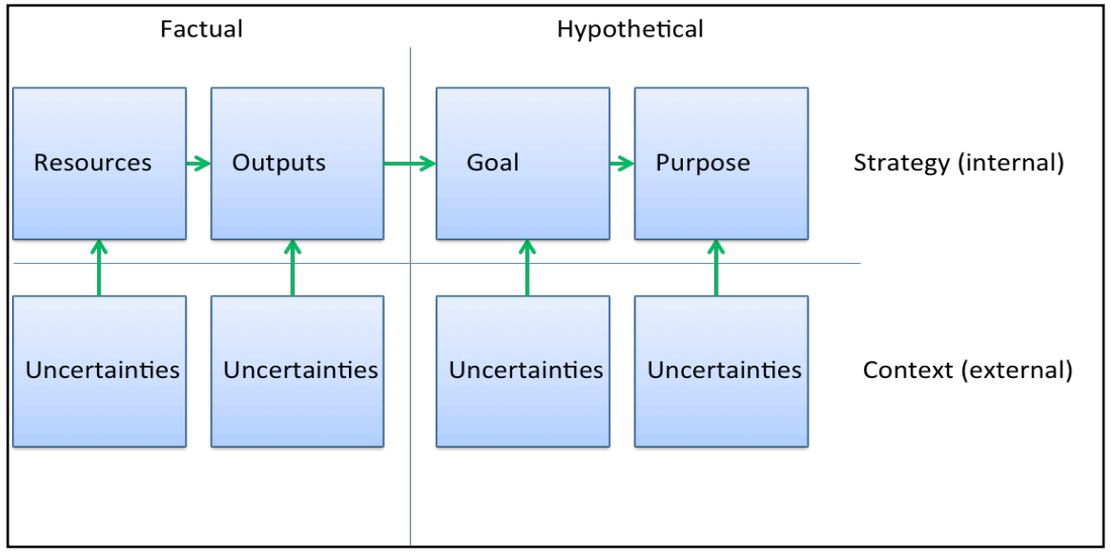


Figure 7 The logical framework with objectives on three levels: Outputs, Goal and Purpose.

The LFA methodology uses a so-called logical framework to help categorise the most important components in the investment project. The logical framework serves to visualise the different levels of objectives of the investment project and the uncertainties corresponding to each of them.

One of the LFA's main attractions is the establishment of a formal hierarchy of intended inputs, planned activities and expected results, and highlighting the logical linkages between them. The tool also elaborates a hierarchy of uncertainties corresponding to the different levels of the hierarchy.

We will in the following illustrate how this methodological tool can be used to sort the elements constituting the investment project of the Eiffel Tower according to it, commencing in the top left corner of the frame.

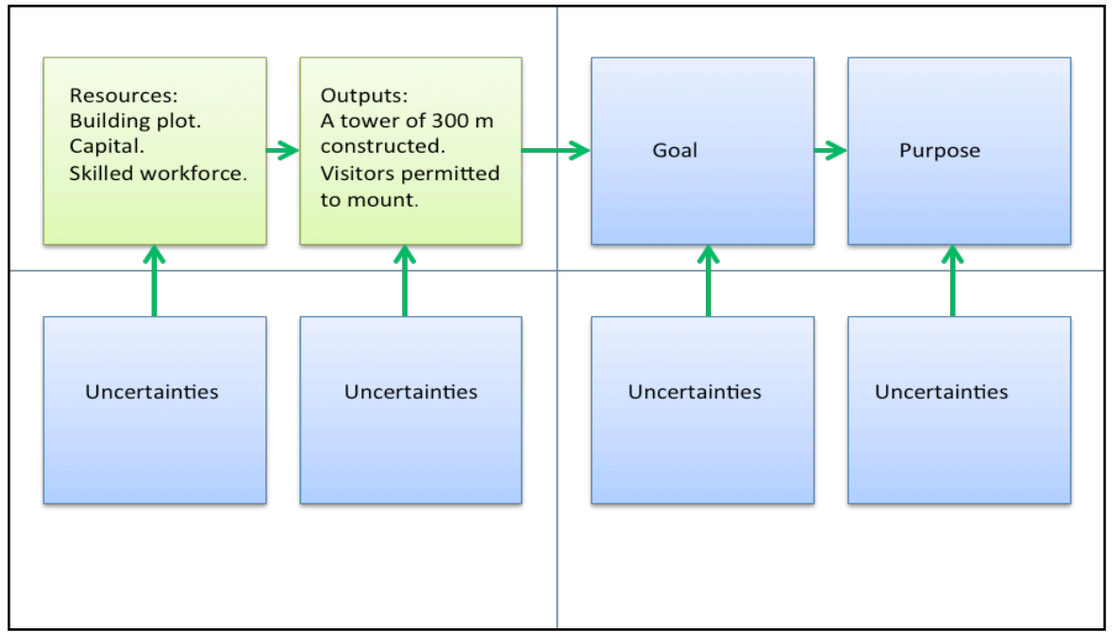


Figure 8 Resources and planned output of the Eiffel Tower fitted into the logical framework.

The project organisation formed by the Eiffel Company main task was to construct a fully functional tower of 300 meters of height, using the available resources. These resources included the available building plot, satisfactorily financing and the availability of a properly skilled workforce. It would be possible to construct a tower of 300 meters if and only if the building plot, necessary capital and skilled workforce were available.

In his book, Eiffel describes with assurance the technical feasibility studies performed by his engineers or and his firm convictions that his workmen had all the skills necessary for the job. Even considering this, there project execution phase was none the less veiled in significant uncertainties, both concerning the question of resources and the question of adequate skills of producing the intended output (the tower).

In a general manner, we understand by "uncertainties" factors which we can expect will significantly influence the success or failure of the project, but that are outside the control of the project administrator.

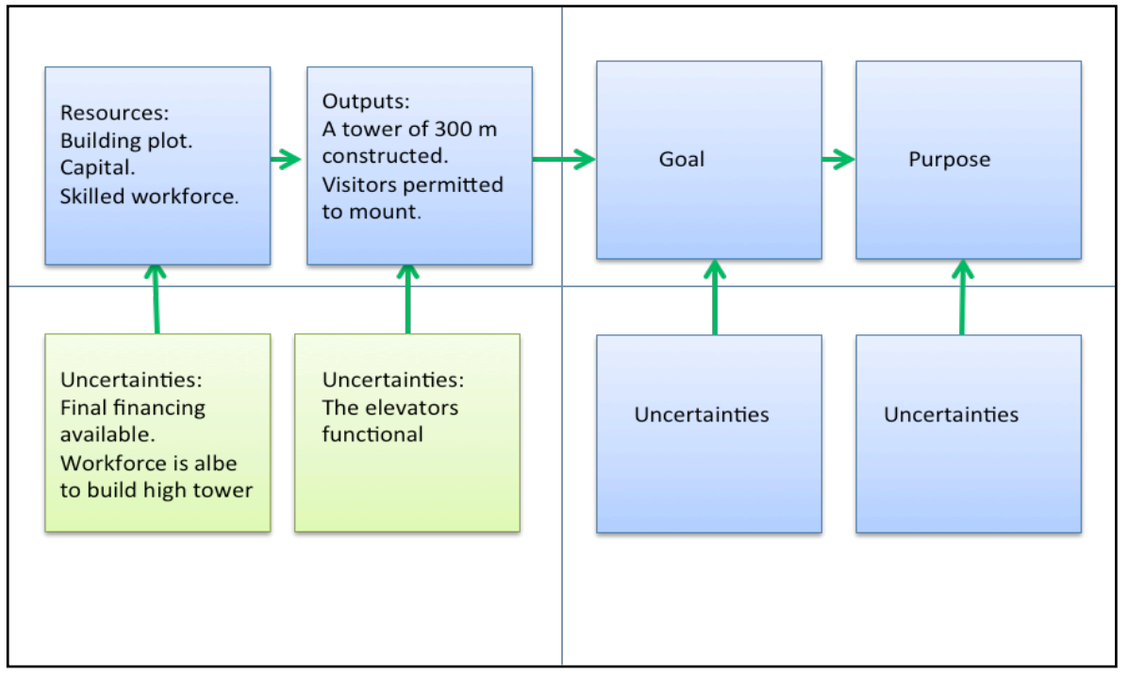


Figure 9 Uncertainties corresponding to the resources and wanted output of the Eiffel Tower.

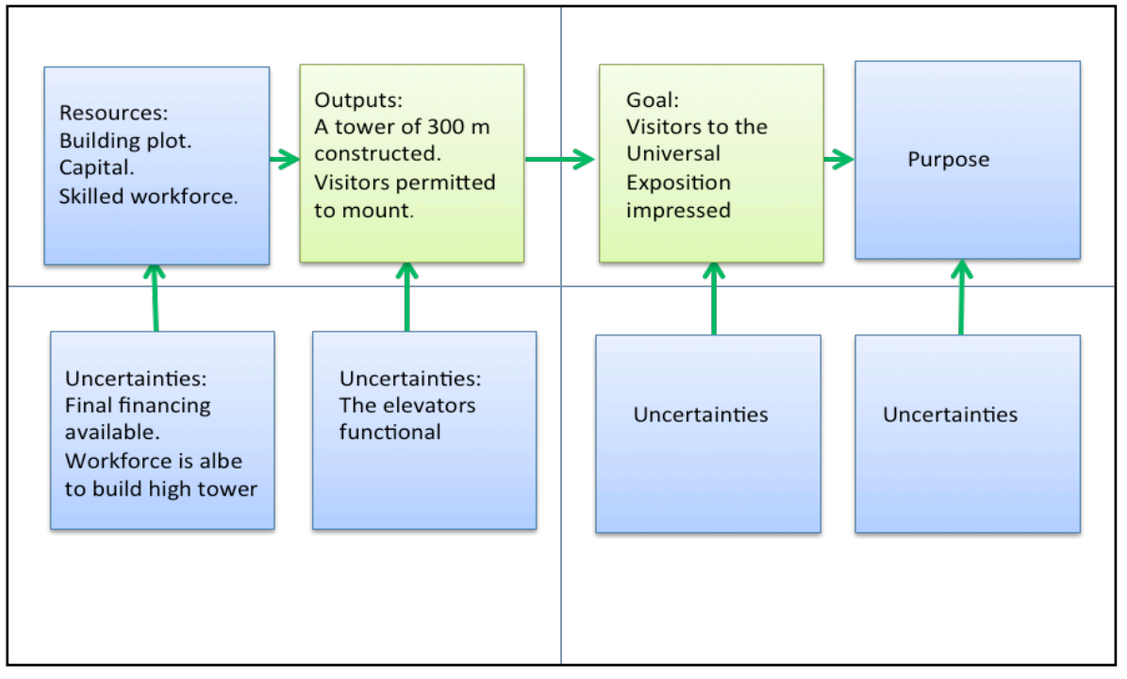


Figure 10 Wanted output and goal of the Eiffel Tower as fitted into the logical frame-work.

Assuring adequate financing for the investment project is often the first uncertainty the common man thinks of as a major uncertainty that might threaten the feasibility of the investment project. Everyone who has been engaged in complex and possibly dangerous undertakings, however, will acknowledge that the question of assuring the availability of a workforce with the necessary qualifications is often equally challenging.

The financing of the tower in fact proved to be rather more uncertain than wanted. The tower was promised to cost 6,500,000 gold francs; the official committee, however, did not want to increase its grant beyond 1,500,000 gold francs. When this became clear, after delaying the order to execute the tower, Eiffel "decided to take the extraordinary personal risk by floating a company to distribute 10,000 shares of 500 francs each. He planned to retain half the shares in his own name [and calculated that other partners] such as the company itself and the consortium of banks that showed interest" would take the rest (Harvie, 2004:90).

But the uncertainties did not only concern the resources available, they also comprised the production of the tower, the intended output. There was, as above mentioned, the question of the elevators. As no one had ever erected a tower of 300 meters, no one had proper experience with building elevators to reach such heights. In addition, there was the question of the curvature of the legs... And as Jonnes comments, "if the crowds could not ascend safely and swiftly up the Eiffel Tower, what sort of attraction would it be?" (2009:39)

We can illustrate how the output is thought fulfilling the goal of an investment project by the example of the Eiffel Tower:

Again, observe the logic governing the logical frame, where the fulfillment of the goal, to make the visitors impressed, depends on the intended output, i.e. whether the construction of the tower is achievable. From the identification of the main components of the resources and wanted output of the investment project, we can thus pursue the matter into establishing how the goal and purpose are realized by them.

By the formulation of the goal, we can thus follow the logical movement from the resources via the output to the goal and further to the purpose of the investment project.

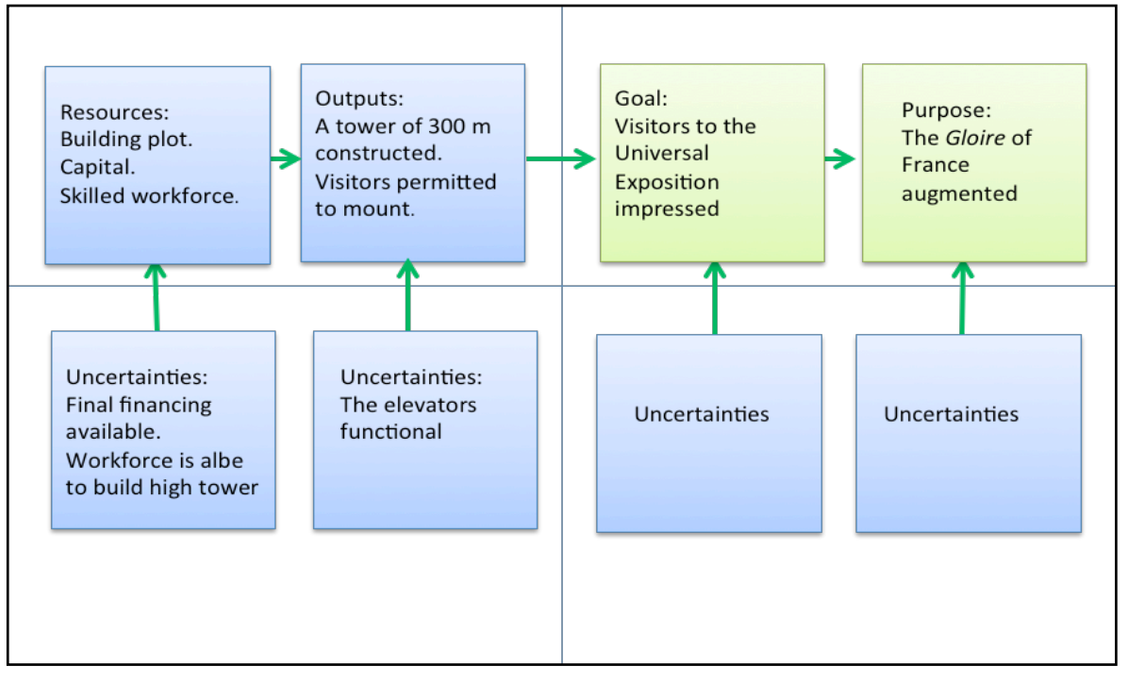


Figure 11 Goal and purpose of the investment project as fitted into the logical framework.

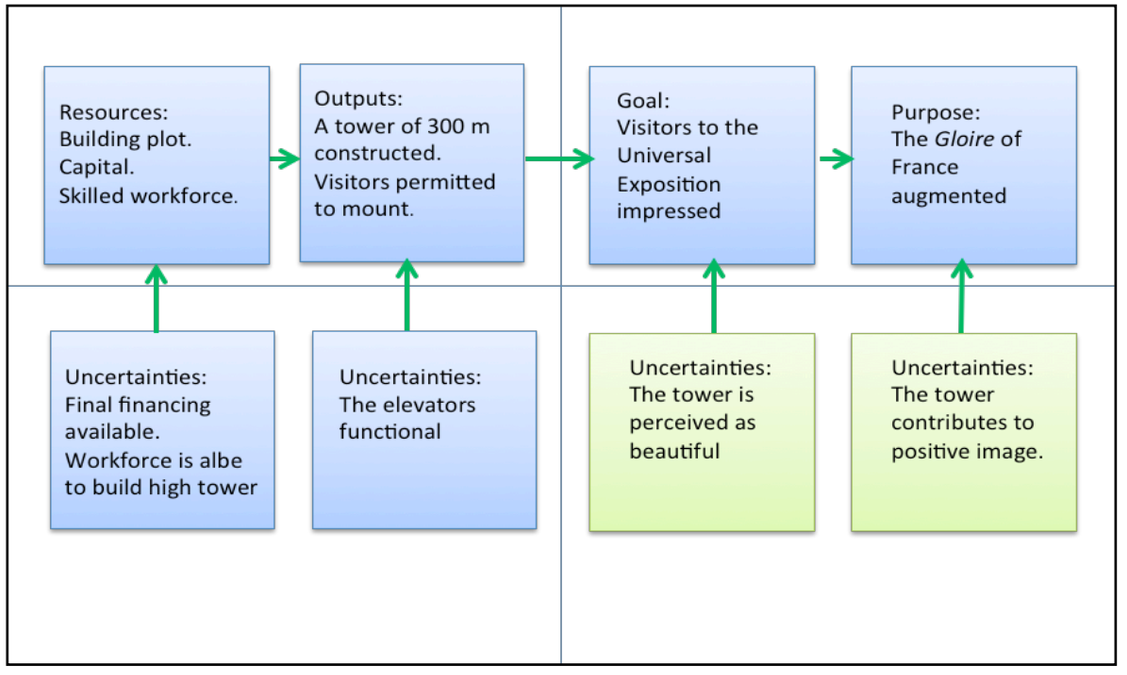


Figure 12 Uncertainties corresponding to the goal and purpose of the Eiffel Tower.

As we have seen, without the building plot, necessary capital and skilled workforce, it would not be possible to construct a tower of 300 meters. And without the tower of 300 meters, the visitors to the Exposition would not be impressed, and in consequence, the Gloire of France would not augment.

Equally, the goal and purpose are accompanied by corresponding uncertainties. The achievement of the goal, for instance, depends on the aesthetic judgement of the general public; if the tower is considered being monstrous, it will in fact not impress the visitors in any wanted manner. And in turn, if the visitors consider the tower as an abomination, the glory of France will not augment, rather the contrary.

By use of the logical framework, we can in this manner establish logical connections between the project proper and the wider context, incorporating and expressing objectives with their corresponding uncertainties. We can see that to each box correspond a set of uncertainties, identified and attributed to the appropriate level.

When examining the logical framework, we can observe a division between the output that is to be obtained by the available resources and the goals and purposes the project is thought to achieve. This distinction reflects the division in the responsibility of the project administration and the decision-maker. It is the decision-makers strategic identification of a need (the need to augment the Gloire of France) that leads to the tactical decision of holding a Universal Exposition of which the Eiffel Tower is a main attraction. The project administration (the Eiffel Company) is only responsible for the actual construction, the project, and the efficiency of its technical solution. The logical framework thus permits the illustration of the different areas of responsibility.

We have seen that the logical framework identifies uncertainties on all levels of the cause-effect sequence. The first one, the output (expected project results), is very likely to be satisfied as long as the contractor does his job on time, and that he is paid on schedule. What concerns the achievement of the goal (in the example of the Eiffel Tower) aesthetic perception depends mostly on the observer and is hard to really control. Lastly, the satisfaction of the society's expectation of the investment project, expressed as its purpose, is even more uncertain and would take even more time before it could be assessed. It could be that a certain project would be deemed successful with respect to producing the output, but the goal and the purpose might not be fulfilled because of factors outside the control of the project operations. In such cases, the project should not have been started in the first place, or it should have been redesigned to better tackle the hurdles that should have been identified a priori.

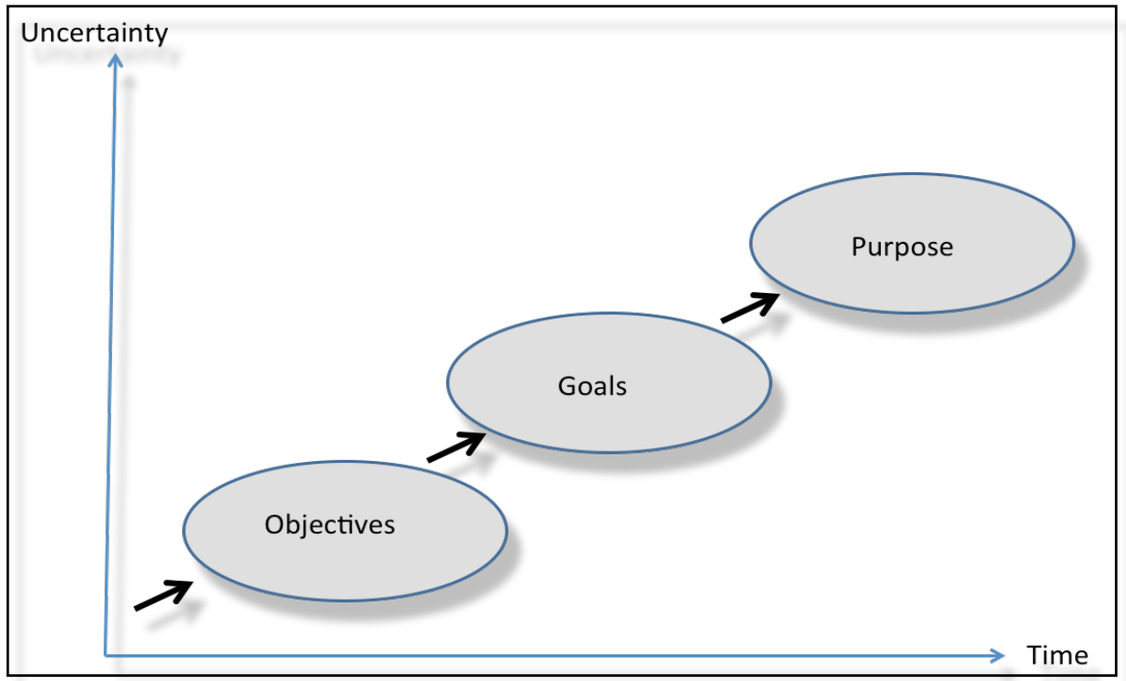


Figure 13 Assessing the uncertainty of the objectives in an investment project according to different perspectives.

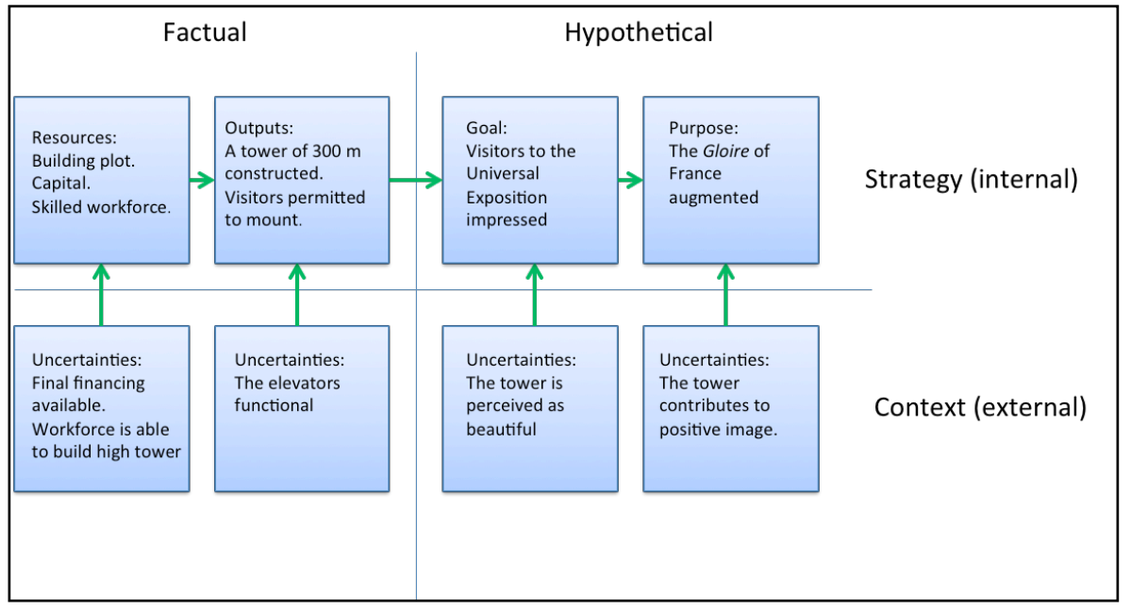


Figure 14 Logical framework; the case of the Eiffel Tower with divisions between project, objectives, strategy and context.

