Value for Money evaluation in PPPs: difficulties and developments

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ABSTRACT

Public private partnerships (PPPs) are procurement models used in the provision of public infrastructures and involving private, as opposed to public, finance. The PPP model differs from the traditional public procurement model in this sense and in the unprecedented degree to which the private sector is involved.

All things being equal, the rationale for choosing a PPP instead of a traditional public procurement model is if it provides a better Value for Money. As a result, a crucial issue to address is to find the key drivers of Value for Money in PPP projects and most importantly, to analyze the relationships between those key drivers and the complex notion of Value for Money.

This study is based on a large overview of the literature together with contributions of informal interviews and my own opinions. Emphasis is put on the importance of risk management from financiers’ perspective and its consequences on Value for Money. The findings highlight the current problems in the Value for Money assessment that make the analysis hardly reliable. Good and bad practices in Value for Money assessment are discussed and potential solutions and guidance toward more Value for Money are provided.
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# TABLE OF CONTENTS

**ABSTRACT** ........................................................................................................................................... 1  
**ACKNOWLEDGMENT** ............................................................................................................................ 2  
**TABLE OF CONTENTS** ......................................................................................................................... 3  

## 1 INTRODUCTION ................................................................................................................................. 7  
1.1 Background ........................................................................................................................................ 7  
1.2 Personal motivations ......................................................................................................................... 7  
1.3 Definition of the problem and aim of the thesis ............................................................................. 7  
1.4 Initial purposes and objectives ......................................................................................................... 9  
1.5 Outline ............................................................................................................................................ 10  

## 2 METHODOLOGY ............................................................................................................................ 11  
2.1 Methodological process ...................................................................................................................... 11  
2.2 Difficulties, limitations and change of scope .................................................................................. 11  
2.3 Trend of the literature and criticism of sources ................................................................................ 13  

## 3 INFRASTRUCTURE PROVISION AND PUBLIC-PRIVATE PARTNERSHIPS ............................................ 14  
3.1 Introduction to construction projects ............................................................................................... 14  
3.2 Procurement of public infrastructure: the public sector as client ............................................... 15  
3.3 Public-Private Partnerships: definition of the concept ................................................................. 16  
3.4 Project structure, contractual framework and classification of PPPs ........................................... 17  
3.4.1 Project structure and web of contracts ...................................................................................... 17  
3.4.2 Payment mechanism .................................................................................................................... 18  
3.4.3 Roles and objectives of the stakeholders .................................................................................. 20  
3.5 General PPP procedure .................................................................................................................... 21  
3.6 Advantages of PPPs from a public sector perspective: ................................................................. 22  
3.7 Disadvantages of PPPs and problems encountered ....................................................................... 23  

## 4 VALUE FOR MONEY IN PPPs: THE IMPORTANCE OF RISK ANALYSIS ........................................... 24  
4.1 Definition of the terms ....................................................................................................................... 24  
4.2 Determinants of Value for Money ...................................................................................................... 25  
4.3 Evaluation process of the economical aspects of Value for Money .............................................. 26  
4.4 Interdependence between Value for Money and Risk Management .............................................. 29
5 MANAGING UNCERTAINTY AND RISKS IN PPPs........................................30

5.1 Risk and uncertainty: definitions ..........................................................30
5.2 Risk as a key factor in the analysis of PPPs ...........................................31
  5.2.1 Introduction ..................................................................................31
  5.2.2 Risk classification ........................................................................32
  5.2.3 Challenges and problems ...............................................................34
5.3 The risk management process .................................................................36
  5.3.1 Model of risk management process ................................................36
  5.3.2 Risk identification .........................................................................38
  5.3.3 Risk analysis and assessment .........................................................38
  5.3.4 Risk allocation .............................................................................39
  5.3.5 Risk mitigation strategies ...............................................................41
  5.3.6 Risk monitoring and control ...........................................................41

6 FINANCING OF PPPs: RISKS AND STRATEGIES...............................42

6.1 Introduction .........................................................................................42
6.2 Financial flows and financial structure in PPPs .....................................43
  6.2.1 Time-profile of financial flow .........................................................43
  6.2.2 Project Finance Organization .........................................................45
    6.2.2.1 Sources of capital within the SPV ......................................46
  6.2.3 Financial structure in different phases of a project .......................48
    6.2.3.1 A risk dependent financial structure ..................................48
    6.2.3.2 Other factors that influence the financial structure ...............50
  6.2.4 Payment Mechanism ....................................................................50
6.3 Risk management from financiers’ perspective ....................................52
  6.3.1 Key Performance Indicators ...........................................................52
  6.3.2 Qualitative and quantitative financial risk assessment ..................54
  6.3.3 Upstream and downstream securitization ....................................55
  6.3.4 Illustration through a case study ....................................................57

7 FINDINGS AND DISCUSSION ON HOW TO REACH A BETTER VALUE
FOR MONEY IN PPPs..............................................................................58

7.1 Hypothesis and issues raised ...............................................................58
7.2 Overview of the current problems ....................................................59
  7.2.1 Economy and Efficiency in Value for Money assessment ...........59
    7.2.1.1 General risk assessment issues ........................................59
    7.2.1.2 Specific risk assessment problems ....................................60
    7.2.1.3 Asymmetry of information and perception bias ..................61
  7.2.2 Sustainability issues in PPPs ..........................................................62
7.2.2.1. Absence of public consultation ................................................................. 62
7.2.2.2. Lack of flexibility due to long-term contracts ............................................. 63
7.2.2.3. Lack of competition .................................................................................. 63