Generally speaking, we can say that "the operational objectives should be factual in the sense that the project is expected to fulfil these objectives with a high probability. The tactical and strategic objectives are hypothetical in the sense that the project is only one of several conditions that have to be fulfilled in order for the objectives to be realised" (Samset, 2003:23). In other words, the construction of the tower does not guarantee neither the awe of the visitors, nor the amplified glory of France.

Remark how the framework also permits to distinguish what is internal and what is external to the investment project. What is internal to the investment project is what we call the strategy, whilst what is external is what we call the context. We can consider this in light of the Eiffel Tower, thereby illustrating the logical framework in its full extension.

We will now turn our attention to the actual articulation of these main elements of the investment project, and describe procedures to assure their pertinence and representativeness.

Section 3

The Logical Framework Approach – the steps in the case of the Eiffel Tower

In the following, we will illustrate the procedure by the process leading up to the construction of the Eiffel Tower.

Step 1: Participation analysis

It is a core insight of modern sociological research is that different perspectives produce different motives, interests and priorities. Such diverse opinions might for instance be held by individuals particularly concerned by the investment project, community organisations, interest groups, and official authorities on several levels. We call all such parties holding an interest in the investment project stakeholders.

In order that an investment project is to succeed, it is of prime importance that the actual stakeholders are identified and that their interests are analysed and weighed. It is essential that the participation analysis is really involving all interested parties.

The interested parties can be divided in two groups, the internal and the external stakeholders. By internal stakeholders, we mean those directly involved in the investment project, i.e. the operator, the user and the financing party. In the case of the Eiffel Tower, these internal stakeholders were the Eiffel Company (operator), the Exposition organisers (user) and the Ministry of Culture (financing party).

To each of the different stakeholders corresponds different perspectives on the investment project.

The operator's main concern is the production of project outputs, here the Eiffel Tower itself. This involves a particular concern for the time, cost and quality of the agreed output.

The user perspective tends to be larger in scope and is concerned with the process into which the project output is a constituting element. This is including considerations relevant to what we have denominated the project goal, here the holding of the Universal Exposition.

The financing party perspective, finally, normally goes even beyond that of the user, being concerned with the societal process into which the process is implemented. This includes considerations of a more general nature concerning the wanted development of the society.

Stakeholders can also be external. This means that they affected by the actions realised within the investment project, but not directly involved in the investment project themselves. It is imperative to identify and examine the concerns of the external stakeholders, especially since a lack of appreciation of their can severely harm the progress of the investment project, or even threaten it entirely.

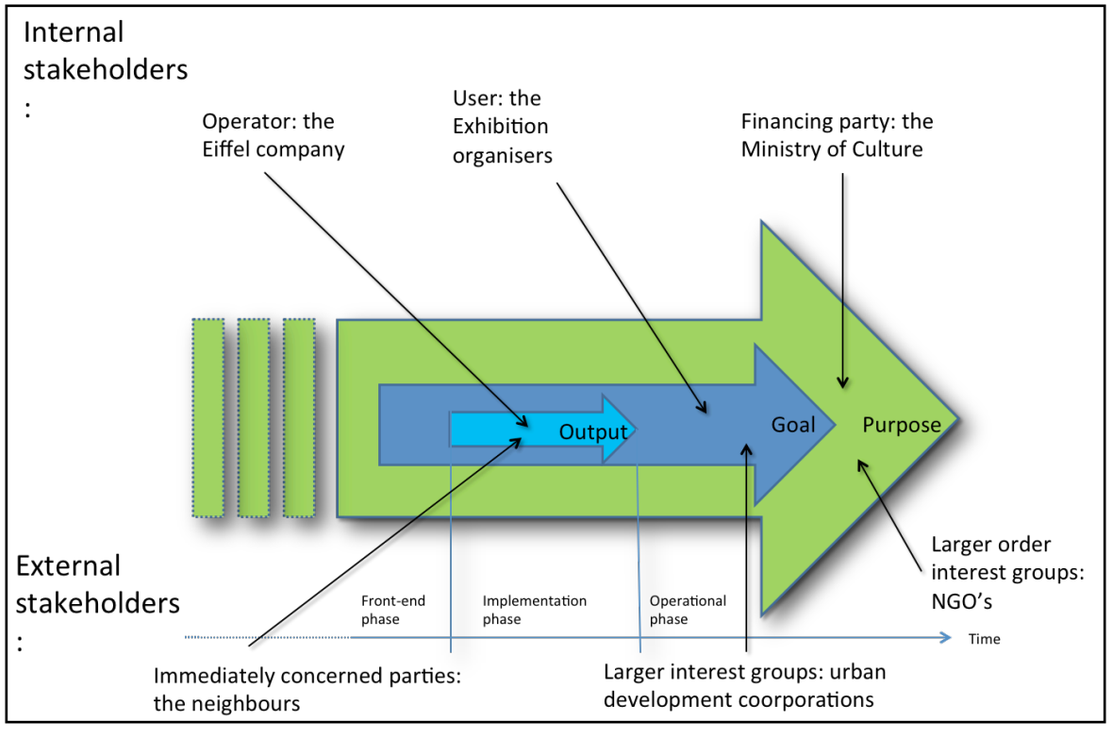


Figure 15 Main internal and external stakeholders, and their corresponding perspectives, in an idealised representation.

In the case of the Eiffel Tower, mainly two external stakeholders posed grave problems to the progress. The first we already have mentioned, that is the artists protesting against what they perceived as the sheer ugliness of the structure.

The other external group of stakeholders were the neighbours. "The Comtesse de Poix, along with her neighbour, filed a lawsuit to stop construction of the tower. Both were residents of the avenues abutting the Champs de Mars. [...] She holds that the building of the Eiffel Tower is not only a menace to her houses", reported The New York Times, but that it will block up for many years the most agreeable part of the Champ de Mars, and the only one in which she has been accustomed to take her daily exercise." (Jonnes, 2009:23) Not taking the concerns of the external stakeholders seriously can in effect implicate grave problems. The ensuing lawsuit, actually, delayed the construction of the tower considerably, and posed a real threat to it being possible to erect it before the opening of the Universal Exposition.

A well-designed participation analysis permits the inclusion of all perspectives and scopes we have identified as important to the decision-making process. Their interest in the investment project will come out as interests, i.e. the main needs seen from the different groups, and potentials, i.e. the capacities of the groups. One of the main interests in the participation analysis is thereafter the highlighting of linkages between these, i.e. establish major conflicts of interests, patterns of cooperation or dependency of the stakeholders. These will form the point of departure for the later steps.

Step 2: Problem analysis

On the basis on the viewpoints identified in the participation analysis, the situation is analysed, in that the main problems are identified and the main causal relationships between them are visualised in a problem tree. The problem analysis is intended to establish an overview over the situation and identify existing problems. It is important in this phase not to exclude possibilities, but to keep possible options open.

Problem analysis:

- Establish overview
- Identify existing problems
- Keep all possible options open

Certain semantic considerations are necessary. A problem in the meaning we are developing here is not the absence of a solution, but an existing negative state. The problem is not that a tower is not constructed, but rather that the true glory of the republic is misperceived.

The perceived main problem is thus identified as the core problem one needs to address. Let us consider the example of the Eiffel Tower:

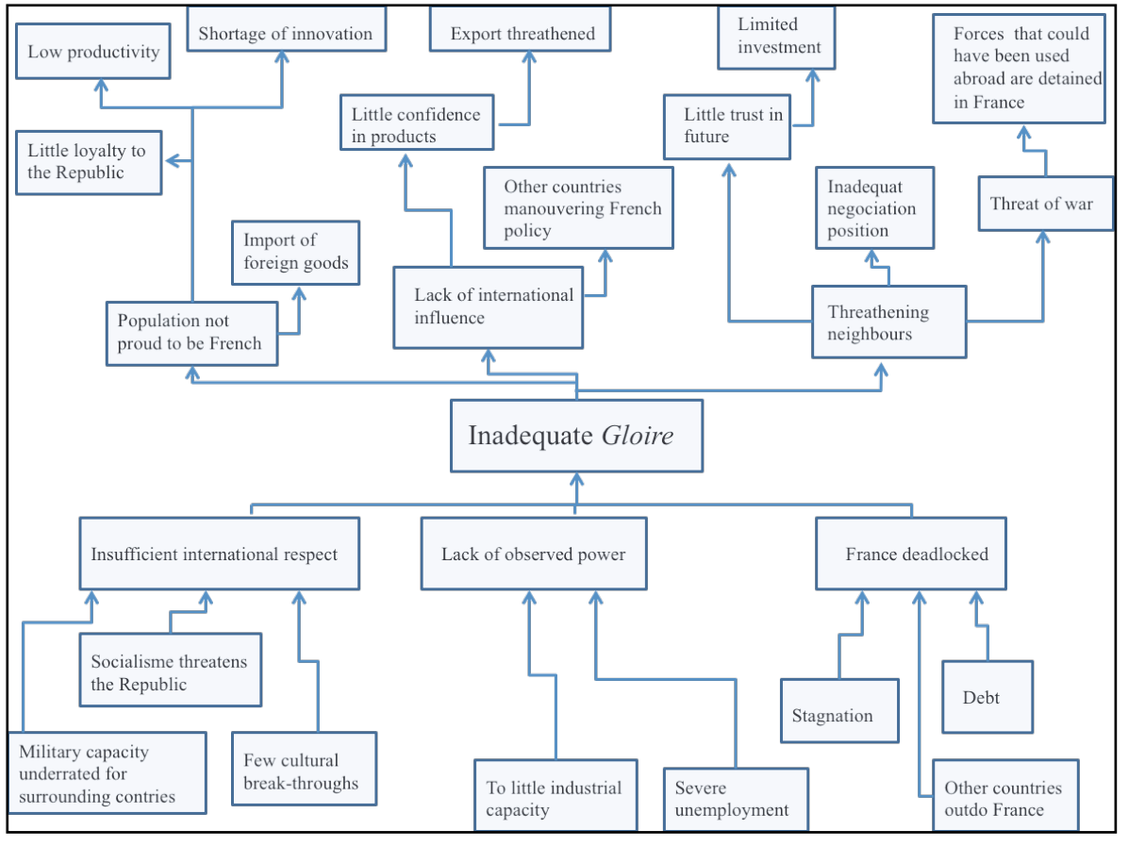


Figure 16 Problem tree.

That the lack of Gloire was perceived as the uttermost problem which occupied the committee might appear strange today; at the time of the construction of the Eiffel Tower, however, the opposite was true. As Jonnes comments:"The French nation badly needed to demonstrate its revived Gloire, which had been tarnished by Napoleon III's disastrous defeat in the 1870 Franco-Prussian war, the bloody revolt of the Commune, and all the ensuing political and economic turmoil" (Jonnes, 2009:6).

What is considered as problems and desirable states varies effectively with the cultural context into which the decision-making process is taking place. Considering the fact that forces are withheld in France rather than being able to continue colonial conquest in Africa and south-west Asia as a problem alienates 21st century readers. It cannot be doubted, on the other hand, that 19th century France judged this so. Similar considerations of cultural context have in fact been crucial in development investment project, where donor nations' cultural preferences collide with those of the receiving nations.

Step 3: Objectives analysis

"It is worth the pain to live in order to bring ones stone to the edifice of the common Gloire. Let us forget our quarrels and not think of other than the Fatherland. Let us invent, create, let us perfection our tools, join forces, instruct ourselves and become better! Let everyone heighten in himself, in his brain, in his own conscience, the spirit of France which has made so grand things, this old French heart, always ardent, always generous, always proud."

Charles Baïhaut, Minister of Public Works, Discourse pronounced on the banquet for entrepreneurs of public works in France, quoted in Les chantiers de l'Exposition Universelle, (1887:149)

From the problems analysis, the LFA continues into an objectives analysis. In the objectives analysis, the problem tree is transformed into a tree of objectives. The problems thus reformulated into positive statements, design in effect a series of desired conditions (future solutions of the problem) and presumably their logical interconnection. This latter is not, however, always the case, and the objectives tree must always be reviewed in order that its validity is assured. If necessary the tree can be adjusted, its statements revised and new objectives can be added. Make also sure that unrealistic objectives there do not appear.

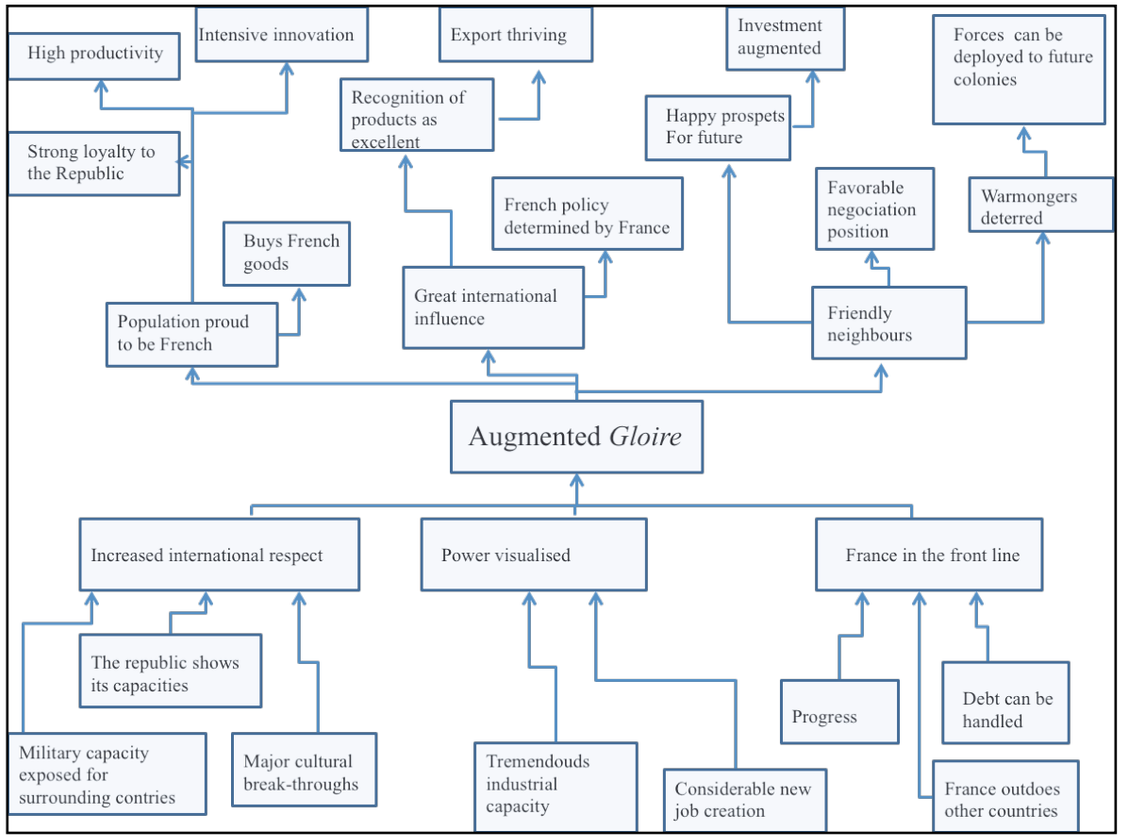


Figure 17 Objectives tree. The tree is based on positive, realistic formulation. It is important to assure the validity of interconnections, and to review the formulations if necessary.

Step 4: Alternatives analysis

After the objectives analysis, the next step in the LFA is an alternatives analysis. The concern identified and chosen as the main objective (i.e. augmenting the Gloire of France) can in effect be achieved through a wide array of alternative strategies, and the alternatives analysis aims at identifying these possible strategies. The different strategies should then be discussed in light of who will be affected by them and in what way (according to the participation analysis), their cost and risk. The alternatives analysis aims in this way at identifying different strategies and determine which strategy is most suitable.

Let us consider this in light of the Eiffel Tower.

As we have seen in the objectives tree above, the main objective (the purpose) was the augmentation of French Gloire. Several investment projects aiming at this could in fact be envisaged, ranging from a relentless stimulating of scientific progress, to the pursuing the policy of colonisation more aggressively.

As often is the case in large public investment projects, in effect, the alternatives analysis seems to have been biased by preconceived ideas. In his Rapport Général de l'Exposition, Picard evokes the "national sentiment" that arose from 1878 (date of the previous Exposition), identifying the date of 1889 as the due date for the holding of a new Universal Exposition (1891-92:303) of which the Eiffel Tower was to be the main attraction. The choice to host the Universal Exposition seems in this light not to have been held up against other alternative ways of augmenting French Gloire.

Such deficient alternatives analysis is in fact quite common. It is not so rare that today's decision-making processes resemble that of the Eiffel Tower. Consider for instance:

- Construction of prestigious cultural institutions, such as opera buildings
- The decision to host major sports events, such as the Olympic Games
- Be the first nation to land an astronaut on the surface of the moon

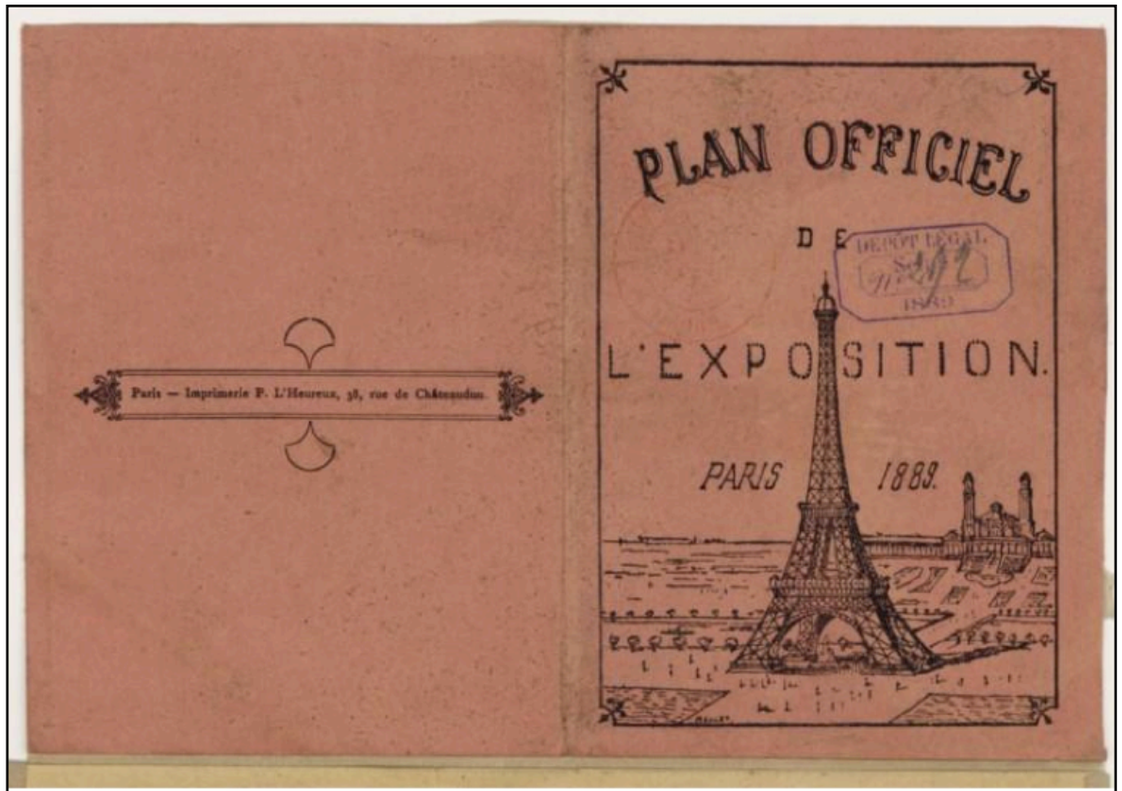
Step 5: Identify main investment project elements

Once the major strategy for the investment project has been chosen, the main elements need to be identified. This is the stage at which the main project elements are chosen and accompanying attribution of objectives are identified, along with the need for inputs.

The choice of an enormous tower that to all probability would not have any practical use besides being a spectacular view-point as the main element was not accidental either. Harvie argues that "the structure required for the exposition was almost certain to be a tower, of one sort or another; in the late nineteenth century, tower were becoming, at least in concept, all the rage. Engineers and entrepreneurs had been considering ways and means of erecting towers – usually characterised as "the tallest building in the world" – for many years" (2004:83).

It seems a bit rough to ascertain that there was not any alternative to the tower; as Jonnes comments, the proposal to make a giant replica of a guillotine the centrepiece of the exposition was judged "impolitic" (2009:21); it is fair to say, however, that such a focus of attention would probably have made quite an impression on the public.

The front page of the map to the Universal Exposition illustrates in effect the role of the Eiffel Tower within the Exposition clearly:



Source gallica.bnf.fr / Bibliothèque nationale de France

Illustration 2

The Eiffel Tower on the front page of the map to the exposition, leaving no doubt on what was the main constituting element of this latter.

It is important to note that in order for the logic governing the logical frame to be maintained, the project must significantly contribute to the realization of the objectives.

Step 6: Uncertainties

What we in the logical framework denote uncertainties are conditions that must exist if the investment project is to succeed, but which are outside the direct control of the investment project management. These conditions are thus considered external to the strategy chosen. Identifying the most important risk factors of an investment project concerns its actual feasibility according to the strategy chosen.

In the case of the Eiffel Tower, such uncertainties concerning the output of the investment project could be:

- *Visitors attending the Universal Exposition*
- *The French Republic being able to pay its contribution*
- *Stable political conditions*
- *Price of iron on world market*
- *Available workmen*
- *Natural disasters*
- *Etc.*

And even worse; uncertainties could afflict the objectives of the investment project, such as:

- *Visitors unimpressed by the structure, radicalizing its meaninglessness.*
- *The Gloire of France diminished due to the ridicule of the investmentproject.*
- *Etc.*

After the uncertainty factors are identified and articulated, their possible influence on the investment project is assessed. First determining which are important to the outcome of the investment project, secondly determine which can be controlled and how. If the external uncertainties are such that they reduce the probability of the investment project being a success, the overall strategy ought to be revised. The identification of uncertainties in this way illustrates the iterative nature of the LFA; the first steps ought to be reconsidered until an overall design has been found that does not if possible include such severe uncertainties.

Conclusion to the step-by-step analysis

The step-by-step analysis has gone from the scrutiny of stakeholders in the investment project, via problems- and objectives analysis, and reached the stage where different alternatives and the main investment project ingredients with their corresponding uncertainties can be subject to examination.