7.3  Potential solutions to integrate sustainability in PPP projects ...................... 64
7.3.1  Balancing profits and sustainability ............................................................... 64
7.3.2  Reinforce the public bodies - creation of independent agencies dedicated to PPPs .... 66

8  CONCLUSIONS ........................................................................................................... 67

GLOSSARY ......................................................................................................................... 69

APPENDIX .......................................................................................................................... 72
Appendix 1: Map of Thought ......................................................................................... 72
Appendix 2: Classifications of PPPs .............................................................................. 73
Appendix 3: Example of a PPP-PSC evaluation ......................................................... 74
Appendix 4: Theoretical discussions on the concepts of risks and uncertainties .......... 75
Appendix 5: Risk identification techniques ................................................................. 79
Appendix 6: Calculation of a fictive cash flow .............................................................. 80
Appendix 7: Definition and calculations of NPV and IRR .......................................... 81
Appendix 8: Cover ratios ............................................................................................. 83
Appendix 9: Case study ................................................................................................. 84
Appendix 10: The sustainability concept ..................................................................... 89
Appendix 11: The choice of a discount rate ............................................................... 90

REFERENCES ..................................................................................................................... 91
1 INTRODUCTION

This introduction starts with a brief presentation of the Public-Private Partnership (PPP) procurement method in the construction industry. Then I explain the motivations that led me to this particular topic for my Master’s Thesis and what research questions I have focused on. This brings us to the definition of the problem and the presentation of the aim and objectives of this study. Finally, the outline for the Master’s Thesis is displayed.

1.1 Background

A PPP is a contractual agreement between the public sector and the private sector, and it is commonly used for large infrastructure projects such as roads, hospitals or prisons. In these agreements, the private party can both design, build, finance and operate the construction project. In many countries it has become a widely used model since it has been seen as a compromise between the perceived need for infrastructure and the lack of financial resources in the public sector. The term PPP has been known for almost two decades, but there is still no single definition of the concept. According to the UK’s HM Treasury (2011) “PPPs can cover all types of collaboration across the interface between the public and private sectors to deliver policies, services and infrastructure”. In this study I have chosen to use this broad definition so that no specific case is excluded or emphasized.

1.2 Personal motivations

As an exchange student at KTH in a double-degree program, I had one year of full-time courses in the School of Architecture and the Built Environment, in the fields of Urban Planning and Construction Management. I decided to perform my thesis on a topic related to Construction Management, even if Urban Planning issues are raised in the last section. I focused on the early phases of a project, specifically from the development phase to the awarding of the contract with an emphasis on the financial appraisal of the project. I chose to deal with PPPs for different reasons; firstly, there are a growing number of PPP projects around the world and this form of procurement and project delivery is likely to be developed in the future. Secondly, there are many financial and economical issues to be addressed in those projects and these issues are currently highly discussed.

A personal objective was to address some of these issues after I have gained valuable knowledge in this field, and to provide findings and future guidance for this relatively new form of procurement.

1.3 Definition of the problem and aim of the thesis

In order for a PPP to be chosen instead of a traditional public procurement, it should provide better overall results regarding the project. Expressed in a formal way with the terminology often used for PPPs, satisfying Value for Money should be achieved with PPP procurement. The term “Value for Money” will be defined in
detail later; depending on the definition and the aspects we focus on, different questions can be raised.

Kelly et al. (2004) state that there are two components of value (for money): “objective” –based on an economic perspective– and “subjective” –based on individual perceptions of benefits–. Atkin and Brooks (2009) claim that Value for Money expresses “the satisfaction with the cost of a good or service of given quality”. With this last definition, the emphasis is put on the economical aspects of Value for Money. In this thesis, I also prioritize the economical aspects. However, other noneconomic aspects of Value for Money like social and ecological sustainability are also discussed in section 7.

Value for money should be maximized so it is crucial to find out its value drivers. Among these, risk is at core and has a great level of influence on PPP projects; it is therefore a key factor in the analysis of PPPs and an appropriate risk assessment and management is essential to actually achieve the expected Value for Money. For these reasons, this thesis studies the concept of risks within PPPs, with a special emphasis on risk assessment from financiers’ perspective.

The objective is to understand the relations between risk assessment and Value for Money and to highlight good and bad practices so that Value for Money is maximized. In other words, the objective is to address the following research questions:
1. How are the relationships and intrications between Value for Money and financial risk management in PPPs?

2. In a PPP context, what are the consequences of financial risk on the three dimensions of Value for Money (namely, Economy, Efficiency and Effectiveness)?

3. What could be the future guidance and solutions so that Value for Money is maximized in PPPs?

This is summarized in a sort of “map of thought” that illustrates this thought and the critical questions.