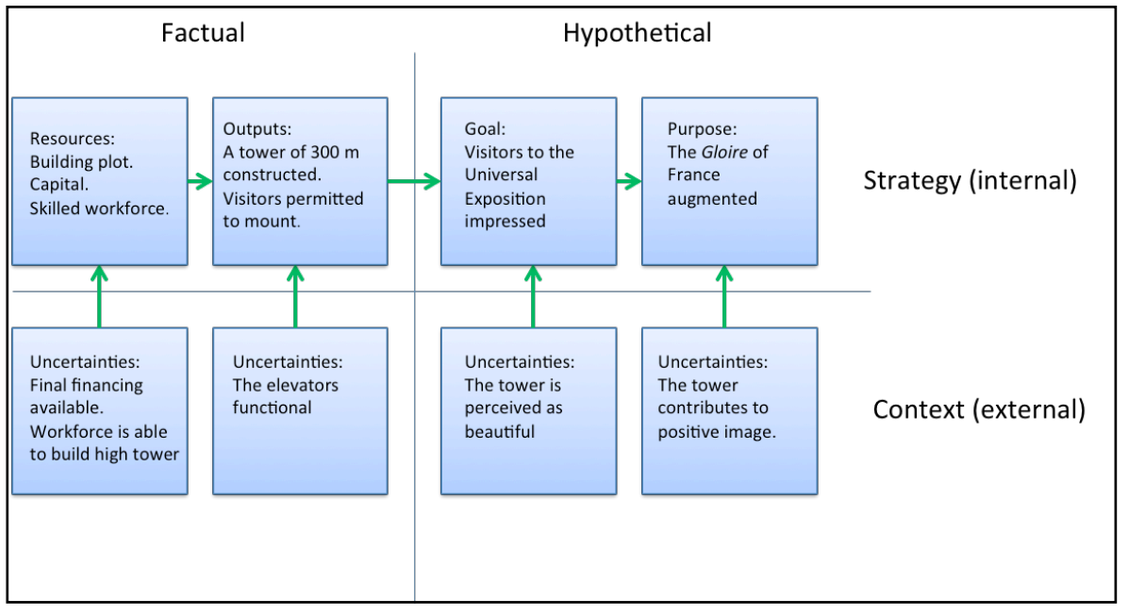


Figure 18 The LFA-grid as it appears in light of its constitution. The analytic movement goes from identifying the purpose of the investment project, to derive goals and outputs based on strategic considerations.

In chapter 2.2, in order to elucidate its internal logic, we presented the logic governing the logical framework as going from the resources via the project output and the goals to the purpose. In light of the step-by-step proceedings of the LFA, we can see how the process in fact proceeds the other way around. An overall purpose is identified, a more tangible goal is formulated, an objective (output) is determined, and the necessary resources are identified. As the process progresses, it becomes more tangible and focused, it narrows down and is deepened.

In this way, the LFA assures that the individual investment project is seen in the perspective of the societal processes initiating it, rather than as an accidental occurrence.

Section 4

Aiming at consensus and weighing of alternatives

It is worth noting that the LFA is a consensus based methodology. It offers the advantage of systematically mapping out all important interests and identifying possible conflicts between the different stakeholders concerning the design of the investment project.

What then if consensus cannot be attained?

Generally speaking, there exist two solutions. One can either try further efforts, reshaping the investment project in order to reach a solution in which all stakeholders are satisfied. Or it is possible not to proceed further, and a decision has to be made without entire general agreement.

In fact, the general phenomenon merits consideration. Generally speaking, to which extent are the different interests to be listened to? And are all perspectives and stakeholders interests equally valuable?

Numerous were in fact they who were affronted by the protests of the artists and writers protesting against the construction of the Eiffel Tower. Arsène Alexandre (1887:148), for instance, scorned the infuriated aesthetes:

"M. Boulanger and his forty friends, were they Egyptians, would in old times have protested against the construction of the pyramids, in the name of Art."

That someone protests, in other words, does not necessarily mean that their protest ought to be taken into account. In the case of the Eiffel Tower, the above referred lawsuit that the Comtesse de Poix, along with her neighbour, filed against its construction, illustrates this point. One thing is their fear that their houses were threatened by the tower, a collapse of which would have been a true disaster, but what to say about her protest on basis on that the tower was to occupy the part of the Champ de Mars on which she was most accustomed to take her daily exercise? At any rate, that the protesters actually did achieve halt the tower for about a month (Jonnes, 2009:25) until Eiffel promised to indemnify the state for any possible damages caused by the tower.

In the complex lifeworld in which investment projects are assessed front-end, conflicting interest are bound to exist, but the procedures of the LFA helps identifying the level to which such disagreements correspond, a fact that may improve dialogue.

Section 5

Possible grounds for devious assessments

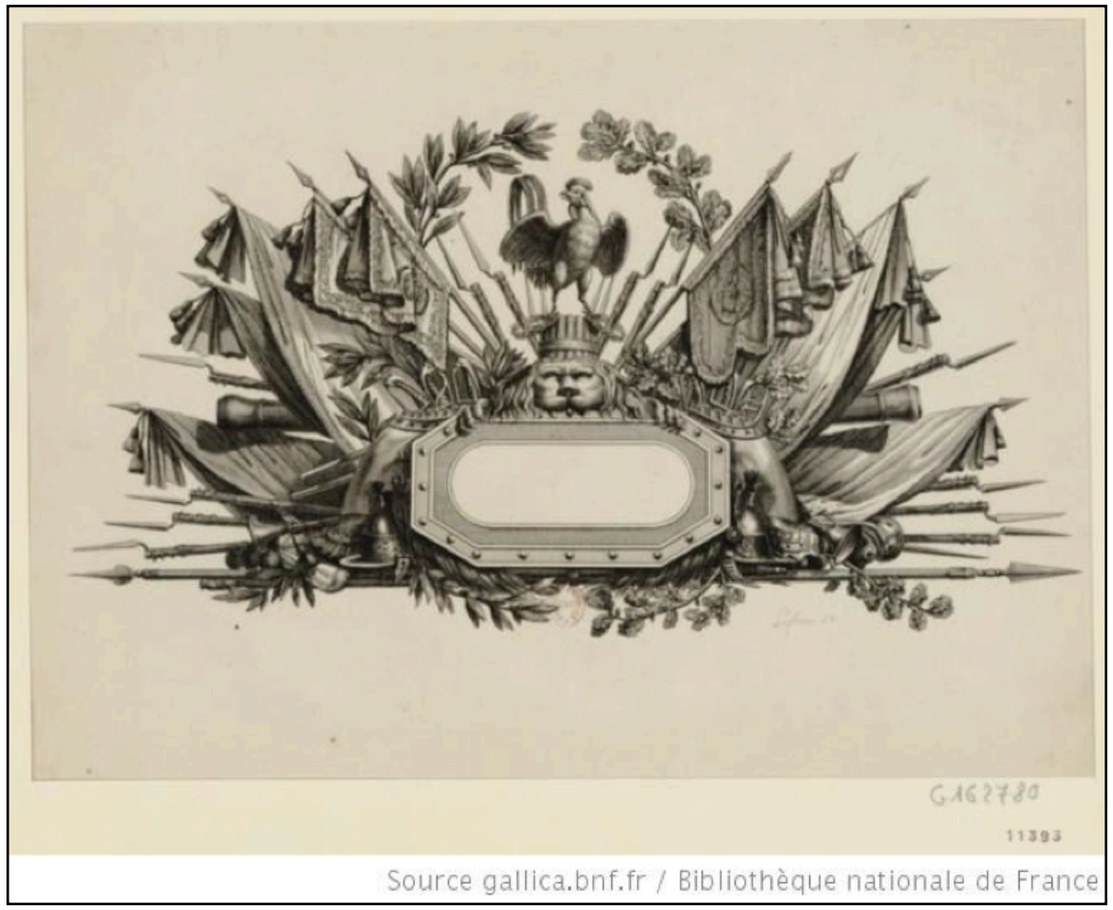


Illustration 2

In addition to Marianne (the female hero incarnating revolutionary virtues such as freedom, liberty and equality) the coq is an icon of the French nation. Often portrayed in more belligerent surroundings, it has been taken to represent the aggressive nature of French pride. The association of the Exposition with the coq rather than with Marianne can easily have dissuaded the neighboring countries from participating. At any grounds, the symbolic charge of investment projects is not to be underestimated.

The inner mechanics of the LFA is based on the identification of the objectives of the investment project. It is important to see that such identification is not a neutral exercise.

Again, the process leading up to the construction of the Eiffel Tower exemplifies the challenges involved in the identification of objectives. Consider for instance the purpose of the Exposition of which the tower is to become the iconographic emblem. When examining the official papers leading up to the Universal Exposition and in consequence to the construction of the tower, there is no doubt that the purpose of the event is to promote France's place among the modern nations, by exposing its technical advancements and productive capacities.

Europe in the 1880's, however, is not any sort of neutral territory. The centenary of the French revolution also marks a bloody centenary of conflicts and war, territorial disputes and colonial expansion, during which primarily the European powers affronted each other on a regular basis.

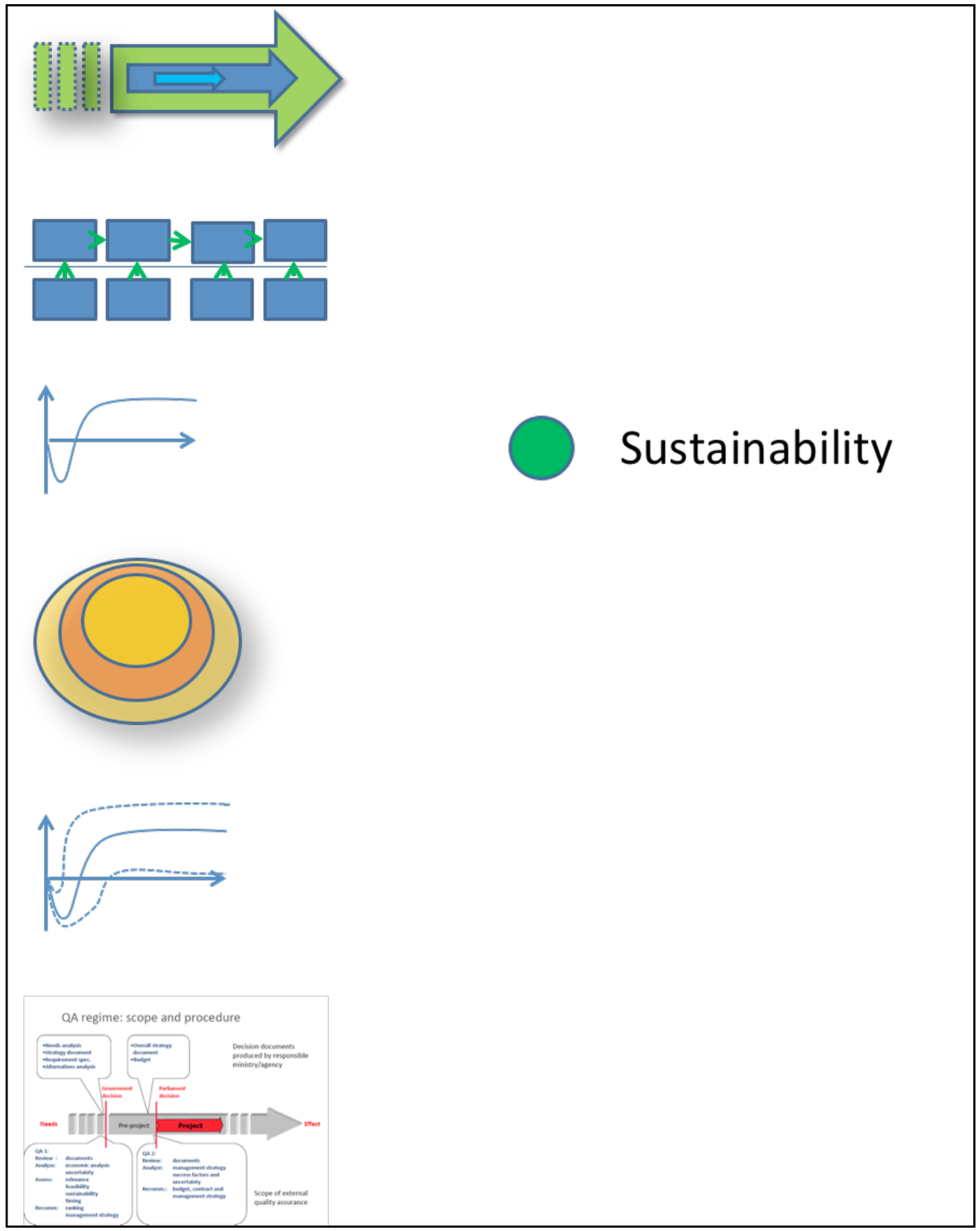
This is the probable reason why the responses to the general invitation to all nations of the world to participate in the Exposition were rather unenthusiastic, if not directly hostile. As Jonnes comments: "The great European powers responded with hostility, for while the republican government might insist it's fair was celebrating liberty, science, and technology, Europe's monarchs viewed it as a celebration of the downfall and beheading of kings and queens" (2009:7). The result was a major renunciation to participate, either on the basis of it being out of date (Germany), on diverse political or purely ideological explanations (Russia, Austria), on the proclamation of poverty (Turkey, Italy), or on other, non-specified reasons (Belgium, Holland, Romania).

It is in fact easy to underestimate the challenges involved in the process of identifying and rendering explicit the objectives of an investment project. The danger is always present that the assessor considers his own perspective as pure and unbiased, and that the result of his assessment is the pure and unproblematic truth. In reality, points of view, cultural preferences, professional training and individual attitudes influence all judgement processes.

Finally, and most importantly in this context, we can ask if the motives for promoting the preferred concept stem from a sense of urgency and thereby downplaying the long term performance requirements, that is, the sustainability of the investment project. It is to the examining of the conception of sustainability that we now turn.

Chapter 3

Sustainability



Section 1

The five success criteria

In the first chapter, we have seen that investment projects can be assessed according to different aspects and perspectives. We have seen that to the different perspectives correspond different objectives. In the second, we have examined the use of the LFA as an analytical tool aiming at the identification of these objectives, with their corresponding uncertainties. The question which will occupy us in this chapter is the systematic approach to measuring to what extent the investment project can be said to accomplish these different objectives. That is, we need criteria onto which measure whether or not the objectives are reached, as well as to assure that the investment project has not entailed excessive negative consequences.

The OECD (2010:13-14) has developed five such criteria, notably effectiveness, efficiency, impacts, relevance and sustainability. These are the success criteria of investment projects, and in this chapter we shall see why the criterion of sustainability is the most important one to consider in a front-end assessment.In fact, assessing the success of an investment project is not an obvious task. Cost, time and quality, for instance, are the traditional indicators used to measure project delivery. They are, however, not sufficient to measure the success of an investment project, as they do not necessarily take in the larger picture, involving societal needs and possible environmental challenges. An investment project that is perfectly accomplished can be totally irrelevant to the goal or purpose it is supposed to fulfill, so the assessment of solely time, cost and quality as indicators of success is clearly insufficient. It is in order to assess the success of investment projects according to all relevant perspectives that OECD has introduced its five success criteria. The following preliminary definitions can provide a first comprehension:

- **Efficiency:** A measure of the "productivity" of the implementation process – how well economic inputs are converted into outputs.

- **Effectiveness:** A measure of the extent to which an investment project is successful in achieving its goal.

- **Impact:** Positive and negative changes produced, directly or indirectly, as a result of the investment project.

- **Relevance:** The degree to which the output of an investment project are and will remain suited to the overall goal and purpose

- **Sustainability:** The extent to which the users will continue to find that their needs and concerns are being served, without the investment project causing negative effects that outweighs the positive ones in the long run.

The scope or domain of the different success criteria according to the objectives if the investment project can be schematically illustrated as follows:

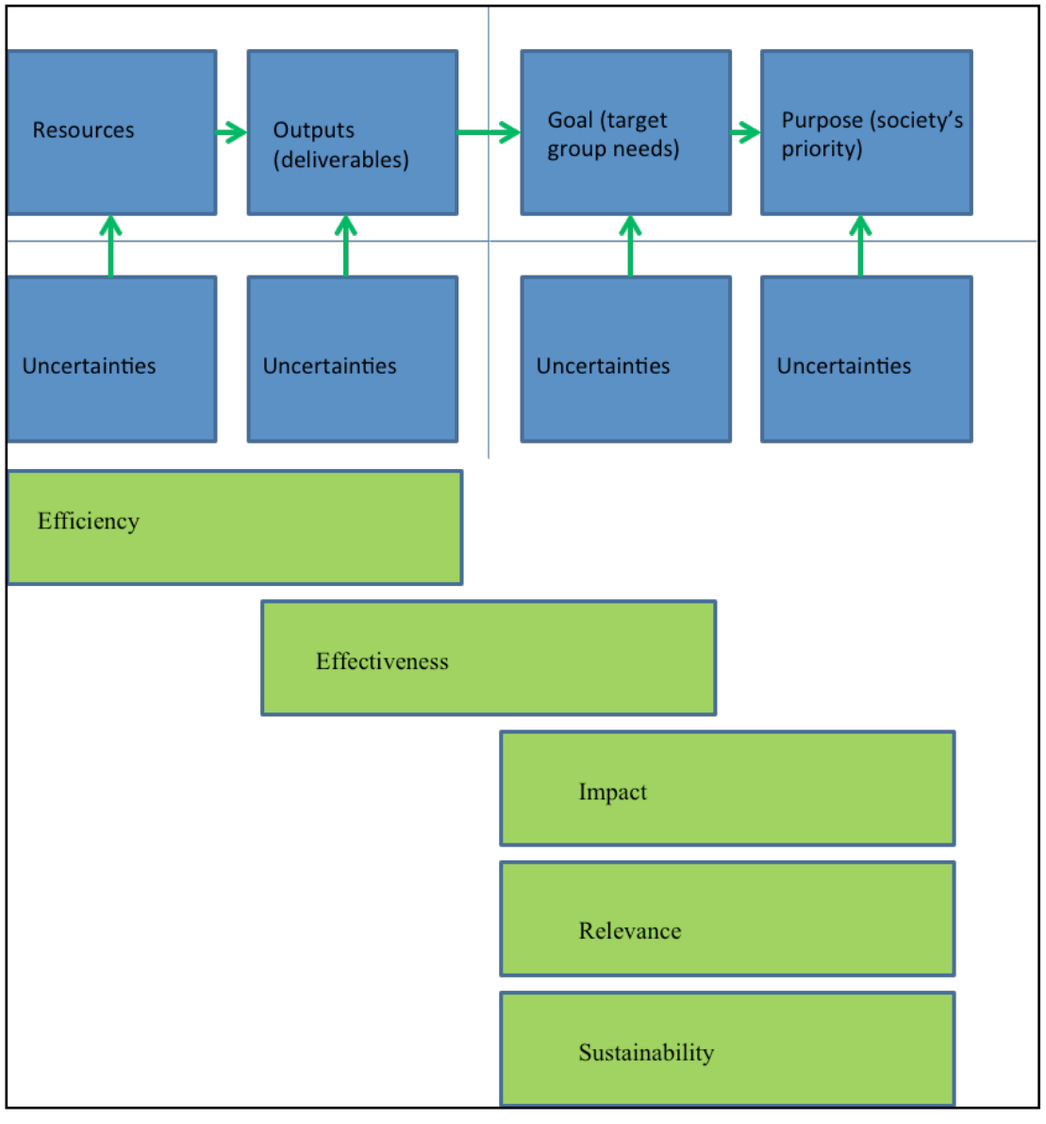


Figure 19 The criteria for assessing the success of the investment project in relation to its objectives (inspired by Samset, 2003). From this figure, we can see that the criteria of efficiency concerns the relationship between the inputs and the outputs of the investment project (its project deliverables), the effectiveness concerns the question of to which degree the output was effective in achieving the goal for which it was constructed, while the three last criteria (impact, relevance and sustainability) concerns the question of knowing if and to which degree the investment project was effective with regards both to its goal and purpose.

Section 2

The success criteria exemplified by the Eiffel Tower

The importance of assessing the different criteria on different stages of the investment project is not equal. Let us illustrate this by using the example of the Eiffel Tower.

Efficiency

The efficiency of the investment project is most important in the execution phase. This is not the only time when efficiency is of importance, but the execution phase is the time when high or low productivity have the greatest consequences. This is the phase when it is possible to influence on time, cost and quality.

The Eiffel Tower was constructed with significant cost overrun and at considerable more time than planned. Strikes hindered the work at two occasions. On the other hand, it was a huge technical achievement, bringing out the finest of French engineering capacities. All metal pieces were prefabricated on the Eiffel Company factories, and no fitting was necessary on the actual workplace of the tower, where the staff never went beyond 250 workmen. No mortal accidents happened.

Effectiveness

The effectiveness of an investment project concerns the degree to which the outcome of the execution phase reaches the goals put forward. With effectiveness is thus understood the degree to which the outcome is capable of producing a specific, desired effect, and it is not necessarily linked op to cost, time and physical quality.

The Eiffel Tower opened in time for the Exposition, and became its unrivalled symbol. Close to two million visitors mounted the tower the first year of its existence, and admiring reviews abound. For his achievement, Eiffel receives the order of the French legion of honour, a mark of distinction rarely obtained at the time.

Impact

Large investment projects commonly result in a complex set of changes. Normally, some of these are positive, others are negative. Some of them are direct, others indirect. Building a bridge to an island can ameliorate the traffic situation of the islanders, but might expose the island wildlife to mainland predators. Some of the changes are predictable, while others are less predictable. That tidal flows are affected can be expected, that nuns choose the island as location for a cloister can sometimes be impossible to foresee. We call all these changes the impacts of the investment project. An investment project is not a success if its negative impacts are of such a nature that they largely overshadow the positive outcome.

Illustration 3

Repainting higher parts of the Eiffel Tower. The efficiency of a project also includes further technical aspects of the investment project, such as maintenance.

The Eiffel Tower quickly, and unintentionally, surpassed the intended frame of the Universal Exposition and became a major symbol for the city of Paris itself. It is difficult to come across negative impacts beyond aesthetic concerns. The original intention of tearing the structure down 20 years after the exposition was abandoned and the structure continues to dominate the Parisian skyline today.

The above considerations, however, are all subsequent to the question of what needs the investment project is thought to satisfy, and what changes it will cause in the long run. The questions concerning the execution phase are of less interest at the opening stage of the assessment, since they are subsequent to the questions of whether or not to execute the project. The questions why and which changes it will cause in the long run are addressed by assessing the relevance and sustainability of the investment project.

Relevance

What we here call relevance is the degree to which the investment project responds to the demands and priorities on basis on which it was initiated, i.e. its appropriateness in relation to policies, needs and priorities. If the investment project is not relevant to the user, it will not be used, and if it is not relevant to the owner, it will not give the effect intended. No matter how technically successful an investment project might be according to all of the above criterions of success, without relevance it will simply not be successful.

The society as a whole is the perspective when judging of the relevance of an investment project. Society disposes limited resources, and prioritising between different needs is inevitable. If the chosen investment project is not used according to these needs, it is not relevant in the sense that society as a whole ought to have prioritised another investment project. Assessing relevance, then, is an overall assessment of whether the investment project (or the investment project alternative considered) is in accordance with national and regional policies, as well as with local needs and priorities. This is methodologically challenging, considering that the perceived needs and priorities vary according to the viewpoint of the different parts of society.

The critics of the tower dreaded the lack of the public's eagerness to use money on such a horrific monument as the Eiffel Tower. The result, they feared, would be an abandoned tower, financially unsound, and let alone to rust. Rather than a monument of French glory, it would then dominate the city as a witness of incompetence and pomposity.

The supporters of the tower, with the Minister Lockroy and Eiffel as the chief characters, correspondently answered that the beauty of the tower would appear gradually as it rose towards the sky.

In order to assess relevance, some key questions can be whether all project objectives are in line with needs and priorities, whether the investment project alternatives should be changed and whether one of the investment project alternatives should be recommended by the appraiser.

Sustainability

The success criterion of sustainability is complex, and must be well defined in order to understand what is meant by it. The term is derived from Latin, and is composed of the two parts sus (up) and tenare (to hold). In this sense, we can define its meaning as the propensity to hold up, support and make something last. Based on these conceptual roots, we can define sustainability as the consideration of ability to deliver future net utility. What does this mean?

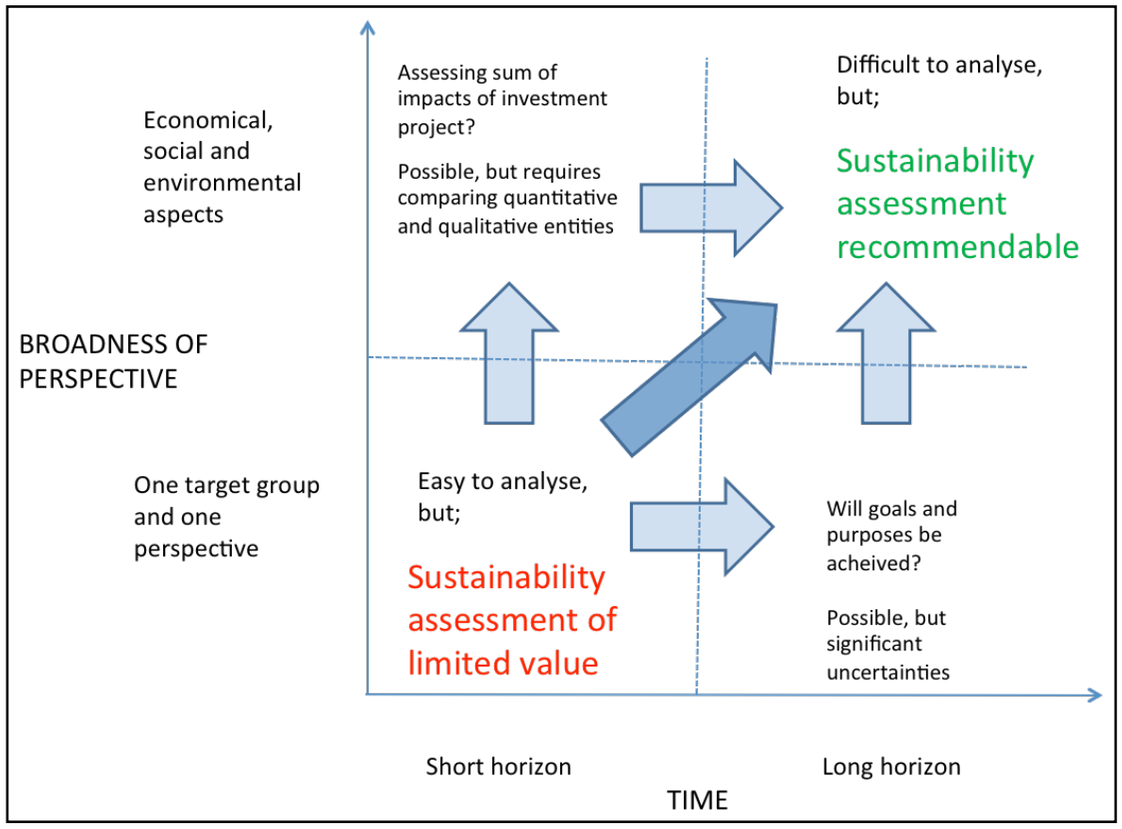


Figure 26

Need for and feasibility of sustainability assessment. Assessment of the sustainability of investment projects demands both a broad perspective and long horizon. Broadness of perspective combined with the long temporal horizon, however, makes assessing sustainability inherently difficult.

Above, we have considered how the investment project emanates from a larger societal process, which aims at specific goals and purposes. Considerations on the sustainability of the investment project assess the degree to which it continues to fulfill these goals and purposes over time. It is not sufficient for a bridge only to stand on the day it is delivered from the entrepreneur, to be said to be sustainable it must continue to stand for many years. Equally, to be sustainable, it must not only permit islanders to leave the island to which it was constructed, but continuously to support the regional economical development as it was meant to.

The time perspective in question varies according to the nature of the investment project. A major IT-reform can have a provisioned live span of only a few years, and still be considered sustainable. The sustainability of houses constructed in order to resist earthquakes, on the other hand, will usually be considered in the perspective of several centuries.

Generally speaking, we can say that the fulfillment of goals provides considerable utility, but that this is not the only element which needs consideration. The investment project will normally have other noteworthy impacts. Nearly all investment projects, for instance, involve negative impacts in their initiation. This is by no means limited to the stress involved in building processes. Comprehensive organizational changes or introduction of major IT-systems can easily perturb the functioning of the organization for a long time. Some investment projects, such as major healthcare reforms, are in fact such that they can threaten the political stability of a nation for a period. When assessing its sustainability, therefore, other effects beyond the hierarchy of objectives need consideration. It is in light of the need to get a better comprehension of what this means that we define sustainability as net utility. Net utility can be defined as the positive impacts of an investment project minus its negative impacts. The figure illustrates what might be a typical example of the impacts of an investment project. Initially, great investment costs are involved before any real return can be expected. Equally, dust, emissions of various sorts and noise influence the environment. Finally, the investment project can alter or hinder the standard of living and working conditions of people. Further on, as the implementation phase is finished, the image is altered. Return on investment starts coming in, the environment no longer witnesses prolonged damages and people are back at work.

Sustainability:

- Sustainability = future net utility.
- Net utility = utility – negative impacts.

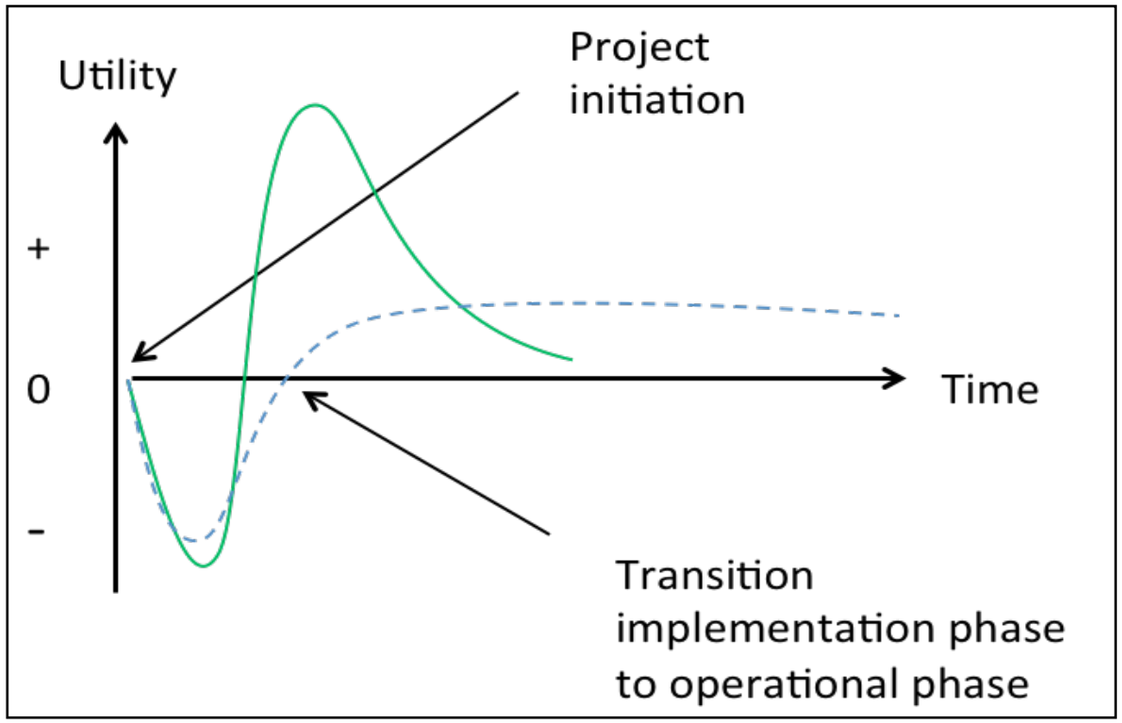


Figure 21

Different utility profiles of investment projects over time. The green line indicates high utility over short time, the broken line low utility over long time. Both give equal utility.

The idea of the conception of sustainability as net utility, then, is the weighing of these negative and positive impacts. After this, it can be determined whether or not the investment project produces any positive utility or if it on the contrary produces negative utility.

As investment projects are differentiated, the consideration of net utility will vary accordingly. The timeframe of two investment projects can be radically different in their profile of net utility (high utility over short time vs. low utility over long time), but can both be sustainable. It is worth noting that the term net utility does not include only the impacts that the investment project was originally intended to fulfill. All future impacts, both intended and unintended, are considered in the assessment.

Section 3

Mazimizing relative net utility for optimal sustainability

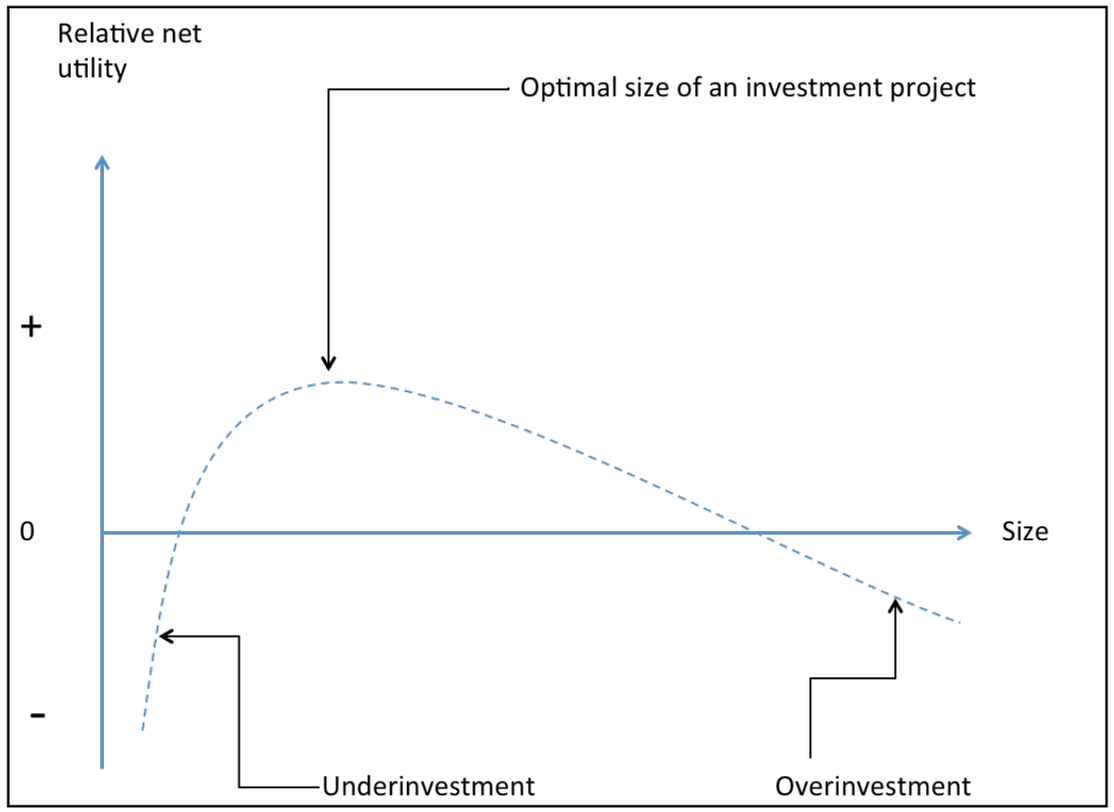


Figure 22 Exemplary illustration of relative net utility over size. Both underinvestment and overinvestment can turn that the relative net utility of an investment project to negative numbers. The causes to both over- and underinvestment will vary according to the nature of the investment project.

In order to assess the sustainability of an investment project, then, one needs to examine the anticipated impacts and judge whether the expected utility of the investment project exceeds the sum of the negative impacts. The result comes out as the net utility of the investment project. Once established the net utility of the investment project, it is time to consider whether it is possible to optimising it. An investment project, in fact, is not an absolute entity. Its dimensions and shape might be adjusted according to what is its optimal size.

Optimising sustainability

- Relative net utility = utility relative to size.
- Optimal sustainability = maximizing relative net utility

The consideration of what is the optimal size or ambition of an investment project is of vital interest. If the investment is too insignificant to procure the desired impacts, the expenditure will render its relative net utility negative. Constructing only a fragment of a road, for instance, will not improve the traffic situation in such a manner that the investment can be justified. On the other hand, overinvestment also causes the investment project to produce negative relative net utility. The rendering of a six-lane highway is not sufficient to defend the invested capital, if a two-lane highway could produce the intended effect. We can illustrate this in the following manner:

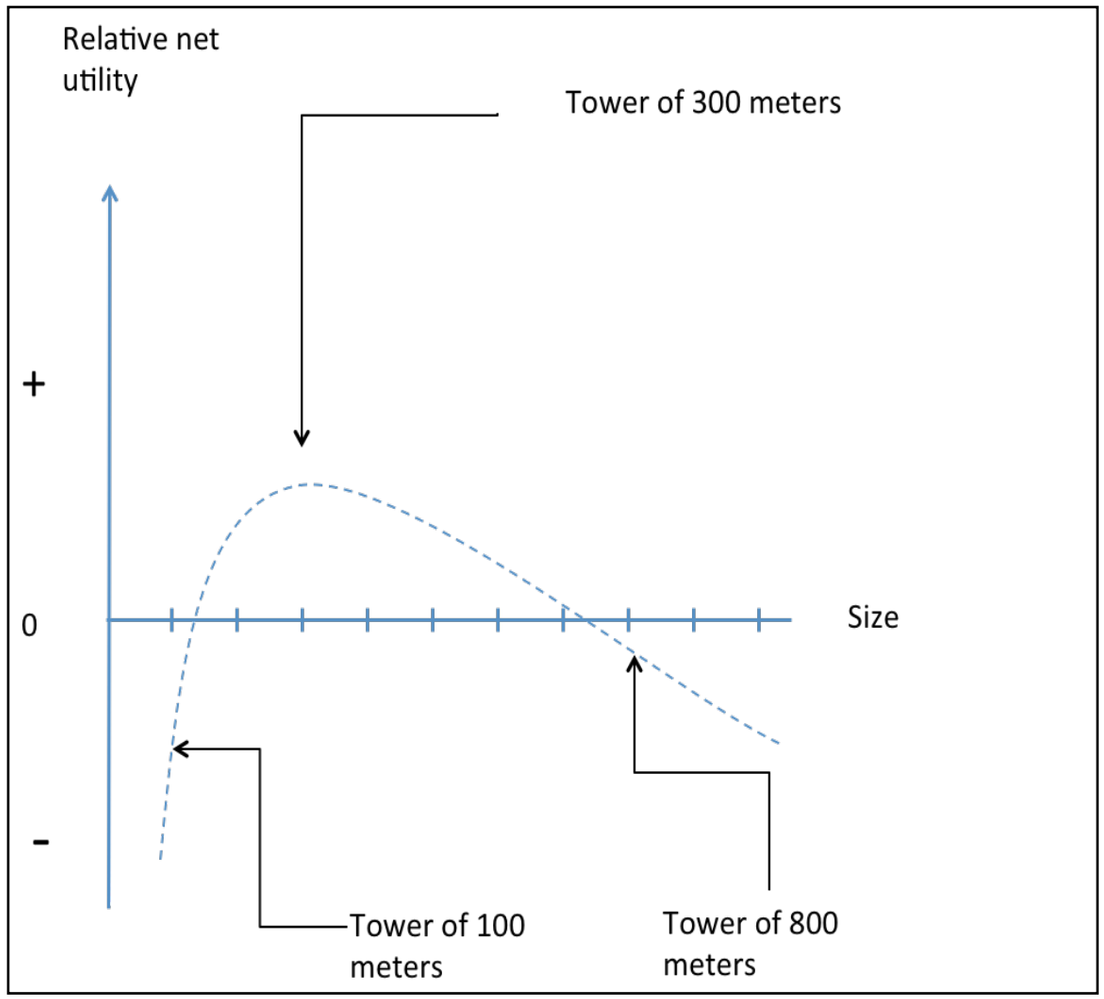


Figure 23 Relative net utility over size, in the case of the Eiffel Tower, with alternative heights. The dotted curve indicates that 300 meters is probably the best choice.

Again, we can illustrate this by referring to the Eiffel Tower. In case of the tower, a construction of 100 meters would with all probability not have impressed the spectators sufficiently to assure a satisfactorily net utility, and it would therefore not qualify to be considered sustainable. A tower of let us say 800 meters, on the other hand, would probably have stretched the limits of the engineers of that time too far. The extra resources needed to augment the tower further would probably have implied costs and uncertainties largely overshadowing the utility (i.e. the further esteem from the spectators) of the further heightening. In order to complicate the picture further, we can equally addition a sort of benchmark level, that is, a degree of utility demanded from the financing party when assessing and initiating alternative investment project in general:

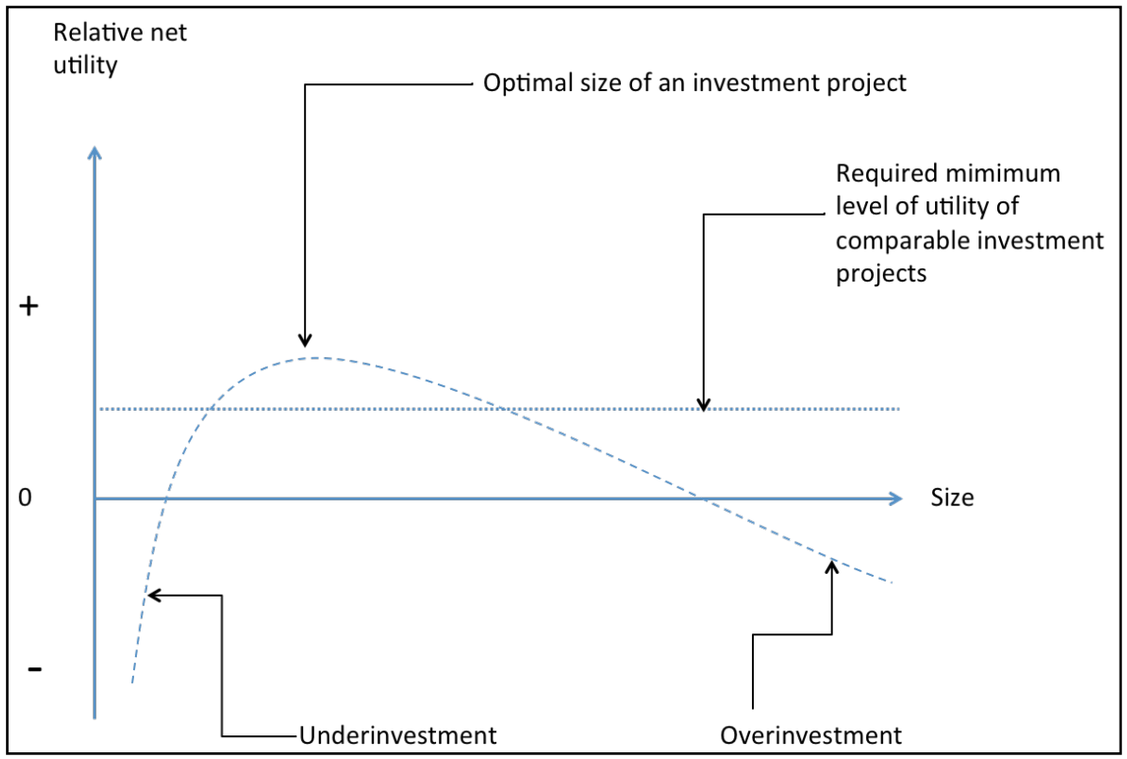


Figure 24 Relative net utility over size, and introduction of benchmark for demanded level of utility. The minimum level of utility will vary according to investment sector.

Actually assessing and optimizing the sustainability of the investment project in the front-end phase is not, however, as simple as the above figures might suggest. Hypothetical data, risk and uncertainties of various nature pose problems to those who want to assess to what extent the expected long-term impact justify investment.

Section 4

Sustainability – the three pillars

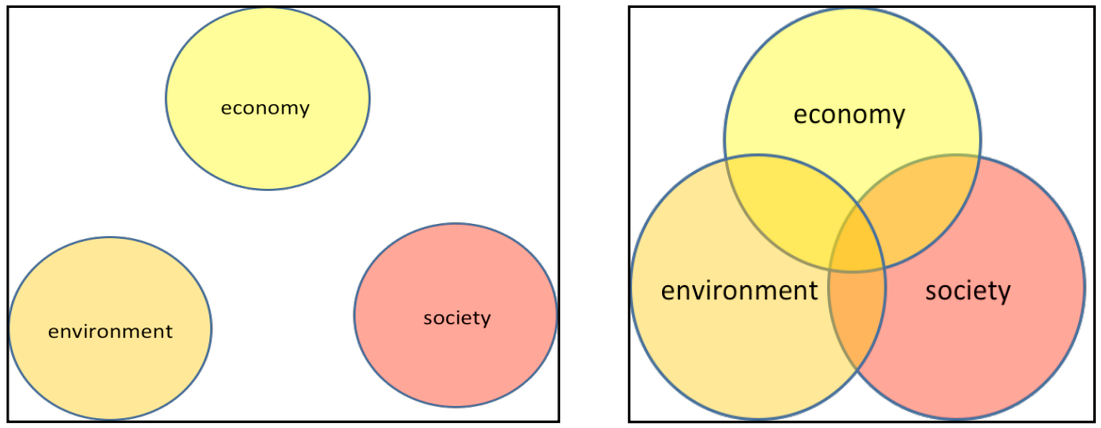


Figure 25 Sustainability as the intersection of economical, environmental and social sustainability. Rather than seeing economical, societal and environmental questions as discrete, separate entities, one can see how the idea of sustainability prerequisites the intersection or even the confluence of the different perspectives.

We have thus seen the sustainability defined as future net utility of an investment project. It is clear, in light of the complexity of the conception of sustainability that we have already remarked, that some kind of classification is necessary in order to organise the information concerning sustainability.

The United Nations (2005:12) concluded that sustainability requires the reconciliation of economical aspects, social aspects and environmental aspects. These three were denoted the three pillars of sustainability. Note that these three pillars are to be considered as wide conceptions, assembling such questions as concerns the financial viability, legal anchoring, political accept, institutional framework, technological development, socio-cultural tendencies, ecological protection etc. The point is to make sure that the assessment can be done in a sufficiently broad manner.

When assessing the sustainability of an investment project, the main idea is that a balance between the pillars must be achieved – an investment project cannot be sustainable no matter how successfully it is according to one of the pillars, if it is fails according to the others. No system should be outbalanced, neither the economy, nor the eco-systems or the social organization of society.

In development projects, from where the term sustainability originates, social development is often a main target. If investment projects are to be viable, one must be certain that they are also environmentally and economically sustainable (OECD, 2010). One of the main challenges involved when aiming at sustainability is the future financing of the activities, this being dependent on it being legitimized, having good governance and the ability to tackle change.

Also elsewhere, we find investment projects primarily directed towards social conditions. Examples can be the introduction of different requirements concerning work conditions or security, or especially prioritized groups.