Figure 1.1 Map of thought\(^1\) Source: author (this map is enclosed in Appendix 1)

### 1.4 Initial purposes and objectives

The initial objective of the study was to exhibit reasons why there is often a gap between the Value for Money projected initially and the Value for Money finally achieved. This was to be discussed in a risk management perspective. In order to “measure” that gap, the idea was to compare optimized theoretical assessment of Value for Money and how they are performed in practice. I planned to carry out a

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\(^1\) Economy: minimizing the cost of resources used and required – **spending less**

Efficiency: the relationship between the output from goods and services and the resources to produce them – **spending well**

Effectiveness: the relationship between the intended and actual results of public spending – **spending wisely**

These definitions come from the National Audit Office and are found in English L.M *et al.*, (2010:65)
retro-analysis, meaning starting from the empirical results and coming back to the theory, with an analysis of the differences at every step. Unfortunately the empirical part of the study could not be performed, as explained in section 2.2. I did not want to perform a study based on interviews from project managers as it has already often been intensively done by other researchers and students and some data gathered on these interviews are too informal to be really valuable.

Consequently, based on theoretical knowledge, other empirical studies, theoretical studies and my own reflection I raise concerns in the Value for Money assessment and I try to provide solutions and new ways of reflection. The approach chosen is holistic and encompasses the three aspects of Value for Money. In this way, my thesis is mostly theoretical and provides knowledge and guidance for future empirical studies.

My personal added value when it comes to the understanding of PPPs has two sources: the angle I have chosen to analyze issues on Value for Money and the holistic approach of Value for Money explicitly considered.

Indeed, I have chosen to assess the consequences of financial risk management on the three dimensions of Value for Money. According to my literature overview this scope has not been explicitly addressed in previous studies.

1.5 Outline

The thesis is organized as follows:

Section 2 deals with the initial methodology to be used and the necessary change of scope.

Section 3 introduces the concept of PPPs.

Section 4 defines and explains the concept of Value for Money in a PPP framework, so that the study can be appropriately narrowed down and the importance of risk analysis is demonstrated.

Section 5 is about risk, which is a core driver/barrier for Value for Money. The crucial role of risk management and the way it is preformed through a comprehensive model are issues addressed. Risk is extensively defined since it is a broad notion and a specific risk classification is considered.

In section 6, special emphasis is put on financial-related risks and their respective risk analysis processes. This section provides technical knowledge and deals with project finance issues.

Section 7 attempts to address the initial issue, by listing current problems and possible solutions so that Value for Money can be maximized. It is addressed from a risk assessment perspective and it deals not only with economical and financial aspects but with other sustainable aspects.

Section 8 provides some findings, conclusions and guidance for future research.
2 METHODOLOGY

2.1 Methodological process

In this section I present my initial method during the research process even if it has had to change, as explained in the next section.

The initial plan was to divide the thesis in three main phases: preparatory, executing and evaluating phases (Yin, 1994)

The preparatory phase includes basic prerequisites necessary to perform the two following phases as well as procedures, project plan, detailed time schedule, etc. The preparatory phase also contains the theoretical research.

The executing phase is supposed to consist in case studies analysis according to the theoretical framework and the initial statement of the problem in this thesis. The aim is to gather both qualitative and quantitative empirical data.

The evaluating phase is supposed to include the analysis of gathered information and to provide a comparison between empirical and theoretical data. In this phase, method evaluation and criticism of the study should be performed as well. In practice this methodological process had to be adjusted and it is explained in the next section.

2.2 Difficulties, limitations and change of scope

The initial objective was to focus on a real case study in order to understand and describe the risk management processes and then to compare it with the theoretical “optimal” principles of risk management in PPPs. The ultimate goal was to investigate the gap between Value for Money assessed initially and Value for Money achieved in practice through a comparison between initial key performance indicators and final performance measures, with focus on risk management processes.

The initial scope was too broad as I realized gradually while progressing in my studies. I faced the following problems:

- Impossibility to get access to the internal organization and performance measurement systems due to commercial confidentiality reasons.

Given that some renowned authors of similar studies faced the same problems it is for sure not an easy task to gather relevant information on PPP project. It might be due to the amount of money and other resources involved in such big projects. Comprehensive financial data thus were not available. Therefore a real Value for Money assessment based on practical example was impossible. This problem with the accessibility of data has been raised by many authors\(^2\) and it is illustrated by the two quotes below:

\(^2\) See e.g. in Siemiatecki, 2010:48
“One of the main obstacles in infrastructure research has been the lack of available data” (Bitsch et al., 2010:107)

“There was some reluctance amongst respondents to provide information about their internal organization and performance measurements systems. Commercial confidentiality was cited as the reason for not providing such information” (Demirag et al., 2011:6)

- Too long process to have access to Nya Karolinska Solna data, planned to be one of the main empirical cases.

I contacted stakeholders of the project. Except one consultancy firm, no other answers were received despite many repeated attempts. Yet, regarding another project I managed to contact and interview a member of the legal department in the PPP unit of a big French contractor company. During this interview this person confirmed that I could not have access to relevant financial data. I was told the same by a personal contact who is financial manager in PPP contracts in another big French contractor company

- Difficulty of the topic

There are two degrees of difficulties connected to the topic of the thesis: firstly, the broad concept of PPPs. As pointed out by Brinkerhoff and Brinkerhoff (2011:2) “the literature on public-private partnerships (PPPs) is enormous, yet it remains confused and inconclusive”. Among the reasons invoked they notice “conceptual vagueness, multiplicity of definitions, ideologically-based advocacy (both pro and con) and disparate research traditions”.

Secondly, in order to carry out the evaluation of the Value for Money assessed/achieved, studying a project in its operational phase is required and it means having access to all data since inception of the project. Even without the confidentiality issues this scope was too broad and time-consuming for a degree project.