A more common situation, however, is that investment projects are conceived too narrowly when focusing only on their economical aspects. The investment and maintenance costs result in future income, and net profit is upheld as the dominant criterion for the actual investment to take place. The investment project can, however, have considerable unwanted effects, both social and environmental. Such effects tend to be overlooked (they are often considered external to the investment project and their cost therefore be excluded in the consideration of net profit), but can over time become so considerable and entrain such consequences that the entire investment project from society's perspective must be considered a failure. It is worth remembering that modern states are not profit-maximizing organizations, but intended to maintain all present and future inhabitants, their well being and general welfare. In short, assuring the sustainability of investment projects is a matter of balancing different perspectives and priorities. This demands that the state concerns itself with all the three pillars of sustainability.

Section 5

How to assess sustainability? Indicator suites

As our main concern in this book is to examine methodological procedures and considerations, we will not elaborate on what is to be understood by economical-, social- and environmental sustainability respectively in an extensive manner, simple propose a list of indicators onto which an assessment can be based. The following indicators are inspired by Donald Macrae (2008).

Economic sustainability indicators:

- Accessibility
- Traffic congestion
- Infrastructure costs
- Consumer costs
- Mobility barriers
- Damages by accidents
- Non-renewable resources

Social sustainability indicators:

- Equality
- Consequence for handicapped
- Less expensive consumer products and services
- Effects on health
- Coexistence and discrimination
- Living conditions, living standard of the local society
- Aesthetics

Environmental sustainability indicators

- Air pollution
- Climate change
- Noise and noise control
- Water pollution
- Effects of water resources
- Housing and households
- Deterioration
- Non-renewable resources

It is worth noting that all such lists are subject to controversy. Such controversy is not surprising, given that what you put into a list of this sort to a large degree determines the outcome of the assessment.

Intuitively, considering sustainability as ability to deliver future net utility is easily comprehended. The combination of this formulation with the other aspect included in the definition, that is the fulfilment of designed goals and purposes over time, makes the sustainability of investment projects naturally difficult to assess.

We have defined sustainability as at least twofold. It concerns both the utility produced by the investment project in question, and its achievement of specified goals and purposes. The consideration of the net utility of the investment project demands a wide perspective (over a long time), whilst the consideration of the achievement of goals and purposes demands a long temporal horizon. Together, this means that anyone wanting to assess the sustainability of an investment project needs both a broad perspective and a long temporal horizon.

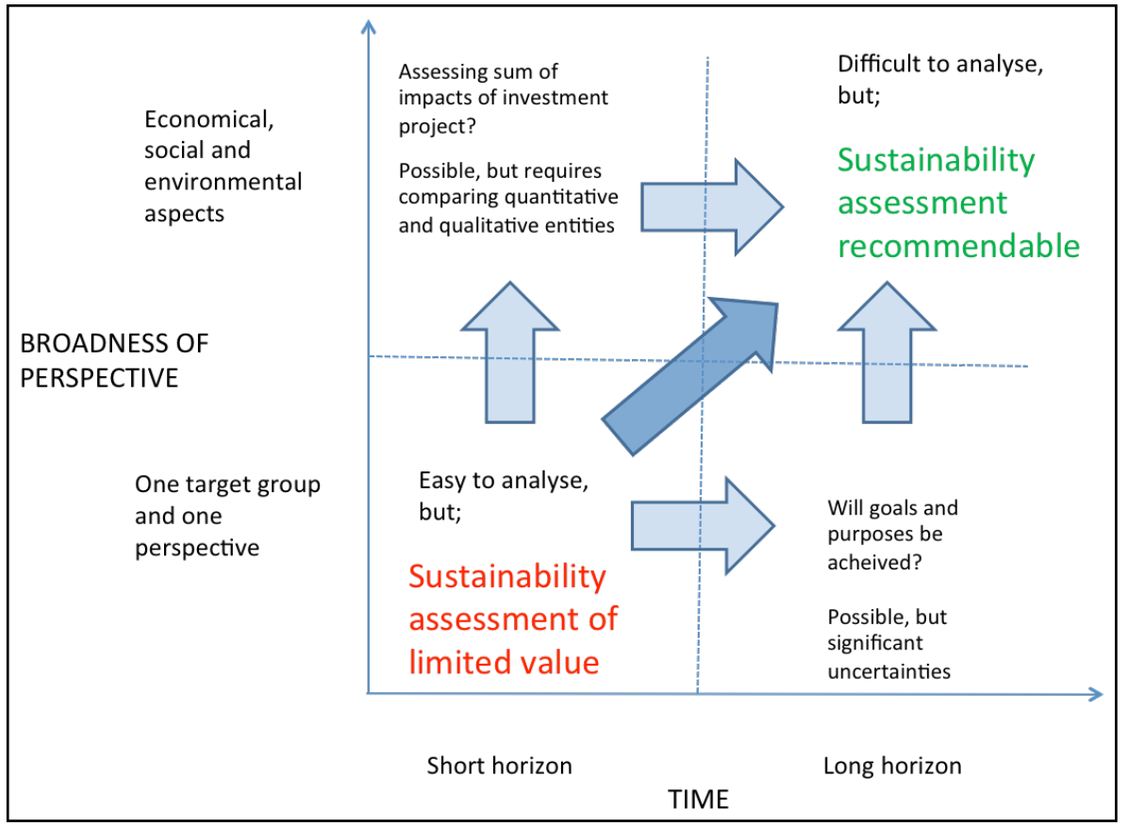


Figure 26

Need for and feasibility of sustainability assessment. Assessment of the sustainability of investment projects demands both a broad perspective and long horizon. Broadness of perspective combined with the long temporal horizon, however, makes assessing sustainability inherently difficult.

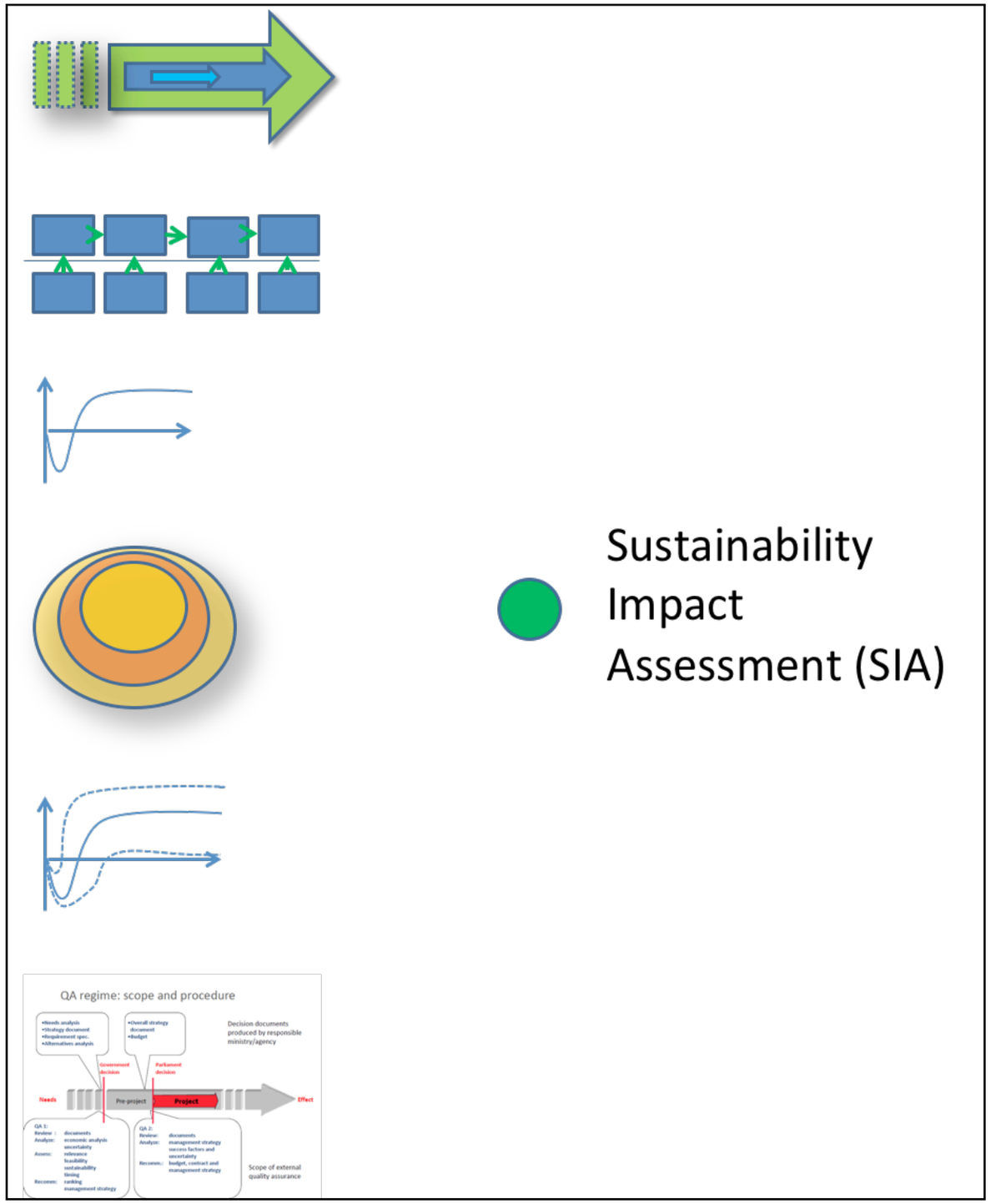
One of the main messages of this book is that even though broadening the perception and including of a long horizon makes front-end assessment more difficult, this difficulty is not an argument for the omission of such considerations. A general trait of human nature often makes us focus on what we are good at, and familiar with, and avoid the unknown and uncertain. In other words; assessors often put a lot of effort into what is easy to analyse, and more or less neglect that which is difficult. At the same time, it is of the utmost important to assess exactly this which it is difficult to assess, i.e. broad perspective and long horizon. A complete assessment considers all information available, even though this information is difficult to quantify and burdened with uncertainty.

The broadening of the perspective helps enlarging and solidifying the base onto which decision-makers decide. On the other hand, such a broadening of perspective makes the assessment correspondingly difficult. Seeing into the future is inherently hard, and the more factors one chooses to include into the assessment, the more difficult it gets.

The question which will occupy us in the following chapters is how to be able to assess the two dimensions of the sustainability of an investment project, that is, its fulfilment of the goals and purpose for which it was conceived over time, and its net utility in light of the three pillars. Our next chapter is concerned with a methodological approach aiming at assuring the sustainability of large investment projects, the Sustainability Impact Assessment (SIA).

Chapter 4

Sustainablility Impact Assessment (SIA)



Section 1

Sustainability at the intersection of economy, environment and society

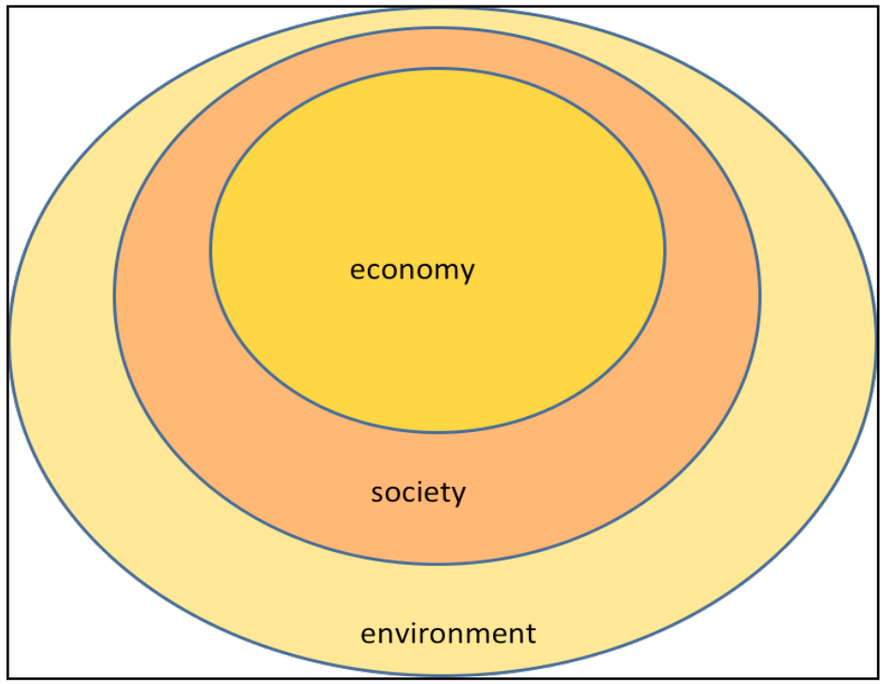


Figure 27 Sustainability as the intersection of economical, environmental and social sustainability.

In the former chapters, we have illustrated front-end assessment by use of the LFA and examined the conception of sustainability as the salient factor in the assessment. We will in this chapter augment the scope with the Sustainability Impact Analysis (SIA), a methodological tool aiming at assuring the necessary broadness of perspectives included. The SIA is an approach designed in order to include a variety of perspectives on an investment project and intends to give a balanced and comprehensive assessment of economic, social and environmental impacts. It is a relatively simple analytical approach, and its most significant feature is the comparing of quantitative and qualitative data.

The LFA, as seen in the previous chapter, is a methodological tool conceived in order to assure that investment projects correspond to wider societal needs. We have expressed this as a way of assuring that the project outputs and goals are conceived within the framework of purposes identified by a societal process. As we have seen, it is particularly suitable to assess needs of users and relevance within the societal process it exists, and gives a good indication of whether the investment project is viable in light of the uncertainties it confronts. The LFA, however, does not necessarily assure the assessment of impacts beyond the scope of the defined goals and purposes.

The sole use of the LFA, therefore, is not sufficient to assure to assess the sustainability of an investment project within a broader context. It is this broader perspective that is thought assured by the use of the SIA. At the base of the SIA lies the awareness that the sustainability of a project depends on the intersection or rather superposition of economic, environmental and social aspects.

The fundamental point of view underlying the SIA comprehends economy, the society and the environment as interdependent. Rather than them being discrete, well-separated entities, this methodology comprehends the economy as existing within a society and cannot develop in the long term without taking society's needs into account. The society similarly exits within the boundaries of the environment; if environmental concerns are not addressed in a proper manner, society itself cannot exist in the long term. On the basis of such comprehension, it becomes clear that an assessment of the sustainability of any investment project ought in this manner to assess its impacts within a wider context.

As we have seen is the case with the LFA, the SIA is based on a step-by-step procedure. Steps usually considered are:

1. Screening the proposal; deciding whether an SIA is needed
2. Scoping the assessment; deciding the extent of the assessment to be conducted
3. Selecting tools or methodologies to match the scoping
4. Ensuring stakeholder participation; deciding on the role of the stakeholders
5. Assessing the economic, environmental and social impacts
6. Identifying synergies, conflicts and trade-offs across these impacts
7. Proposing mitigating measures to optimise positive outcomes
8. Presenting the results and options to policy makers

The observant reader will recognise several of the steps prescribed by the LFA in the above list of steps. We will in the following focus on the steps that are particular to the SIA. From step five onwards, in effect, the SIA enters its technical stage, with this step as its pivotal step. In order to grasp the signification of the SIA in this context, we will centre our attention on this step and see how the use of SIA can help assure the sustainability of an investment project.

Sustainability impact assessment aims not only at identifying the consequences of a proposed project, but also at comparing these consequences. Comparing the impact a project will have in the economic, the social and the environmental areas respectively, however, is not immediately straight forward. The economic consequences of a given project have the advantage of being in most cases possible to assign monetary values, and can as such be liable to overshadow other concerns which cannot be quantified directly. The social and environmental consequences of a project are most often concerns of this latter type, being more prone to be evaluated by qualitative measures.

In step 5, prioritised impacts of the investment project within the different sectors are selected and assessed individually. The results are then rated or evaluated according to a score system ranging from +2, +1, 0 -1 and -2, where +2 is given when the consequence is considered very positive and -2 is given for very negative and 0 is neutral. We can consider such rating in light of the Eiffel Tower:

Table 1 Economical questions:

ECONOMICAL QUESTIONS:	SCORE	RATIONALE
Financially sound?	-2	Huge state subventions needed in order to assure its construction.
Economical consequences in case of collapse?	-2	A structure of the magnitude of the Eiffel Tower would no doubt cause enormous damage in case of collapse.
Affects traffic-flows?	-1	The Champs de Mars ends in the quai Branly and the Pont d'Ieana, major thoroughfares in Paris. Huge crowds will hinder traffic.
Subsequent use after the Exposition?	-2	Hard to see any actual use for the structure besides marking the Exposition entrance.
Dismantling costs?	0	The net value of the metal will probably cover the costs of tearing down the structure.
Influence on neighbourhood real estate pricing?	-1	Who willingly wants to live in the shadow of a giant tower? The general attractiveness of area limits the downside.
Maintenance costs?	-2	Huge maintenance costs predicable. Improbable that entrance fees can suffice.

Table 2 Social questions:

SOCIAL QUESTIONS:	SCORE	RATIONALE
Job creation?	1	250 workers on site, plus equal number off-site. Could have been used for alternative investment projects.
Workforce conditions	0	The conditions do not differ significantly from comparable projects, such as bridge construction.
Permitting other investment projects?	-1	The construction of the Eiffel Tower might block the way for other investment projects with larger social benefits, such as hospitals or schools.
Available for the general public?	1	The tower is open to all; ticket price might, however, affect entrance of poverty-stricken.
Assures well-functioning neighbourhood?	-1	The net value of the metal will probably cover the costs of tearing down the structure.
Contributes to higher self-esteem among the inhabitants?	1	On a national level, the ability of French engineers will awake pride, but within limits.
Influences public health?	0	No evident influence on public health.

Table 3 Environmental questions:

SOCIAL QUESTIONS:	SCORE	RATIONALE
Is it beautiful?	-2	Nearly all of Paris' intellectual elite protested vividly against the construction of the tower, considered "a brute".
Preserves much used footpaths?	-1	The Champs de Mars is a much used strolling ground for neighbours.
Preserves public areas?	0	The structure of the Eiffel Tower will be open on ground level, so the influence is marginal.
Preserves light-/ shadow conditions?	-1	Tremendous shadow over large area. However, as the structure is perforated, the impact will not be as momentous as would be the case with a solid tower.
Assures water resources	0	Even placed at the banks of the Seine, the tower does not seem to represent any threat to the water resources or navigation of the city.
Influence wildlife?	0	No substantial influence on wildlife.
Preserves biodiversity?	0	No substantial influence on biodiversity.

The above analysis is based purely on an intuitive mode of reasoning. In real life, each of the assessments will be based on more technical approach or using more sophisticated methodological tools. The intuitive mode, however, is sufficient to illustrate the workings of the SIA in practice, and how this use gives a broader picture than the sole use of the LFA.

A good graphical presentation of the scores can ease the discussion about which alternative should be selected. Such a presentation is shown on the figure below where the score is marked on the radial lines where each line represents one question. After this assessment, the results can be gathered in a spider diagram. When drawing a line between the scores, a polygon appears.

With a bit of training, one can quickly get an overview of strengths and weaknesses of the different project alternatives. We have in this way assessed the outcome of the investment project according to 21 parameters, from the three areas economical, social and environmental. This is a good tool to ease the communication and discussions, for instance about different design alternatives or mutual changes of properties to make the alternative more acceptable for all parties.

Generally speaking, the spider diagram reveals limitations concerning the Eiffel Tower from a front-end perspective. We can see that the environmental and especially the economical scores range from neutral to negative, with hardly any positive elements easing the picture. The social scores, however, range from slightly negative to highly positive, with most scores at this latter end of the scale.

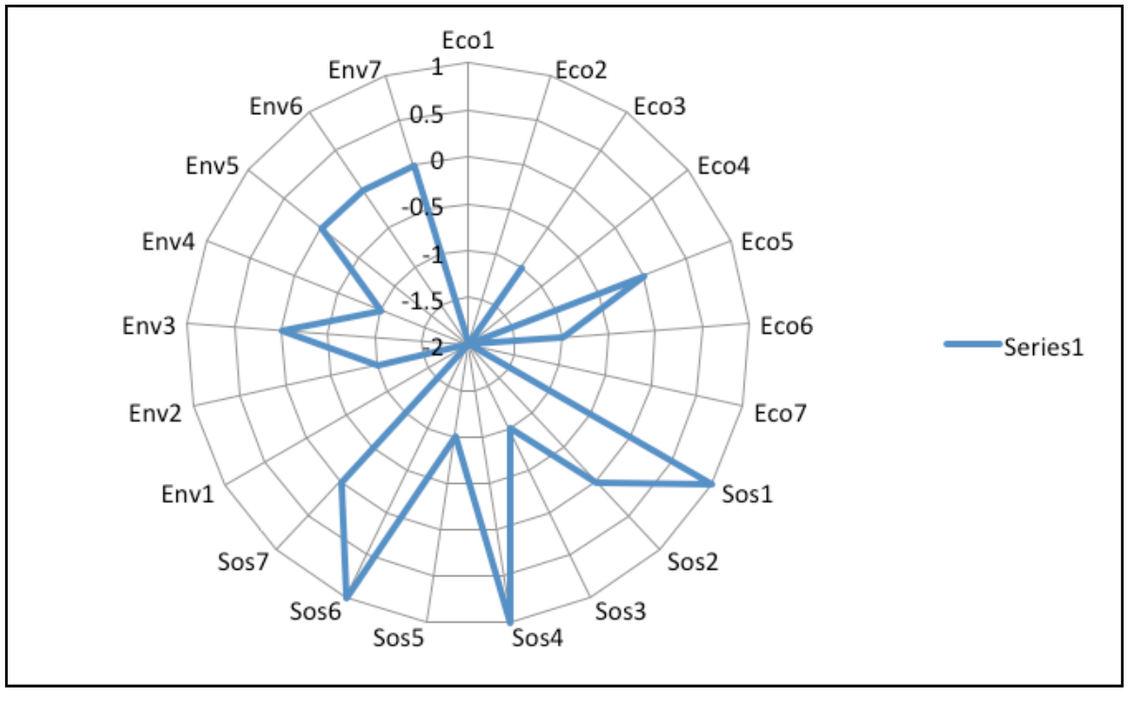


Figure 28

Spider diagram indication the assessment of the different indicators in the case of the Eiffel Tower. From the diagram, we can observe how the environmental indicators come out in a relatively neutral score, whilst the economic indicators are close to catastrophic. The social indicators, however, come out in a predominantly positive manner.

According to the contemporary conception of sustainability that we have developed in our second chapter, a front-end assessment of the Eiffel Tower today would hardly have proven it sustainable. The broadened picture provided by the SIA illustrates that Eiffel Tower might very well contribute to augment the Gloire of France; the cost both in monetary and environmental aspects would probably not have been judged sustainable. In fact, it seems improbable that the Eiffel Tower would have been constructed today if assessed according to this methodological approach.

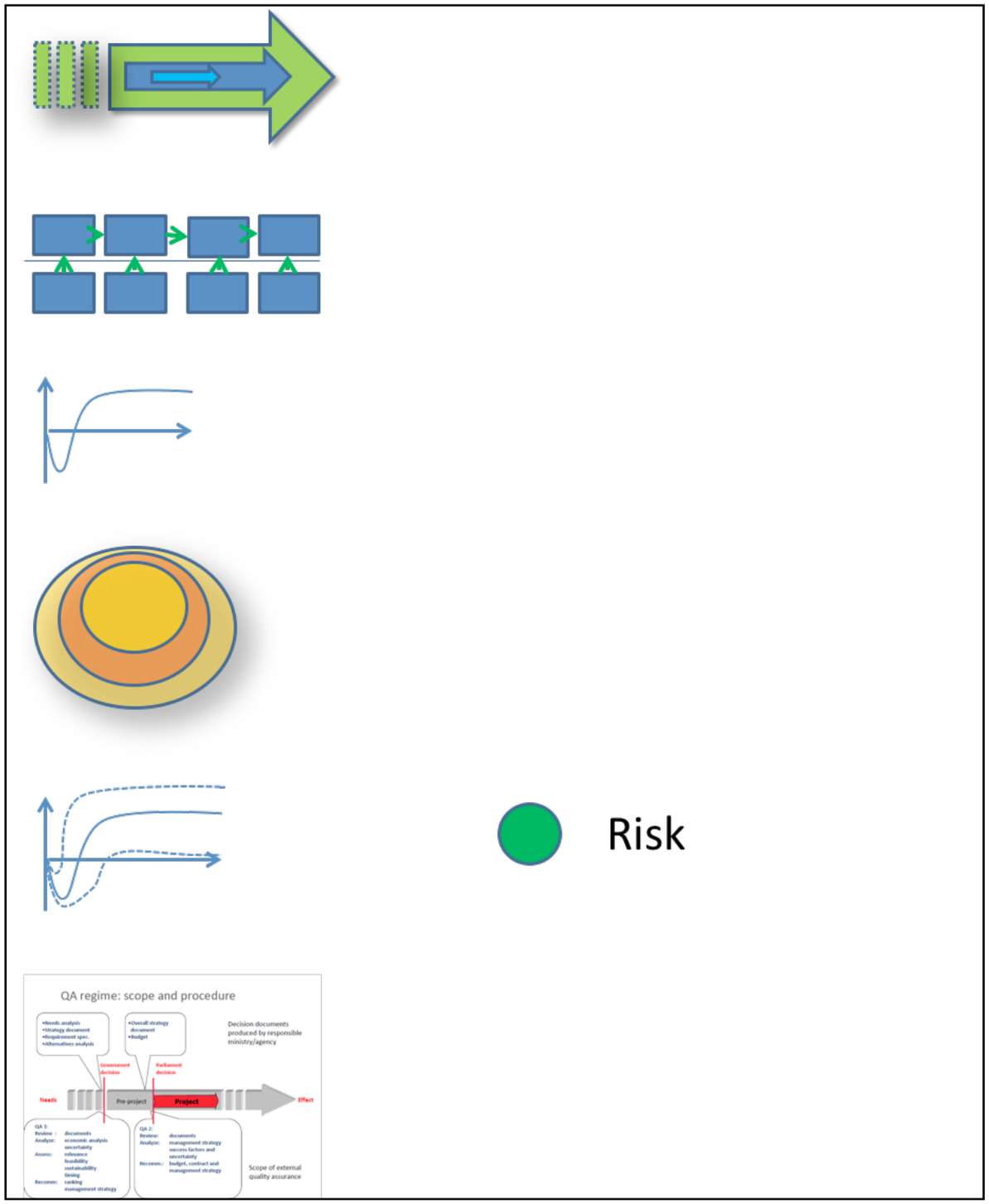
The SIA is a tool aiming at integrating quantitative and qualitative parameters into a coherent basis for evaluation, and thereby give a more complete analysis. This does not imply, however, that the SIA is a fool-proof assessment tool.

Firstly, the choice of which parameters include determines the outcome of the analysis. A complete accordance between different actors judgement of parameters is hard to envisage, and the choice of which parameters onto which base the evaluation might therefore invalidate the results from the evaluation process in the eyes of particular actors. Is the commerce of local merchants a weighty argument in investment projects aiming at transforming entire urban landscapes? In theory, the number of parameters is limitless, and the number of aspect worth considering might drown the eager evaluator in information and concerns. In practice, there has always to be performed a choice between these factors, and this choice is never value-neutral.

Secondly, the weight given to the different parameters and classes of parameters (economic, social and environmental) is not innocent, whether it comes from the assessor or the orderer of the assessment. Are economic factors for instance more important than environmental factors? Is it more important to provide employment to the workforce of a region than to ensure its long-term economic development? Is the single nest of a rare bird enough to stop the expansion of a trans-regional highway? The answer to such questions cannot be answered in any value-neutral manner and will often vary over time. In sum, the opinions and prejudices of both the evaluator and the orderer of the evaluation might influence the end result. Considering the evaluation process as a purely technical analysis aiming at neutral recommendations, is in such a perspective erroneous.

Chapter 5

Risk



Section 1

Risk

Definition:

Risk = probability x consequence

Risk analysis is a basic feature of any investment project. We have seen in our fourth chapter how the LFA matrix helps us identifying risks concerning the achievement of objectives, whilst the SIA permits identification and assessment of risk in a broader perspective. However, as Andersen (2009:315) points out, "risk analysis [...] is in itself an extensive field covering both specific analysis approaches, psychological issues about risk and opportunities, principles for continuous uncertainty monitoring etc." This is a field by far too vast to be covered in this present work. The main concern of the following pages is therefore a more limited one, namely to underline how risk can influence the assembled net utility of the investment project.

A common understanding is that risk is the product of probability and consequence.

We have earlier shown how the sustainability of an investment project can be assessed according to its most likely outcome, weighing the probable outcome over time. This has been illustrated in the following schematic figure:

The actual outcome of an investment project, however, does not always conform to this most probable outcome. Accidents happen, technological development makes the investment project irrelevant, or it comes out at such a high cost that it undermines equally important investment projects. On the other hand, similar factors can make the investment project more successful than what is anticipated. The probability for such divergence – be it positive (luck) or negative (bad luck) – is what we in the following call risk. Estimating the risk involved in the investment project is of prime importance when assessing its sustainability. We can illustrate this duality of risk in the following schematic figure:

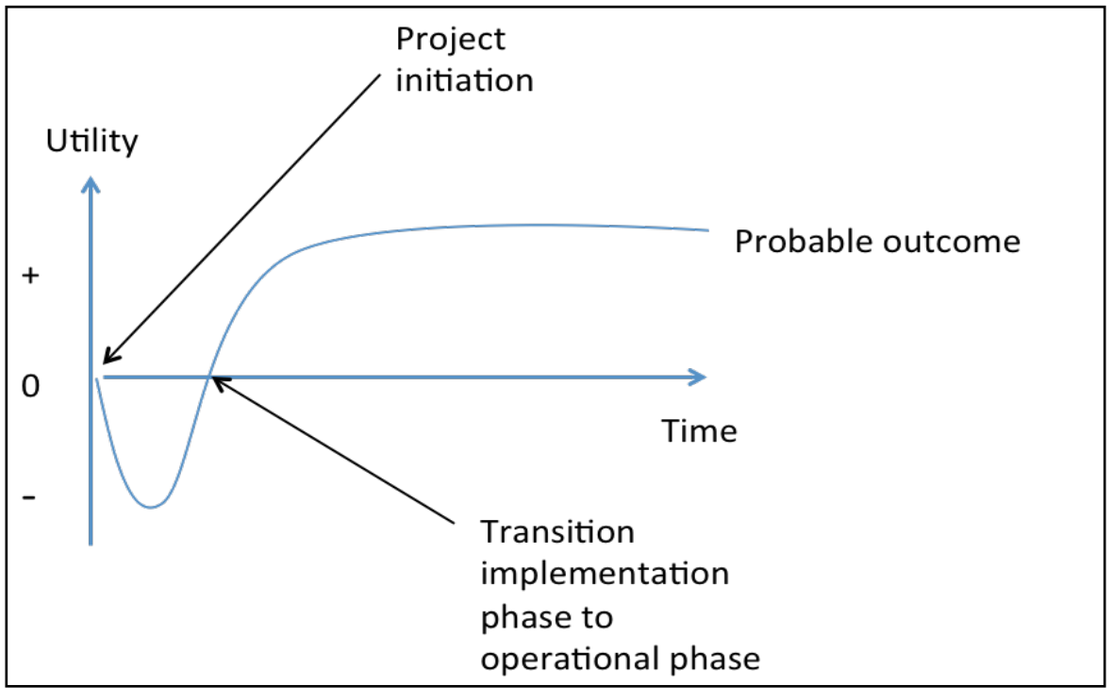


Figure 29 Illustration of typical project utility over time.

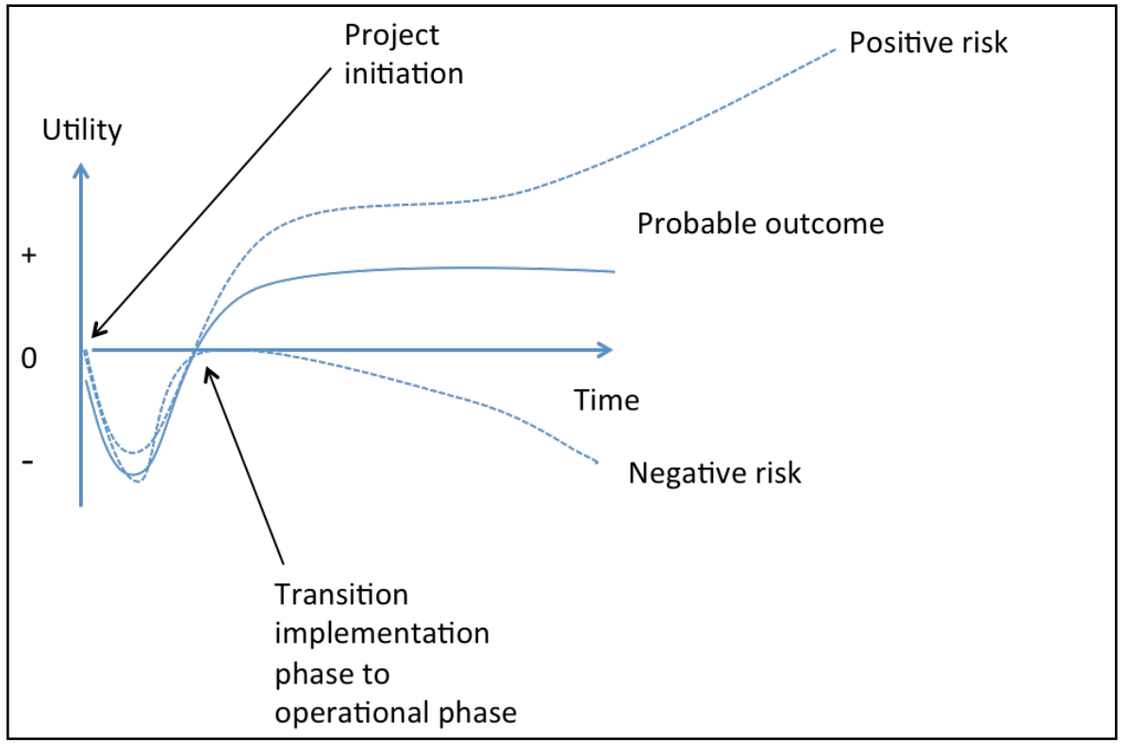


Figure 30

The probable outcome as situated between positive and negative risk. As we can observe, the divergence between the probable outcome of the investment project and the corresponding positive and negative risks is comparatively small in the project phase. Whether the investment project succeeds in responding to its goal and purpose is, however, attached with significantly more uncertainty.

The above illustration is naturally simplistic and intended only to illustrate the relationship between probable outcome and the corresponding positive and negative risk. It is worth remarking that the above figure is an aggregated figure, that is, it gives the total picture of the risk involved in an investment project. Risk assessment, in fact, is of interest within as well the economical as the social and environmental areas, and may vary according to sectorial focus.

The risk of the different components of the sustainability of the investment project, therefore, might fall out differently. We can illustrate this point in the example of the Eiffel Tower.

The risk aspects of the economical utility of the Eiffel Tower vary according to which phase we were considering in a front-end assessment. In the construction period, large amounts of capital were needed, and little if any income could be expected. Later, in the first year (the Exposition year), large incomes could be expected (and were in fact realised). After the Exposition was over, the expected income potential for the tower again dropped, but would most probably have stayed positive.

The prospect of social utility in the case of the Eiffel Tower must probably have looked very advantageous in the front-end assessment. The very construction must have generated loads of extra work, giving an economic boost to the local society that must have been considered equally important as that of the Gloire it was thought procuring. Risk existed, none the less, most certainly concerning the impression of the tower on the visitors.

Of the impacts of the Eiffel Tower, the environmental would predictably have been identified as the lowest in a front-end assessment. The consequences of a collapse would have been judged catastrophic, but the risk of such an accident taking place would have appeared so small that it would not significantly influence the overall assessment. These considerations can be gathered in these simplified figures:

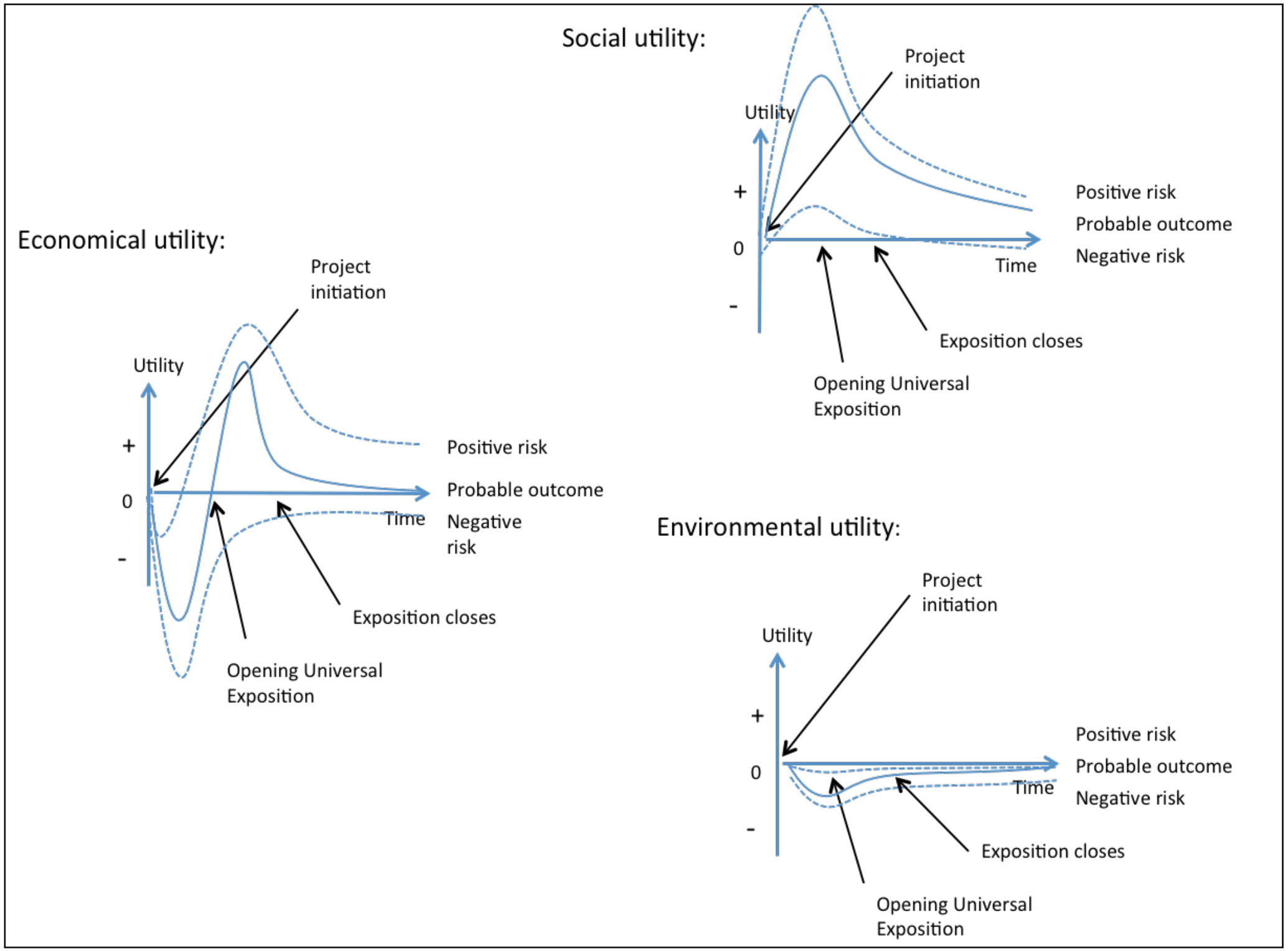


Figure 31 The probable outcome as situated between positive and negative risk, broken down to the three individual pillars of sustainability.

Uncertainty of future utility

The point we are trying to make here is not a complicated one, nor ought it to be controversial. We have in our chapter on the conception of sustainability seen how the assessment of sustainability depends on a broadness of perspective and a long temporal horizon. That is, in order to handle risk, it needs to be identified (with respect to the three pillars of sustainability) and understood (in the whole intended life span of the investment project).

Alongside these considerations, there can exist risk over the very future utility of the investment project. Most investment project are planned to function over a long period of time, and is not always easy to foresee future development of technology, needs and priorities.

Certain types of needs are quite stabile over time, and can be predicted with considerable degree of certainty. Examples of such are the need for education of the young, leading to construction of schools. Institutions aiming at taking care of the elderly fall into the same category.

The situation is quite different, however, in a certain number of cases. Consider for example military needs. Defence projects are of nature essentially technology driven; the battlefield is probably the place where the "competitive edge" is felt the most. Historic evidence show that defence strategies also are subject to occasional major revisions, according to changing alliances or large technological break-troughs. In fact, such changes can occur within most sectors. On a more general level, political priorities might change, as well as needs (trends) in the general public. These are examples of assumptions outside the control of the investment project organizers, as for the Eiffel Company. Generally speaking, we can say that risk assessment is often challenging, due to lack or uncertainty of data.

A classic challenge within risk assessment is the analysis of situations where the probability for loss (negative utility) is infinitesimal, but eventual incidents can be catastrophic. On basis of the above, we can add another fundamental challenge involved when performing such assessments: when using risk-analysis on consequences that might arise in the far future, the conclusion will often be very uncertain even if one tries ones hardest to procure data that might help to quantify the probability for loss and adhering consequences with any degree of reliability. Improved data can be achieved by for instance use of advanced modelling, studies of historic records, and field research. One example of such assessment is risk-reducing investments in urban centres exposed to earthquake. It is not rare to incorporate earthquakes with a return period of up to 500 years in the assessment of investments aiming at securing the urban district against collapse.

Large public investment projects are often of an exceptional or unprecedented nature. It is not rare that they depend upon technological innovation or that they involve technical solutions on a hitherto unknown scale. Varying with the degree to which the investment project is unique or technically avant-gardist, uncertainty conserving its technical feasibility and endurance might arise. Previous experience in similar fields can to a certain extent limit such risk factors.

There can exist no doubt that the risks involved in the construction of the Eiffel Tower were thought to be mastered, due to the extensive experience of both Eiffel himself as a master engineer and his organisation. As Du Moutier comments:

"In order to construct this tower, not only was needed a conceptual genius, but also an experimented entrepreneur. All along his career, Gustave Eiffel had progressively acquired the experience and the know-how necessary to take on this challenge. After the École Centrale, of which he finishes in 1855, he has his first experiences as a young engineer at the bridge of Bordeaux, (1860). Associated to Théophile Seyrig, another student from the École Centrale, he constructs the viaducts over the Sioule, (1869), and the bridge Maria Pia over the Duoro, in Porto (1877). Alone in the lead of his own company, Eiffel takes on what will be his masterpiece in railroad bridges, the construction of the viaduct over the river Garabit (1884). [...] Throughout these works, he acquires the experience of organising large construction sites, and knowledge on the resilience of metals. Above all, he forms groups of workmen used to work with one another, a fact which permits him to develop the concept, the fabrication and the montage of the tower that will bear his name." (2009:17)

The larger the innovative nature of the investment project, the higher the risk. It is not surprising, therefore, that one of the most common rhetorical strategies in the decision-making progress leading up to it is the consequent hold back the distinctive character of the investment project.

The reflection of such a rhetorical strategy is to be found in Eiffel's book The tower of 300 meters.

In his work, Eiffel argues that the feasibility of his project was in part assured by the previous experience he has had with major iron-work construction. He do not quote more than two of the largest of these projects, notably the viaduct of Garabit, crossing the river Truyère, at the hight of 122 meters, "the worlds highest railway bridge" which "seemed effortlessly to uphold the railway lines crossing the gigantic valley" (Jonnes, 2009:6), and the bridge over the river Duoro in Porto, which has a central metallic arch of 160 meters of length by 42,5 meters of height.

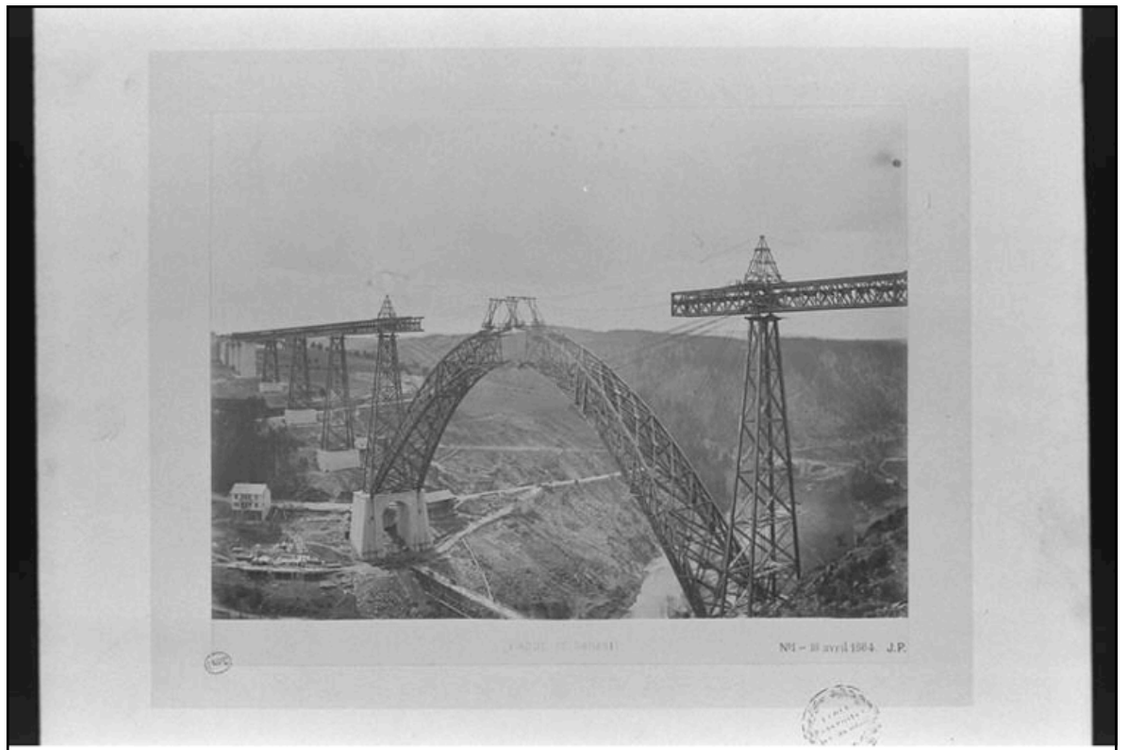


Illustration 4 The viaduct of Garabit, department of Cantal in central France. One of the largest projects involving iron-work performed by Eiffel before the construction of the tower.

Eiffel also underlines his own role in the development of the modern iron pillar:

"I have had the occasion during my industrial career to undertake a large number of studies on metallic pillars, from 1869 with Monsieur Nordling, engineer of the Company of Orléans. I constructed, under the orders of this eminent engineer, two [...] the grand viaducts [...]. The pillars of these viaducts, of which the metallic parts have a height of 51m over the masonry foundations, were constructed out of cast iron united by stilted arches of higher quality iron. I have since engaged myself in this genre of construction, however choosing to substitute the cast iron with iron of higher quality in order to ensure the guaranties of solidity." After this follows a more technical description of the procedures developed, before concluding that they now have become "customary" (p. 3).