As pointed out by English et al., (2010) the Value for Money assessment (ex ante) is performed by an auditing body and there is still a lack of “current advice” available for assessing Value for Money achieved (ex post). Moreover, no professional standardized research has been performed regarding this difference between Value for Money assessed/achieved. Actually there is a huge concern with subjectivity of data and perceptions and many interpretations about the Value for Money assessment.

- Final method chosen

For those reasons I had to adjust my initial scope and I decided to perform a more theoretical study in contrast to the initial empirical approach. I somewhat compiled findings of different studies –some were from an exclusively financier’s perspective (Demirag et al., Gawlick, Davies and Eustice, Engel et al.) others were objective and apparently non-orientated (EPEC, OECD, Fischer et al.) – and I ended up drawing my own conclusions.
2.3 **Trend of the literature and criticism of sources**

This thesis is mainly based on an extensive literature overview. It is important to discuss the trends in the studied literature over time and the choice of the used sources.

The literature dealing with PPPs appeared in the beginning of the 1990s, when the United Kingdom and Germany began to implement those procurement practices. The articles were mainly descriptive and they were reporting on the actual practices. The number of research papers and professional papers dramatically increased from the mid 1990s to 2010. Specific issues such as Value for Money, financial appraisal and risk management in a PPP context had been studied.

During the last two years, there have been a lot of public criticism against PPPs and that is a visible trend also in the literature, especially in the UK context where many PPPs are already in their operation phase. Criticism is mainly found in independent research papers (see e.g. Pollock and Price (2004), Unison (2011)) or papers released by Journals like the Accounting Review. Among other things, they deal with accounting issues, e.g. the refinancing of PPPs leading to high profits to the private partner.

Another form of criticism comes from the urban planner community (see, e.g. Enserink and Koppenjan (2009), Siemiatycki (2010)). Their main concern is about the consequences of the private sector involvement on sustainability issues, and the poor involvement of urban planners and the public at large in decision making processes.

On the other hand, many professional papers (The PricewaterhouseCoopers report written by Davies and Eustache in 2005, Infrastructure Ontario Methodology written by Deloitte and Touche in 2007) are providing a rationale for PPPs and their objective is to spread the “good” practices. These are written by consulting companies that have interest in this business, therefore it could be argued that the objectivity is questionable.

Finally, some papers are released by European institutions such as the European Investment Bank (EIB), the European PPP Expertise Center (EPEC) or the Organisation for Economic Co-operation and Development (OECD); these can be considered as relatively objective sources, even if there seems to be a positive bias towards PPPs in many EU-related reports.

As mentioned by Brinkerhoff and Brinkerhoff (2011), the literature on PPPs is not always objective and can be “ideologically-based”. By pointing out those three different trends, I want to mention that I am aware of the subjective aspect of the literature and that my results might be distorted by the sources I am using.
3 INFRASTRUCTURE PROVISION AND PUBLIC-PRIVATE PARTNERSHIPS

3.1 Introduction to construction projects

One of the ways modern societies create new value is through the construction of projects like transport and energy infrastructure, industrial facilities, offices or hospitals. The construction industry generates around 10% of GDP (Gross Domestic Product) in highly developed countries and this figure is even higher for rapidly developing countries. Construction projects play a major role in the dynamics of cities and built environment and they contribute in many ways to social and economical changes.

But the construction sector has always faced several problems such as cost overruns, delays or poor quality standards. Consequently, advanced research and development took place in construction management theory during the second part of the twentieth century as projects became increasingly complex (Winch, 2010).

The aim of construction management theory is to explain how construction projects can be performed effectively and efficiently so that they meet the needs of the clients. Peter Morris declared that “the challenge for research […] is precisely the perceived weakness of the discipline’s theoretical base” thus showing the lack of a consistent body of ideas in construction project management field. In addition, as argued by Winch, any discipline must have strong theoretical foundations to allow further understanding and appropriate decisions in both academic and professional senses. Among five important theoretical perspectives, Winch proclaims that “projects are embedded in contexts that are both organizational and institutional, simultaneously shaping and being shaped by these contexts”.

From a more practical point of view, the UK National Audit Office (2002) set a list of eight Common Causes of Project Failure in the construction field and among these:

- “Lack of skills and proven approach to project management and risk management”
- “Evaluation of proposals driven by initial price rather than long-term Value for Money (especially securing delivery of business benefits)”

From those two different perspectives–theoretical and practical–a central issue emerges: the form of procurement of the construction project and the way risk management is performed. In fact, the form of procurement chosen is influenced by both organizational and institutional contexts, and the emergence of new forms of procurement contributes in turn to changes in those contexts. The procurement system “determines the overall framework of responsibilities and authorities for participants within the construction process, and is a key factor contributing to

3 see Winch, 2010 p.3
4 Quoted in Winch, 2010 p.13
5 Found on http://tm.mbs.ac.uk/SearchResults/tabid/56/ArticleID/72/Why-don%E2%80%99t-we-learn-from-our-project-failures.aspx since the original website does not exist anymore
project success and hence stakeholders satisfaction” (Chinyio, 2010:194). Some authors go further and argue that the choice of an appropriate procurement system should come before the preparation of the project brief, since it affects who assists with the design brief. Finally, other authors point out a particularly important aspect of the institutional level: the regulatory context. Within the latter, the issue of procurement policies chosen by the public sector when acting as a client is seen as critical.

In this thesis, I chose to deal with Public-Private Partnerships as an example of a procurement form. Coming back to the two causes of project failure mentioned above it can be noticed that they are directly connected to the form of procurement chosen.

### 3.2 Procurement of public infrastructure: the public sector as client

Before going deeper into the subject, a definition of the terms is needed. Since many definitions of “infrastructure” exist with different level of details, I choose for this paper the broad characterization of Potter (2006:2) that covers all scales. It states that infrastructures are “made up of the basic facilities, services, and installations needed for the functioning of an economy, including telecommunications, transport networks, electricity, gas and water, […] schools and hospitals.” Nonetheless we can add a level of detail and divide the public infrastructures in two categories since this distinction is relevant in an investment context (Yescombe, 2007):

- Economical Infrastructure: such as transport facilities (roads, bridges, railways, harbor, and airports), energy and water supply, etc. These infrastructures are essential for daily economic activity.
- Social Infrastructure: such as schools, hospitals, libraries, prisons. These infrastructures are essential for daily social activity.

Traditionally, the public sector has always played a major role in the provision of infrastructure for the two reasons above: economic and social activities of a country are directly linked to the efficiency and effectiveness of its infrastructure. Furthermore, the public sector has a role to play in the provision of public infrastructure for the following reasons (Yescombe, 2007):

- The private sector does not take account of the general economic situation of a country and the social benefits. Government intervention can thus be justified to assure benefits for the whole society. Without such intervention, some transport or services infrastructure might not be built since the private sector does not gain direct benefits from it.
- If there is no government control, less competition and monopolies can appear which can result in a decreasing quality of public goods or/and higher prices

Though the public sector is still a key actor in the development of new infrastructures, its role has slightly changed over the last twenty years. From the end

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6 See e.g. Latham, 1994 in Chinyio, 2010.
7 Winch (2010) p.25
of the Second World War to the economic crisis of 1973, public spending on welfare and infrastructure was at its summit (Winch, 2010). But with the financial crisis of the seventies, government’s ability to fund infrastructure declined, particularly in European Union countries that had to meet the Maastricht criteria. With a constantly growing need for infrastructure and a lack of public resources coming from the tax payers, new solutions had to be found. As a result, governments began to rethink the way they bought construction services and introduced infrastructure pilot projects funded by private finance. Since then, the UK Government along with other governments have continually improved and updated those new kinds of arrangements which attempted to “combine finance and therefore returns on that finance with public accountability for asset exploitation” (Winch, 2010:43). Special government agencies and departments designed to support the application of PPPs have been formed in the United Kingdom, Australia, Singapore, South Africa, and Canada (Garvin and Bosso, 2008 in Siemiatiycki, 2010). Between 1985 and 2008 it has been estimated that over one thousand projects worth more than $450 billion were built around the globe using PPPs (AECOM, 2005, in Siemiatiycki, 2010) and the PPP market reached a record high of $68.6 billion in 2007 (Demirag et al., 2011).

3.3 Public-Private Partnerships: definition of the concept

As a primary approach, PPPs can be seen as a form of procurement describing the provision of public assets and services through the participation of the government, the private sector and sometimes the consumers. According to De Palma (2009), “the concept of PPP refers to contractual arrangements covering a long time period (typically over 20 years) by which public authorities assign to private operators the fulfillment of a mission of public interest“. There is no single definition of PPP and there are several different forms depending on the country concerned (Grimsey and Lewis, 2005, Akintoye et al., 2003). PPPs cover a wide range of transactions where usually the private sector is given the right to operate for a defined period a service traditionally under the responsibility of the public sector only. This goes from short-term management contracts, through concession contracts (also known as Design-Build-Finance-Operate from the private sector point of view) to joint ventures where public and private sector share ownership and responsibility of the project.

To keep it simple, PPPs fill a gap between full privatized projects and publicly procured projects. This broad definition is chosen on purpose since it enables a comparison of PPPs in different sectors. Nonetheless, certain issues will be emphasized depending on the nature of the project; for example it is probable that a road project will raise more concerns about ecological sustainability than a school project. In this paper I do not distinguish PPP from Private Finance Initiative (PFI) since PFI is included in the broad definition of PPP. PFI is a common form of PPP used in the UK. As Grimsey and Lewis pointed out, PPPs cannot be considered as

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8 One of the consequence of the Maastricht criteria is that it limits the budget deficit of governments as well as the level of public debt
9 PFI are based on the concept of concession, where the revenues of the projects are derived from payments by end-users (road tolls for instance) or when the revenues come from fixed payments from
just a new form of privatization. Indeed, with a PPP the government keeps responsibility and influence on the project, which is not the case with full privatization. A real partnership between the public and private sector is set up and it means “the end of the BAD old days –Build and Disappear” (Winch, 2010:43) where the private contractor was involved in the building (and sometimes the design) of the infrastructure and then has no further involvement or responsibilities in the project.

With PPPs, a long-term contract is set up and both public and private sectors have responsibilities. The private sector partner is often paid with periodic incomes (from governments, users or both) in return for the delivery of the services along with the providing of all the financial, technical and managerial resources required to reach the output specifications (Grimsey and Lewis, 2005).