Considering the implications of underestimating the novelty of the investment project, or correspondingly being overconfident of own capabilities, the uniqueness of the investment project is highly significant for the front-end assessment.

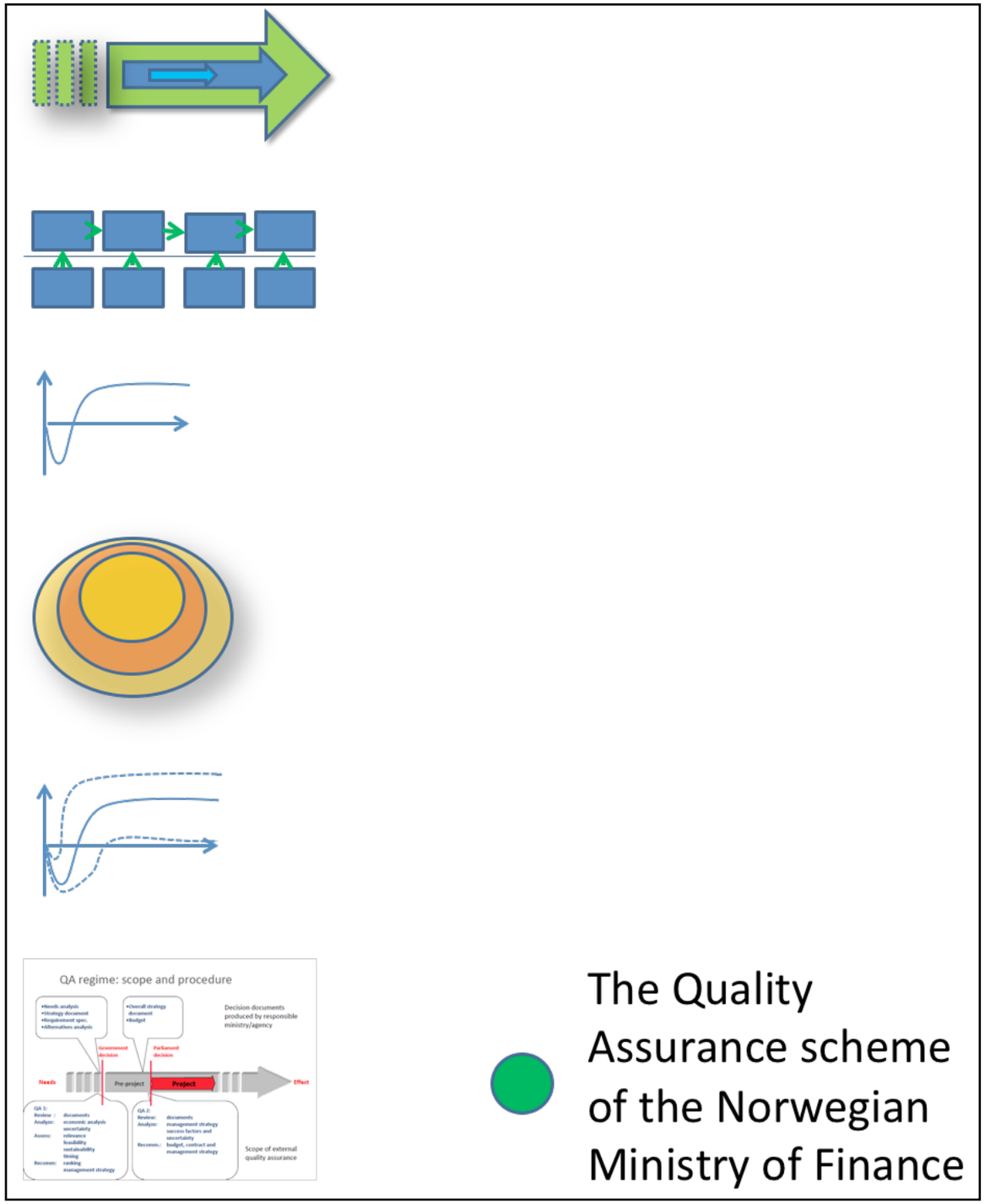
In cases where the future needs or other framework conditions are uncertain, investing in a concept with a high degree of flexibility (so-called real options) can be sensible. Physical infrastructure in particular can rarely be sold in a market. If the framework conditions are altered, the investment project then stands in danger of losing its entire worth. The value of investing in real options manifests itself in the degree to which uncertainty can be limited by permitting future interventions. Such interventions can be based on both altering certain features of the investment project, or more drastically, on terminating it. Generally speaking we can say that the more risk is involved in an investment project, the more real options are precious.

A general characteristic of investment projects is that the costs and the intended effects of it do not come at the same time. This is the reason why we need a method for comparing and summing the effects that appear at various stages. The most common method consists in transforming the annual utility and cost of an investment project into a present value. Accumulating all utilities and costs permits comparing their totality over the lifespan of the investment project.

Based on this present value, a risk premium can be established, based on an assessment of the risks involved in the investment project. What is of importance when establishing such a premium is the systematic rather than the accidental risk. In Norway, a common premium concerning large public investment project is set to 2% per year, but can vary according to the estimated risk involved. When converted to present value, we can thus compare an accumulated systematic risk with the total cost of the investment project. If the future benefits of the investment project are not larger than the expected value plus the risk premium, it cannot be judged sustainable.

Chapter 6

The Quality Assurance scheme of the Norwegian Ministry of Finance



Section 1

A governmental Quality Assurance system: An example

We have in the foregoing chapters examined methodological approaches to front-end assessment of the sustainability of investment projects. We have seen how sustainability is a complex notion, and that it involves assessing both whether the goals and purposes are reached in the long term, considerations on what risks are involved and to what extent further impacts can be reckoned.

In the present chapter, we briefly examine the use of such methodologies in a real-life context, namely that of the Quality Assurance system (QA) of the Norwegian Ministry of Finance. The QA-system has been implemented in order to improve the quality of front-end decision making by improving the knowledge basis onto which decisions are made. This is done at two stages. Firstly, the decision basis for selection of concept (project alternative) is assured through the requirements of the so-called QA1, that is an external quality assurance of choice of concept before Cabinet decision to start a pre-project. Secondly, the decision basis for funding by the Parliament is improved through the requirements of the so-called QA2, that is a quality assurance of the management base and cost estimates before the project is submitted to Parliament for approval and funding. The quality assurance is carried out with the assistance of external consultants that are assigned to assess the quality of the documents supporting the decision making and report their findings to the responsible Ministry.

The NTNU (Norwegian University of Science and Technology) based research program Concept has been assigned by the Ministry of Finance in order to develop knowledge on investment projects in general and to follow up, through research, the experiences from the introduction of QA1 and QA2. It has a website (http://www.concept.ntnu.no/) which is continually updated. The extensive quotations in the following pages are gathered from this site.

The main aim for the QA-system is to expand and improve the knowledge basis before decisions are made. This is done at two stages. Firstly, the decision basis for selection of concept (project alternative) is improved through the requirements of the QA1. Secondly, the decision basis for funding by the Parliament is improved through the requirements of the QA2.

Subsequently, the QA-system is expected to result in more successful projects, reduced cost for the state and better use of the public funds. The quality assurance is carried out with the assistance of external consultants that are assigned to assess the quality of the documents supporting the decision making and report their findings to the ministry.

The Norwegian QA-system

"In December 1997 the Norwegian Government initiated a project to review the systems for planning, implementing, and following up public investment projects. The background was numerous examples of projects that had failed in terms of cost overruns, delays, quality standards not being met, etc. In February 1999 the steering committee for the project delivered its final report based on a review of 11 concrete investment projects under the Ministry of Transport and Communications, the Ministry of Defense, and the Ministry of Labour and Administration. The report recommended the introduction of a quality assurance scheme in major public projects' planning process.

Accordingly, a quality assurance scheme was introduced in 2000. The Ministry of Finance entered into a framework agreement with constellations of consultants to perform the QAs. This first agreement was only about quality assurance of the management base and cost estimates before a project is submitted to Parliament for approval and funding (now known as QA2). It was decided that the requirement to undergo QA should apply to projects with an estimated budget of more than NOK 500 million. Investments in the oil sector and made by state-owned responsible companies were exempt, as they still are today.

The second period of framework agreements was 2005–2010. The scheme had been modified and the most important change was the extension to include a separate quality assurance of the choice of concept (QA1). This was based on an understanding that the choice of concept is actually the most important decision for the state as project owner.

During the ten-year period, 153 QAs were undertaken, 24 of which were QA1s and 129 were QA2s. About half of the QAs were related to the transport and communication sector, whereas about one- quarter of the QAs were within the defense sector.

The third and current framework agreement was signed in February 2011 and will last throughout 2012, with an option for the Ministry of Finance to extend to 31 December 2014. The content and scope of the current agreement does not differ much from the second agreement. However, some changes have been made. One of the most important changes is that the threshold has increased from NOK 500 million to 750 million. Also, the possibility for exemption if the project is purely an upgrading project is now explicitly mentioned."

The functioning of the QA-system is illustrated in the following figure on the next page. It is the QA1 that is most significant when assessing the sustainability of an investment project in the front-end phase, since this concerns the very basis onto which take the decisions leading up to its initiation. Four documents are subject to this first quality assurance, notably a needs analysis, an overall strategy document, an overall requirement specification, and an alternatives analysis. In the following, however, we will give a brief description of both the QA1 and the QA2 in order to elucidate the logic of the system.

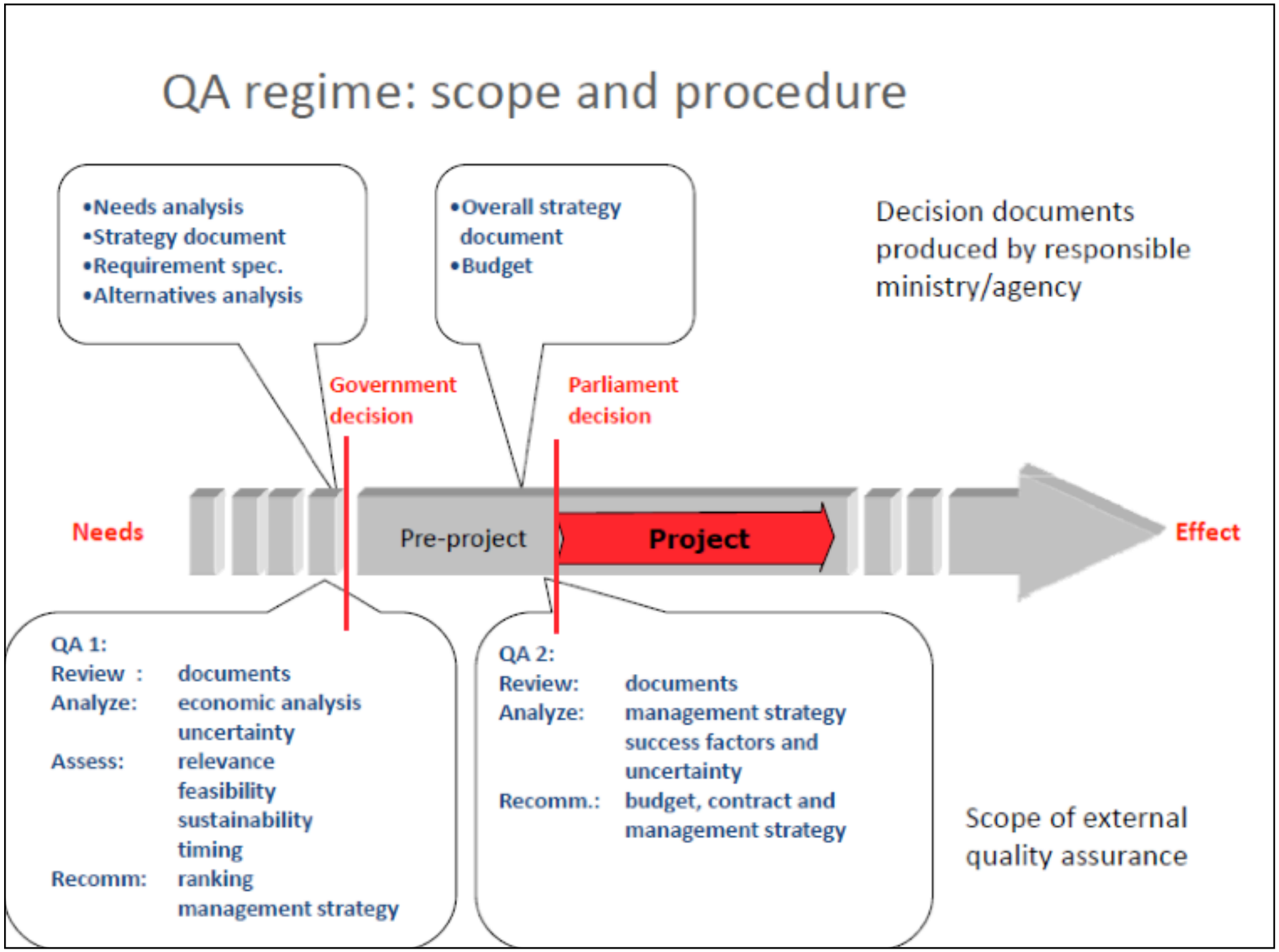


Figure 32 The QA scheme of the Norwegian Ministry of Finance (from Berg, 2010). What in this figure is denominated "project" is what we in the rest of this text name investment projects due to their considerable size.

QA1 – Quality Assurance of the choice of concept

Purpose: To ensure that the choice of concept has been subjected to a political process of fair and rational choice. The ultimate aim is that the chosen concept is the one with the highest economic returns and the best use of public funds. The choice of concept is a political decision to be made by the Cabinet, while the consultant's role is restricted to assert the quality of the documents supporting the decision.

Projects subjected to QA1: Budget exceeding NOK 750 million (EUR 95 million). Purely upgrading projects, where there are no obvious alternatives, are exempt.

Basis for the QA1 review: The responsible ministry/agency is required to prepare a "KVU" (Concept Evaluation) which should include the following chapters:

- Needs analysis mapping all stakeholders and affected parties, and assessing the project's relevance in relation to societal needs and priorities.
- Overall strategy defining the project's goal and purpose (first order and long-term effects), with emphasis on consistency, realism, and verifiability.
- Overall requirements specifying important requirements which need to be fulfilled when the project is implemented. These requirements may follow from the project's own goal/ purpose, or they may be non project-specific purposes within the overall strategic framework. The focus is on effects and functions, not on technical solutions and details.
- Possibility study. Needs, goal, purpose and requirements will together constitute the 'opportunity space'. It is essential to ensure that the opportunity space is not too narrow.
- Alternatives analysis which should include the zero-option and at least two alternative main concepts. If the zero-option lifetime is very short, a 'zero-plus' option should also be developed. For all alternatives, outputs, uncertainties, and a fiscal plan should be specified. The alternatives should also be subjected to a Benefit-Cost analysis.
- Guidance for the pre-project phase, including an implementation strategy for the chosen concept."

QA2 is described by Concept in the frame on the next page. The purpose of QA2 is to provide the Ministry with an independent analysis of the project before the budget is appropriated by Parliament. Focus is on the control aspect. This is partly a final control to make sure that the basis for decision on appropriation of funds is acceptable in terms of scope and quality. Partly it is a forward looking exercise to identify the managerial challenges ahead. The analysis should help substantiate the final decision regarding the funding of the project, and should be used during implementation as a basis for control on behalf of the Ministry. QA2 will be undertaken by the end of the planning phase, before formal submission to Parliament. It should be documented in a report containing advice on: 1. The cost frame, including necessary contingency to make sure the budget is realistic. 2. How the project should be managed to make sure the cost frame will be sufficient.

QA2 – Quality Assurance of the project management

Purpose: To ensure the quality of the decision basis including cost estimates and uncertainties associated with the chosen project alternative before it is submitted to Parliament for funding. The control aspect is the main feature in this exercise. Also, the evaluation shall focus on challenges related to project management in the implementation phase.

Projects subjected to QA2: Budget exceeding NOK 750 million (EUR 95 million).

Basis for the QA2 exercise: Before the start-up of QA2 the following documents must be prepared by the responsible ministry/agency:

- Overall project management document (steering document).
- A complete base estimate for costs and (if relevant) incomes
- An assessment of at least two alternative contract strategies.

Scope of quality assurance: The consultant shall give recommendations regarding:

- The cost frame, including necessary contingency reserves
- How the project should be managed and organized to ensure an efficient implementation. ”

More in detail, the consultant shall:

- Control that the project concept is well defined and that it has been developed in line with the suppositions defined in QA1.
- Review the overall project management document to decide whether it is sufficient for estimation, uncertainty analysis, and management.
- Control the cost estimate (complete, realistic, transparent)
- Review the assessment of contract strategies.
- Map success factors and pitfalls.
- Undertake an independent uncertainty analysis, with a special focus on the following effects on project costs. This includes: 1. Estimation uncertainty in individual and aggregated cost estimates. 2. Event uncertainties, represented by a binary probability distribution. 3. Risk reduction. Ways and means to reduce risk must be analyzed, including the economic potentials and corresponding costs. 4. Potential simplifications and reductions in the project (‘cut list’) to be realized if necessary, without threatening the quality of deliveries.
- Give an overall recommendation regarding cost frame, including necessary contingency reserve and the cost frame for the responsible agency. The cost frame to be approved by Parliament is usually set to P85 minus the effect of possible simplifications. The cost frame for the responsible agency is usually set to P50.
- Recommendations regarding organization and management of the project, including the choice of contract strategy. A particularly important question is the management of contingency reserves.

Timing of QA2: To be performed before the project is formally submitted to Parliament for approval and funding. Normally, this will be at the end of the pre-project phase..

Chapter 7

Discussion

Section 1

What if we were to construct the Eiffel Tower today?

What would happen if the process leading up to the construction of the Eiffel Tower had included an external quality assurance analysis like the QA1 of the Norwegian Ministry of Finance? As is the like of all counterfactual historic analysis, such an assumption rests highly speculative. Some elements concerning the very conceptual foundations of the investment project, however, seem sufficiently clear to be discussed.

Firstly, the process leading up to the construction of the Eiffel Tower can be considered in light of the prescribed alternatives analysis. The QA1 requires at least three conceptually different alternatives to be analyzed, one of them being an alternative that do not differ conceptually from the existing state of affairs (zero-option). We have identified the purpose of the investment project of which the Eiffel Tower was the outcome as augmenting the Gloire of France. This was realized with the holding of a Universal Exposition, of which the main attraction was the Eiffel Tower. We have seen that an architectural concours was held in order to decide on the design of a tower of 300 meters height.

Viewed as a conceptual analysis, this would probably fall short of the requirements in the QA-scheme. The main reason for this is that fundamentally different alternatives were never properly weighed or discussed. The Eiffel Tower is basically a very high rise observation platform. The fact that an alternative tower had been built in masonry or had another design would not, in effect, have changed the conceptual framework, namely that of being high-rise observation platforms.

Augmenting the Gloire of France could actually be based on other, conceptually different alternatives, especially when considering the considerable amount of money spent in order to impress the visitors to the Exposition. For instance, the scale of fireworks such a budget would permit, lighting the French capital on midnight each night of the exposition, could be unparalleled, enough to blaze the imagination of all spectators. A roller coaster of a scale beyond compare would certainly create a lasting impression.

In fact, alternative strategies for impressing the public have been tried at other World Expositions. The 1900 (again Paris) and 1904 (St. Louis)-expositions both had the holding of Olympic summer games as a crowd-pleasing feature. The exposition of Chicago (1893) featured the first modern Ferris wheel, which with 80 meters of height was its dominating element. The point is that the assessments of such alternative concepts were not carried out in the case of the 1889 exposition.

Secondly, the difference between the estimated cost and the assessed future utility constitutes another reason that the concept of the Eiffel Tower probably not have passed through the QA-scheme. The large public subvention necessary for its construction and the privilege accorded to the Eiffel Company for its free use of the structure for twenty years after its completion sum up to a formidable expense for a vain desire to impress the visitors to the Exposition. In other words, the expense of the investment project seems disproportionate to the expected utility (Gloire). Equally, the very short term of utility of the tower poses problem when considering the cost and effort involved.

Yet still it became a success. Hard at heart is the visitor to the French capital today that is not touched by the Eiffel Tower, its forceful erectness and uncompromisingly bold outline. If the conception of "thinking outside the box" ever should be used, it would be very tempting to use it here. There is a certain melancholy to the fact that such explosions of the will to create that which never before have been seen can be hindered by regulations, governance and a lack of taste for the truly grandiose. Methodological approaches as the ones described in this book and regulatory systems may very well temper and rend human activities more sensible and sustainable, but it might be that the logic involved in these systems existing in the world today has been pushed too far, eliminating elements that create enthusiasm and incite new energy, denying the engineering society opportunities to push the limits of what the profession can achieve. It might be, in fact, that we have lost something on the way.

What makes the Eiffel Tower such an interesting example, is in fact that it became startling success despite its generic characteristics, as they would have appeared in a front-end assessment as those described by the Norwegian QA-scheme. During the Universal Exposition alone, the close to two million visitors to the tower ensured that it became an instant economical success. The fall of visitors in the following years (down to about 150.000 per year) were probably more predictable; but how to foresee the rise in numbers of visitors from 1945 onwards, reaching over six million visitors per year in 2010?

Today, the Eiffel Tower is an economic success story, in addition to having become the iconographic symbol of almost unrivaled importance worldwide, and attracts huge numbers of foreign tourists (only 29% of visitors coming from France).

The above chapters have thus indicated two things. Firstly, proper methodological approaches help assessing the sustainability of investment projects. Secondly, the challenges involved in such assessments are of such a nature that they probably cannot be entirely satisfying with respect to predicting the eventual success of an investment project.

The difference between assessments of the nature we have described and the actual success of the Eiffel Tower might indicate one of two things. Either the project succeeded out of pure luck and favorable circumstances. Or, more interestingly, it demonstrates the need for a deeper approach to methodological innovation. It is to considerations of the latter sort we now turn our attention.