Depending on the kind of project, authors consider some key components required in order to achieve successful PPP. In transportation projects for instance, Rietveld and Stough (2007:237) display five required components:

- An overall structure capable of meeting the public policy objectives – effectiveness, improved network development and equitable cost recovery
- An empowered public partner, owning the project and carrying out government functions.
- Private partners who put maximum efficiency and innovation in the project
- An appropriate project procurement system that protects public interests and capitalize on all private sector resources available
- Financial support, coming from taxes or project revenues (user charges). This is a sine qua non condition to access private financial markets

Akintoye et al. state that a PPP consists in a stable and durable relationship between the public and private sector, as opposed to one-off engagement. In this partnership, each member has to transfer material resources (funds, land, etc) and/or immaterial resources (authority, right to build/exploit, symbolic value). Finally, a partnership implies that there is some shared responsibility for outcomes or activities which differs from traditional procurement in which the public sector conserves control over policy decisions after receiving the opinion of organizations in the private sector.

3.4 Project structure, contractual framework and classification of PPPs

3.4.1 Project structure and web of contracts

In a typical PPP structure, a number of contractual agreements among the participants are involved. This forms a network with different levels of complexity. The figure 3.1 below illustrates a typical structure of a PPP project, the principle parties and their contractual relationships (Leidel, 2009).
The typical implementation of a PPP structure can be described as follows: when a private group of interest (consortium) wants to bid for a contract proposed by a government or a public body (Public principal on figure 3.1), the consortium creates temporarily for the project a legal entity called Special Purpose Vehicle (SPV) with a mission to build, maintain and operate the assets, or a combination of these. The SPV is in charge of the pre-design, scheduling and also assigns a general contractor for detailed design and construction as well as a general operator for the future facility. The consortium is often made of a general building company (Contractor), a general maintenance operator, some equity providers (Sponsors) and debt providers (Lending banks). The public authority will sign the global contract with the SPV which, because of the holistic nature and complexity of PPP, in turn sub-contracts finance, design, construction and other services to other companies (Demirag et al, 2011, De Palma, 2009).

The SPV acts as the partner towards the public authority. Between them, the connection is made via the PPP contract which is the foundation upon which the project is developed (Leidel, 2009). The function of this contract is to specify the obligations and roles of each party and to allocate the risks between them. This document is not only a guideline or a summary for the entire project; it is the main legal instrument with which the public authority can regulate private sector activities and decisions ideally. It defines the construction deliverables, timetables, responsibilities of the concessionaire, performance contracts, etc.

### 3.4.2 Payment mechanism

In PPPs the private sector revenues are normally associated with service outcome and performance of the asset over the contract life. The payment profile by the public sector to the private sector is different from traditional public procurement, as
illustrated in figure 3.2. Payments under PPPs tend to be based on outputs for the availability of services or the infrastructure. In transportation projects involving direct user revenues (road tolls or rail fares), contractual annual payments from governments can occur when demand is too low.

Figure 3.2 Payment Profile in traditional and PPP procurement (Davies and Eustice, 2005 p.13)
3.4.3 Roles and objectives of the stakeholders

The different roles and objectives of the stakeholders involved are outlined in figure 3.3 below. Generally speaking, an interesting perspective which will be discussed in section 7 is the possibly diverging and contrary objectives between public and private sector. While the public sector objective tends to be toward a public welfare for the society, the private sector is interested in profit. (Leidel, 2009). This explains -at least partly- the limits to the expansion of PPP projects since the list of lucrative public infrastructure remains limited by the capacity to recover costs from the user (De Palma, 2009)

<table>
<thead>
<tr>
<th>Stakeholders</th>
<th>Objectives</th>
<th>Role and Contribution</th>
</tr>
</thead>
<tbody>
<tr>
<td>PUBLIC SECTOR</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Public authority</td>
<td>- efficiency and effectiveness gain</td>
<td>- ultimate payer</td>
</tr>
<tr>
<td></td>
<td>- leveraging of government budget</td>
<td>- provides concessions rights and licenses regulatory context</td>
</tr>
<tr>
<td></td>
<td>- better service quality compliance with requirements and regulations</td>
<td></td>
</tr>
<tr>
<td>PRIVATE SECTOR</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Financers</td>
<td>Equity provider</td>
<td></td>
</tr>
<tr>
<td>Sponsors</td>
<td>- Adequate rate of return</td>
<td>- Equity (capital funder)</td>
</tr>
<tr>
<td></td>
<td>- Diversification of project, risk portfolio</td>
<td>- Project development, management and professional competence</td>
</tr>
<tr>
<td>Investors</td>
<td>- Satisfying return on investment</td>
<td>- Private equity (capital funders)</td>
</tr>
<tr>
<td>Debt funder</td>
<td></td>
<td>- Financial advisers</td>
</tr>
<tr>
<td>Lending banks</td>
<td>- loan repayment</td>
<td>- Debt funder</td>
</tr>
<tr>
<td>Development finance institutions</td>
<td>- careful financial assessment (with worst-case scenario)</td>
<td>- Financial adviser (in charge of editing the financial close)</td>
</tr>
<tr>
<td>- Monitoring of quality</td>
<td></td>
<td>- Monitoring of quality</td>
</tr>
<tr>
<td>Designers, builders and operators</td>
<td>General Contractor</td>
<td>- required construction work</td>
</tr>
<tr>
<td></td>
<td>sufficient margin</td>
<td>- innovation and efficiency</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Facility manager and operators</td>
<td>required operation service</td>
</tr>
</tbody>
</table>

Figure 3.3 Stakeholders objectives and roles in a PPP project. Source: adapted from Leidel, 2009

As presented in Figure 3.3, the stakeholders can be of different kinds, have different knowledge and perceptions and have different objectives. Those different objectives will shape their own perception of the project success and efficiency, so it is crucial that every stakeholder has an appropriate role and manages correctly its part of allocated risk for the success of the project as a whole (Leidel, 2009). For
instance, financiers are seen as one of the most important stakeholder groups according to Demirag et al. (2011), and they have different perceptions of risks, returns and structure necessary for PPP projects compared with other stakeholders. Besides, Demirag et al. (2011) regret that the body of research focuses mainly on the public sector procurer and the private sector contractor and not on financiers. This is one of the reasons why the role of the financiers will be analyzed in detail in section 6. A deeper understanding and analysis of the SPV’s financial structure and payment mechanism will also be given in section 6.

The most common types of PPP are summarized in figure 3.4 and 3.5, enclosed in Appendix 2. This is a non-exhaustive list and some PPP structures are too complex to be classified in only one category.

3.5 General PPP procedure

When dealing with publicly procured construction project, there is a formal procedure to follow. The public sector, as coordinator and client, has normally to follow a series of procurement procedures, including publishing in the international media, perform market research, contact with contractors and invitation to tender, bid evaluation, negotiation with the preferred bidder, financial close and contract award (Bing et al., 2005).

There are no international principles describing how to use PPP and therefore there are different models describing different procedures in different contexts. However, there are similarities and the overall PPP procedure can be divided in four main phases: feasibility studies, procurement, construction, and then operation of the asset. This paper will mainly focus on the first two phases – feasibility studies and procurement – with regard to risk analysis. The preparation phase of such complex infrastructure projects is crucial since it is where key analysis and decisions are made regarding the need and feasibility of the project, the technical and financial aspects and the choice of procurement among other things.

The diagram below summarizes the PPP procedure:

![Figure 3.4 General PPP procedure. Source: author](Image)
3.6 Advantages of PPPs from a public sector perspective:

PPPs are believed to be a good solution to fill the “infrastructure investment gap” i.e., the difference between estimated infrastructure investments needs and the total supply of infrastructure finance” (Bitsch et al., 2010:110)

From a public sector perspective, PPPs offer a wide range of advantages (Akintoye et al., 2003):

- **Enhance government’s ability to develop integrated solutions**
  In a conventional procurement process, big projects are broken down into different manageable parts - feasibility studies, design, procurement, construction, operation- that have to be implemented sequentially due to budget limitations. Consequently, it is not possible to develop integrated solutions that address specific public sector needs. With PPP procurement it is possible to re-adjust the scope of work and to develop appropriate solutions.

- **Focus on the real added-value of a project.**
  In certain PPP contracts, public sector can externalize the financial evaluation of the project, unlike in traditional public works that are evaluated only according to their capability to reimburse instead of the feasibility or interest of the projects. (Christophe et al., 2007:33)

- **Creativity and innovation; sophisticated bidders involved**
  With PPP procurement, public sector is no longer focused on the detailed definition of inputs but rather on the desired outcomes and certain levels of specifications. This obliges bidders to develop specific skills and innovative approaches in order to deliver the required projects. It allows the implementation of big and expensive projects that would take too much fiscal space in government’s annual budget if they had to be entirely financed by public funds (De Palma, 2009, Christophe et al., 2007:33)

- **Reducing costs**
  With PPP procurement, significant cost savings can be achieved (however this issue is strongly debated) and it is believed to deliver a higher quality for the same cost, for every phase of the project.

- **Reduce the time to implement the project**
  Unlike a conventional procurement process, some phases of the project can be done simultaneously during a PPP project. For instance, according to the New Scotland municipalities guide, PPP:
    - Enables design and construction to be done simultaneously rather than sequentially
    - Incorporates incentives that encourag private partners for an on-time completion of the project. It discourages ongoing changes in the design that would cause costs overruns and delays. According to a NAO study, only 24% of all new PPP projects in UK suffered from time delays, compared to 70% of the earlier traditional publicly procured projects (National Audit Office, 2003)
• Risk transfer to the private sector
An appropriate transfer of risks to the party best able to manage them is a key objective in PPP. Risks attached to the output specifications are largely transferred to the private sector. It is seen as one of the main reason to choose PPP. (Leidel et al., 2009)

3.7 Disadvantages of PPPs and problems encountered

Problems encountered in PPP have been discussed a lot and are a recurrent topic especially when disasters occur. The risk assessment related problems are discussed in section 7. Here I briefly list some of the recurrent problems and criticisms of PPPs, from a public sector perspective; these will be discussed in section 7.

• Higher costs of capital
In economical theory, there is no safer borrower than the government and the state should therefore always be able to get the lowest interest rates when borrowing money to finance large-scale infrastructure projects (Alexandersson and Hultén). Moreover, the private partner often asks for extra compensation -the so-called premium- for bearing certain risks associated with potentially financial losses. The critics here try to evaluate if the premium cost matches the exact cost of the risks transferred to the private sector.

• Complexity of contracts
PPP contracts are incredibly complex and involve different kinds of stakeholders. It is too costly and time-consuming to cover in detail all the risks and their effect associated with long-term PPP projects. Therefore PPP contracts often suffer from incompleteness (Välilä, 2005) thus leaving a room for opportunistic behavior when unforeseen events occur.