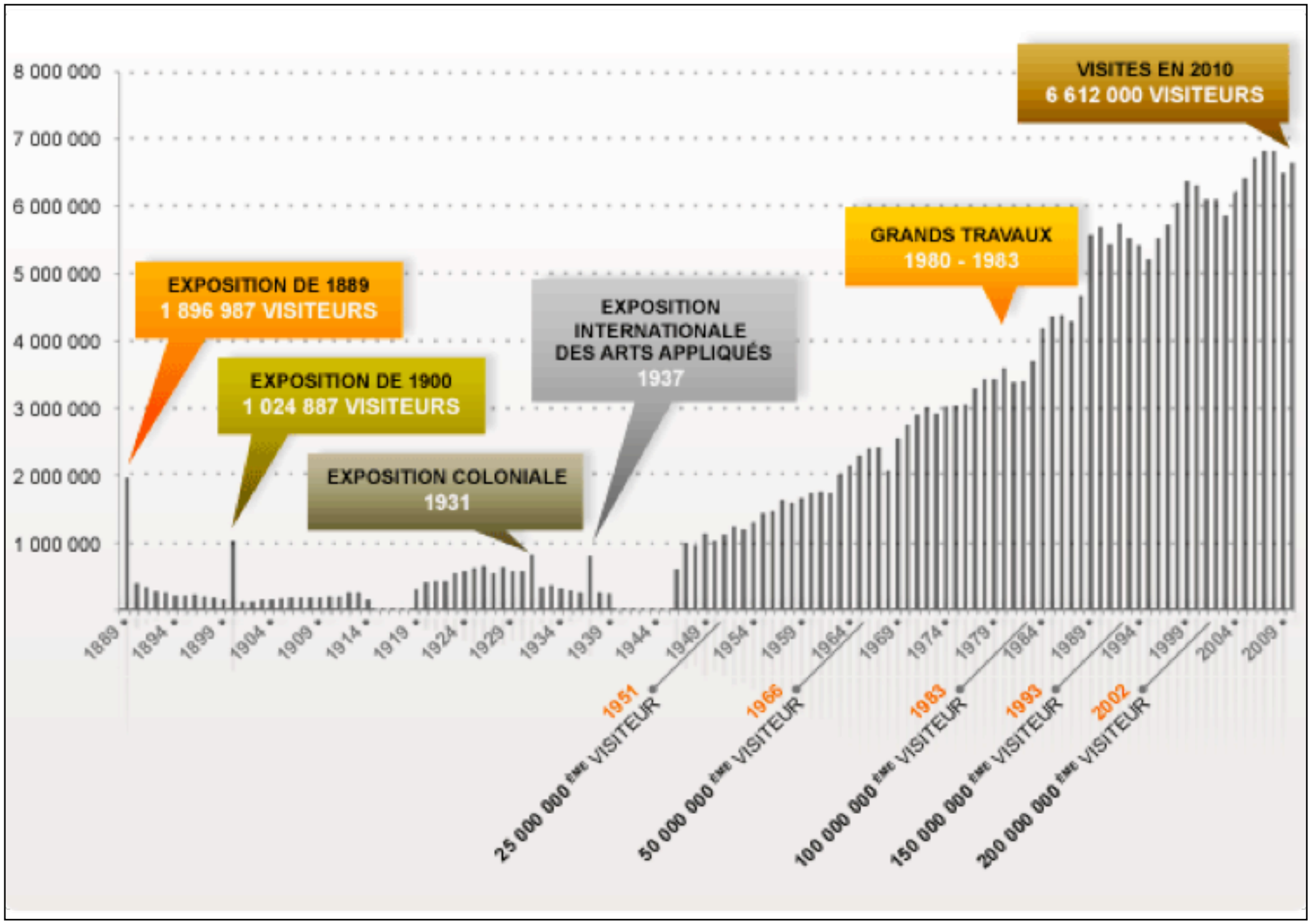


Figure 34 Number of visitors to the tower since its construction, with indications of major occurrences. Figure gathered from the official web-site of the Eiffel Tower (http://www.tour-eiffel.fr/tout-savoir-sur-la-tour-eiffel/la-tour-eiffel-en-chiffres.html). Thus, without pushing the historical anachronism too far, it seems reasonably clear that an investment project such as the Eiffel Tower, especially when considering its genesis, would not have passed through a contemporary quality assurance scheme like the one established by the Norwegian Ministry of Finance.

Section 2

Further perspectives on the methodology of investment project assessment

> **“It is false to say that history cannot be foretold”**
>
> José Ortega y Gasset (1964 (1930):54)

Investment projects invariably lead to changes or effects that are more or less easy to predict. A challenge concerning the assessment of sustainability is to be able to predict effects not only on short sight, but also in a long perspective. Uncertainties concerning expected net utility depend upon both what goals and purposes are considered and on the considered temporal horizon. Normally, uncertainties of net utility will increase according to a prolonged time-frame.

In economic analysis of large investment projects, the social and environmental impacts are to a large extent omitted. One of the reasons for this is their uncertainty, another that they are difficult to assess. Both these reasons stem from the fact that they appear in a long time frame. In addition, future economic values are on a regular basis submitted to discounting procedures which reduce their significance.

It is, in fact, more difficult to assess most environmental impacts than economical ones because they appear outside of the time-frame normally considered by economists and outside the realm of the market. A similar problem is that the economical consequences normally are more easily quantifiable than the environmental. Social consequences are equally difficult to quantify, and must therefore often be described in a qualitative manner. The consequence is often that the economical impacts are more highlighted than the others, even though the social and environmental impacts are the most serious ones. Therefore, it is advantageous to use methodologies that permit the use of both quantitative and qualitative data.

Long term vs. short term

Another challenge it can be useful to include in the assessment is the probable development in net utility in the long perspective. The utility of investments is rarely constant over time, and will vary according to which type of utility one is aiming at. One type of investment projects can aim at securing a substantial utility (usefulness) in the short term, whilst the negative utility in the long term will be limited. If the long-term negative utility is very small, the investment project can be considered a success if the net utility can be reckoned positive.

Correspondingly, an investment project with a large, but short-termed negative utility, will be able to give positive net utility if the positive utility in the long term is positive.

The above considerations are naturally commonly accepted. The point we are trying to make is that a relatively small yearly positive social or environmental utility of a large investment project can in principle give positive utility if the temporal horizon is sufficiently extensive. If assessments consider a short time-frame exclusively, mostly economic concerns will be considered, whilst the long-term environmental and social impacts may fall outside.

The same logic concerns the assessment or risk. The limited time-frame of assessments may make it difficult to assign equal weight to social and environmental consequences as to economical consequences. Risk of irreversible and irreparable damages on nature and society ought to be reserved a particular concern and can give reason to instigate early preventive or risk reducing measures. Equally, it can be useful to act in a similar manner as to that of in the case of earthquakes, where consequences are enormous, but the probability that catastrophe shall arrive within a time-frame normally considered with regard to its economical aspects is infinitesimal. In such circumstances, social concerns will be clearly contrary to economical: consequently, political considerations rather than solely economical assessments will often be determining.

On democracy and technocracy

The key to political action with regard to investment project is what information is available, and how this information flows between specialists and politicians. We have not in this book ventured into the research field of decision-making; as is pointed out by Mary Jo Hatch (2001:304), so called rational model for decision-making demands both an agreement on the objectives of the investment project and the proper methodology assuring that the objectives are reached. If one or both of these two conditions are lacking, the decision-making process is characterized by what she denominates limited rationality. This is not to say that decisions based on limited rationality are necessarily wrong. Our argument is just that the assessor ought to be providing the best obtainable information

before the decision is taken. It is at any rate difficult to hold politicians responsible for that of which they are not sufficiently informed.

In our fifth chapter, we have seen how the QA-scheme of the Norwegian Ministry of Finance aims at rendering decision-making informed and based on a choice between veritable alternatives. Politicians, however, will do their work in a situation of far broader prioritizing, where choice of investment projects often are done in order to satisfy a huge array of different needs. Politics is often about power and interests, functioning in a mode of bargaining. The technical assessment, however, remain a reference point in political bargaining. On the surface, front-end assessment seems straightforward: it aims to inform decision-makers about the potential consequences of their policies. Assessment practice, however, shows that this is an activity where knowledge and politics are inextricably linked.

As Jacob et al. comments, "Officials, policy-makers and stakeholders need to recognize that the use of sophisticated methodologies is not a panacea. Often, the expectation is that assessments provide a straightforward guide to decisions. Complex assessments, however, tend to show that policies have a wide range of consequences - some desired, some undesired, some uncertain – which cannot easily be weighed up against each other. Although further investment in methodologies and data is useful, it should be seen as a step towards (a) more transparency (b) a better understanding of the questions that policymakers are facing and (c) more awareness of what should be monitored and how once the regulation is adopted" (2008:8). Exploring these mentioned consequences in a front-end assessment will at any rate improve the basis for proper decision-making.

Decision-making depends, in fact, both on the analysis preceding the decision and on the process consisting of communication, positioning and negotiation between the different parties involved in and afflicted by the investment project. Equally, it depends on the independency of the decision-maker. Decisions might stem from a manager's fancy, as the result of long and exhaustive process, or as any middle version of these.

Large public investment projects are often characterized by the length of the decision-making process. Such lengthy processes prove necessary for assuring necessary information, consultative statements, technical examinations, etc. They do also, however, complicate decision-making, as their very duration imply the changing of governing regimes, new information or priorities, and possible shifts in public sentiment.

On technocratic and political reason

Political choice might appear bizarre in the eye of the technocrat. Presenting what appear to be clear and unequivocal propositions to the political decision maker, the assessor is often surprised by the fact that these recommendations are not followed. This does not imply, however, that there is a breach of intelligence in the politician, nor that this one does not esteem the advice received properly. Rather, such deviations appear as the result of what we can call a clash of logics. It is in fact important to understand that the logic orienting political choice is other than that of the technical evaluator.

Consider the following examples.

- The governability of the nation might depend on the support of politicians elected from a specific province. The execution of an investment project in this province, which is judged not viable from the evaluator, might assure the continued support of these politicians.

- Large investment projects might be relevant to nation-building. Social parameters such as national pride or unity rarely enter the evaluator's survey, but may play a considerable role in the political reasoning. Also, the symbolic value of a project can be more important to a politician aiming at national unity than for one considering the economic value of an investment project.

- Equally, the binding together of nations by trans-national investment projects may be economically unhealthy, but their wider social impacts are considered such that they are adopted against evaluator's advice.

- Investment projects in sectors considered as of strategic importance to the country, i.e. sectors in which dependency on foreign production. Investment projects that are defying standard economic reasoning might be a way of securing valuable resources (energy, vitals, defense materials etc.) within the country's own borders.

- Defense projects are rarely economically sane from an assessor's point of view, but might be considered an essential assurance on a political level.

It is therefore important to see that political decisions that go against the technocratic logic might be sensible from a political point of view.

Political reason, however, depends on technocratic reason. Without proper analysis is no informed political choice possible. The role of the technocrat is to clarify possibilities, present account of alternatives and provide recommendations, in short, to differentiate phenomena and practices that occur within modern society and give them comprehensible conceptual frames.

Section 3

Sense and sustainability

On transparency and the decision-making process

Finally, a general comment needs to be made on the subject of transparency. A lack of transparency is in fact not only harmful to the choice of contractors or other beneficiaries of the investment project. Lack of transparency might in fact threaten the whole conception of the investment project in the front-end assessment.

We referred in the introduction to the invitation to construct a tower of 300 meters with the base of 125 meters from the French Government, a project initiated and driven through by the Minister of Commerce and Industry, Edouard Lockroy. However, as Harvie comments, "it seems certain that he did not devise such a concept himself, nor did he acquire the idea by accident" (2004:80) Equally, Harvie underlines that even if the time was short, the time limit of only sixteen days for submission of blueprints before applications closed was something near absurd.

In June 1884, two engineers from the Eiffel Company, Maurice Koechlin and Émile Nouguier, commence to develop a project of a tower in metal that could exceed the 300-meter limit. Their intention is to make the tower the hallmark of the 1889 Exposition. It is Koechlin that creates the first drawing of the edifice. His sketch represents a high pylon of 300 meters, with four pillars intercurved so that they join each other at the top. The pillars are linked by platforms every 50 meters. The drawing is presented to Eiffel, who, even though he declares himself not interested, anyway permits the originators to continue their study.

Stephen Sauvestre, architect en chief in the Eiffel Company is then consulted. He redraws completely the project in order to give it another weight distribution. The modifications include heavy mason structures at the foundation, consolidation of the first floor by the joining of arcs, and reduction of platforms from five to two, with a hat at the top making it resemble a lighthouse.

This revised project is presented to Eiffel, provoking his enthusiasm at a degree such that he deposes in his name and those of Koechlin and Nouguier a patent of the plan permitting the construction of a tower of more than 300 meters of height. The genius of Gustave Eiffel thus doesn't consist in the conception of the project, but rather in his energetic efforts to realise it. The first and foremost to feel the display of energy is Éduard Lockroy, the Minister of Commerce 1886-87. The statesman is so convinced by the project of Eiffel that he agrees to lance the concours leading to the construction of the tower on the basis of the project of Eiffel. In fact, the modalities of the concours resemble so closely to this project that one could be led to think that it was from Eiffel's own hand.

This does not mean there were no alternatives. The engineer Sébillot and the architect Jules Bourdais conceives a tower of granite, of equal height. Effectively, the concours is rude. A total of 107 proposals were accepted into it. The text determining its conditions, however, resembles to such a degree to the proposal of Eiffel that it is difficult to envisage this not being preferred, even though Bourdais at this later stage had changed the granite of his original project with iron.

The Eiffel Tower became a tremendous success. But the process leading up to its construction was evidently flawed in such a way that the sustainability of the investment project was in no way assured. This illustrates that even with faulty, opaque processes leading up to the construction of an investment project, success can be achieved. But in those cases, both short-term success and the very sustainability of the investment project are achieved more out of luck than on the basis of methodologically sound processes.

The utility of the Eiffel Tower in hindsight

In our third chapter, we have seen how the LFA can help identifying the goals and purposes of an investment project, taking into account the uncertainties and risks it might meet. We have in our fourth chapter seen sustainability defined as net utility. There, we elaborated how this can be understood as the fulfilment of goals and purposes over time, in combination with a consideration of the impacts of an investment project, meaning that the positive impacts of such an intervention should surpass the negative impacts. In our fifth chapter, we have examined the SIA as a way to identify and assess a wider range of impacts of the investment project. We have seen illustrated these methodological approaches to front-end assessment by the example of the Eiffel Tower.

Let us shortly consider how the investment project came out ex post by the use of an SIA spider diagram. In our fifth chapter, we saw that the financial soundness of the tower was doubtful. Today, the Eiffel Tower is part of the exclusive group of self-financing French cultural monuments. Further, its consequences for traffic flows have proved to be marginal, its use after the Exposition has broken every expectation, its influence on neighbouring real-estate prices has if anything been positive and the maintenance costs are well within what is financed by the visitors.

Concerning the social aspects of its sustainability, the Eiffel Tower has today 250 people directly employed (with an estimated 250 annex or secondary jobs), the workforce conditions during the construction proved excellent compared to a benchmark evaluation, its construction does not seem to have to any serious degree have hinder other investment projects, and the availability for the general public is attested steadily rising number of visitors after the second world war. Its limited effects on neighbourhood qualities are attested by the escalating property prices in the district in which it is erected. The Eiffel Tower has in fact become an iconic image of France itself.

The environmental impacts besides the question of its beauty, we saw were to a large extent were predicted to be limited. The aesthetic judgement, however, has changed radically, transforming the Eiffel Tower from an abomination of industrialisation gone too far (as the protest of the artists attest was a dominating view), to being a positively perceived symbol of avant-garde and French creative ability.

If we were to gather these renewed considerations concerning the Eiffel Tower ex post in an SIA spider diagram, the result would be something like this:

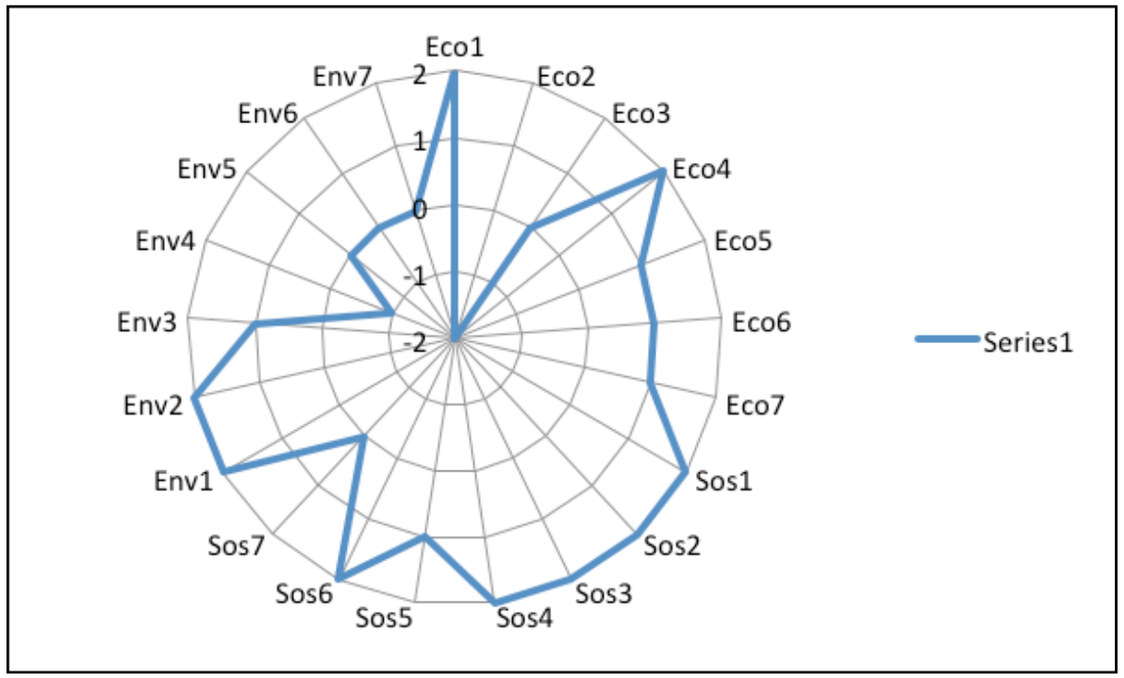


Figure 35

Spider-diagram: assessment of the Eiffel Tower ex post. Compared with the ex ante assessment, this diagram reveals in fact the unpredictable and stunning success of the tower.

From the above spider diagram, it is evident that the Eiffel Tower came out as a tremendous success. When comparing this with the corresponding diagram illustrated in chapter four, representing a front-end assessment, we can observe how the result came out in a more positive than could be expected. Positive scores prevail, especially in the social sector, but also in the economic and environmental sectors. Could this have been foreseen? Certainly not to the degree which we can observe today. From the perspective of the French authorities, it is evident that the investment project stroke lucky.

In effect, when considering the process leading up to the construction of the tower in hindsight, it appears clear that the structure would not have been built if the methodological approach examined in this book had been followed. This does not hinder the project from having become a huge success in the long run.

Most often, however, such investment projects do not. This does not hinder individuals or interest groups of wanting to realise them. A proper methodological approach assures transparency and a well defined decision-making process, assuming challenges and uncertainties, and placing the investment project in its right context.

The sense and sustainability of the Eiffel Tower

"The uselessness of the Eiffel Tower has always been perceived obscurely as a scandal, that is, as a truth, precious and inadmissible. Even before it was constructed, one reproached it to be useless, a fact that, one thought, sufficed to condemn it; it was not in the minds of an époque commonly devoted to the rationalism and empiricism of the great bourgeois enterprises, to support the idea of a useless object (if it was not declared a work of art, a label that did not fit the tower either); therefore Gustave Eiffel, in his defence of the tower to the petition of the artistes, enumerated the uses one could have of the tower; they were all, as one could expect from the hand of an engineer, scientific uses: aerodynamic measurements, studies on material resilience, the physiology of the climber, radio-electric research, research on telecommunications, meteorological observations, etc. These uses exist without doubt, but they appear quite derisory compared with the formidable myth of the Tower, of the signification to the human spirit that it has created throughout the world." (Roland Barthes, 2011(1964):11)

What is useful? What is usefulness? In what is constituted the utility of an observation platform 300 meters high? The very conception of utility, in fact, is put under pressure by examples like the Eiffel Tower.

As we have seen in 8.7, the sustainability of the Eiffel Tower in an ex post assessment appears a lot more positive than it would have done in an ex ante assessment. But do such measurements of the economic, social and environmental indicators chosen really capture the essence of the Eiffel Tower, that is, what made it into the tremendous success that it ended up being? The Eiffel Tower seems to illustrate that the very conception of utility, and correspondingly a conception of sustainability as net utility, is often used too narrowly. In fact, we seem to hurt against a central theorem of a purely socio-economical com-

prehension of utility, notably that all utility can be comprehended in monetary terms, whether the measurement of it concerns economic, social or environmental effects.

What seems clear is that the utility of the Eiffel Tower is to be found more on a symbolic level, as Roland Barthes argues in the above quotation, than on any practical level. The sense of the Eiffel Tower is to be found in the very pride in French engineering capacities it witnesses, the primacy of the country's industrial skills and the boldness of the tower's constructors. It is, probably, such emotions that wake in us the awe that has transformed the tower into such an iconic structure.

More than 110 years after its completion, the Eiffel Tower must be considered a tremendous success. In this book, we have seen challenges related to assessing the sustainability over such a long period of time. One can ask, however, if this impressive performance will continue throughout the next 100 years as well. Or perhaps the tower will, in the end, become a symbol of the perversities of the modern époque, characterized by senseless and disrespectful spending for superficial motives at the expense of future generations. Truly a sinister scenario, but illustrating how our perception of the sustainability of investment projects is intrinsically linked to our general, cultural preferences and socio-economic perspectives.

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Notes

(Note 1) This translation is gathered from the Penguin Classics edition; all subsequent translations from the French are done by the authors of this book.

(Note 2) Here, tactical budgeting means deliberately underestimating investment cots in a budget, in order to get the project accepted and financed. The actual cost is not revealed before it is too late to terminate the project.

(Note 3) This point of view is most outspoken in the so-called Protestation of the artistes against the Eiffel Tower, see http://fr.wikisource.org/wiki/Protestation_des_artistes_contre_la_tour_de_M._Eiffel_du_14_f%C3%A9vrier_1887

(Note 4) The term investment project thus is distinguished from that of a project, in that the perspective of the latter is more narrow. Front-end assessment in this manner occupies itself with the project in its context, comprising front-end, execution and operation phases.

(Note 5) The most common guide to the use of the Logical Framework Approach is the The Logical Framework Approach (LFA) – handbook for objectives-oriented planning, written by Knut Samset and published by the Norwegian aid organisation NORAD. The following pages are largely based on this publication.

(Note 6) The first logical framework was developed for U.S.AID at the end of the 1960's, and has since been utilized by many of the larger donor organizations, both multilateral and bilateral. The OECD's Development Assistance Committee is promoting using the method among the member countries (NORAD, 1999:1).

(Note 7) It is also important to see that the different stakeholder interests are not necessarily as clear-cut as we have presented here. The Ministry of Culture was namely not at all the only financing party; as we have seen, Eiffel personally and a consortium of banks were together in fact responsible for the broader part of the financing.

(Note 8) The definitions above are drawn from the so-called DAC Criteria for Evaluating Development Assistance, on the home pages of the Development Co-operation Directorate (DCD-DAC) http://www.oecd.org/document/22/0,2340,en_2649_34435_2086550_1_1_1_1,00.html

(Note 9) Art.11 of the original contract between Eiffel, the French state and the city of Paris, 8th January 1887

(Note 10) Response by the Minister Lockroy, to M. Alphand, the director of construction to which the protestation fo the artistes was originally directed, published in the journal Le temps, 14th of February 1887 http://fr.wikisource.org/wiki/R%C3%A9ponse_du_ministre_%C3%89douard_Lockroy_%C3%A0_la_protestation_des_artistes_contre_la_tour_Eiffel

(Note 12) Response by Eiffel in the same number of the journal Le Temps, http://fr.wikisource.org/wiki/R%C3%A9ponse_de_Gustave_Eiffel_%C3%A0_la_protestation_des_artistes_du_14_f%C3%A9vrier_1887

(Note 13) These have in other publications been denoted as cross cutting issues, that is issues that needs consideration on each of the above described success criteria. For the clarity of presentation, we do not differ these two approaches to the multiple facets of success.

(Note 14) It is on basis of considerations such as this that the wide-spread use of analytic tools such as Cost/Benefit-analysis poses problem when used in public sector. For a thorough examination of the problems such procedures implicate, see Heinzerling and Ackerman (2002).

(Note 15) Klakegg (2009) suggests a fourth dimension of sustainability, notably institutional sustainability. The term denotes, firstly, the institutional framework under which the investment project is conceived, secondly, it's more general context, that is the demands and rules, processes, norms, values and culture influencing both the decision making process and the decision makers. Institutional sustainability is of primary importance to the investment project, since allowing for the other aspects of sustainability all must be founded in such a formal and non-formal framework.