• Reduced flexibility
Due to the long-term nature of PPP contracts –usually more than twenty years– there is a long-term commitment of all stakeholders and this can lead to a reduced flexibility, from practical as well as financial perspectives. For instance some improvements on ageing infrastructures towards more sustainability might not be included in the contract and for a 99 year contract as the Channel Link between England and France it can cause big concerns.

In this section I provided a general approach on the concept of public-private partnerships and through an extensive review of the literature I tried to capture the essence of this form of procurement. Now that the basic theoretical principles are established, I will introduce the concept of Value for Money in the next section, Value for Money being one of the key objectives of the public sector.
4 VALUE FOR MONEY IN PPPs: THE IMPORTANCE OF RISK ANALYSIS

4.1 Definition of the terms

Value for Money is a critical issue in PPP projects. According to Grimsey and Lewis (2005), the most “critical accounting question” from the public sector’s point of view is if the project represents a good Value for Money. For instance it is more importantly considered than the fact that PPPs arrangements can be on or off-balance sheet and it should be more importantly considered than the question of affordability and bankability10 (EPEC, 2011).

First of all, a definition of the terms is necessary. As for the example of PPP, there are several definitions of Value for Money. The European Investment Bank describes it as a measure of the economic efficiency of a project (Thomson and Goodwin, 2005). But this definition can be more detailed since “economic efficiency” can be vague and lead to misinterpretation. Value for Money can also be defined as “the optimum combination of whole life cost and quality (or fitness for purpose) to meet the user’s requirement” (Office of Government Commerce quoted in Grimsey and Lewis, 2005).

Before considering the determinants and evaluation process of Value for Money, one can notice that value (and to a greater extent “Value for Money”) can be divided in two components: objective and subjective (Kelly et al., 2004). The “objective” value refers to all economic aspects and it is possible to quantify it accurately in theory11 by knowing the price and costs of every step -- feasibility studies, procurement, construction phase, operational phase--. The “subjective” value refers to social benefits and satisfaction. The concept of sustainability can be considered in this “subjective” value if we consider the social and ecological aspects. This “subjective” value is difficult to define because it depends on individual perceptions so it seems even more difficult to measure and quantify.

More specifically in the construction industry, the value achieved through the project is measured by the ratio of benefits delivered (from the owner’s perspective) – to the resources used for the whole project (Dallas, 2006). It gives:

Value = Benefits Delivered / Resources Used

The term “Resources Used” can always be converted in money, whether it deals with raw material resources, technical resources or human resources. Therefore, this value ratio is often named as Value for Money. However, it is arguable that the term “Benefits Delivered” can be easily assessed since it consists of both objective and subjective components.

According to Atkin and Brooks (2009:7), Value for Money expresses “satisfaction with the cost of a good or service of given quality”. Many organizations or clients whose aim is to improve Value for Money might adopt a too narrow method. They

10 Briefly, a project is bankable if it has high enough predictable cash flows or other financial guarantees so that it is able to raise project finance.
11 I am aware that this is not real “objectivity” because calculations are affected by initial hypothesis coming from perception biases and by approximations in the financial models.
are only focused on reducing the cost of a given service without trying to improve the quality or the economy, efficiency and effectiveness with which it is delivered. By having both cost and quality objectives and assessment program, clients are likely to improve their Value for Money compared with a cost reduction only. Normally best value is believed to be achieved when accepting “the lowest tender price in a competition where all other criteria (quality, performance, terms and conditions) are equal” (Atkin and Brooks, 2009).

The UK HM Treasury (2008) defines Value for Money as, “securing the best mix of quality and effectiveness for the least outlay over the period of use of the goods or services bought. It is not about minimizing upfront prices...” This is true in a perfect world without moral hazard and adverse selection, both forming the so-called principal-agent problem. In reality and especially in difficult economic conjuncture, minimizing upfront price along with other initial costs is often prioritized over other criteria like quality and performance. This also implies a real competition between the bidders, which is not always possible when there is just one qualified bidder for complex projects like PPP. These limitations will be discussed later but it is important to keep them in mind.

For future discussions on Value for Money, I use indicators of economy and efficiency (that both form the “objective” value) on the one hand, and effectiveness and other sustainability indicators on the other hand (that both form the “subjective” value).

4.2 Determinants of Value for Money

Determining the value drivers or determinants of Value for Money regarding PPP projects is not an easy task because as underlined by Grimsey and Lewis, those considerations are usually made on a case-by-case basis. Nonetheless six main determinants of Value for Money can be highlighted (Anderson, 2000 quoted in Grimsey and Lewis, 2005)

- risk transfer
- the long term nature of contracts (including life-cycle costing)
- output specification
- competition
- performance measurement and incentives
- private sector management skills

Among those six factors, risk transfer and competition are seen to be the most important (Grimsey and Lewis, 2005, Gao and Handley-Schachler, 2003). My personal opinion is that those two determinants are specific to PPPs, whereas the others are present in most of the construction projects, whether it is a PPP or not. Those two pre-conditions for Value for Money are usually examined on case-by-case basis since risk allocation differs depending on each project’s risk profile, while the competition for bids depends on project types and market & economic conditions. Typically, there is less competition in very complex and risky projects involving big initial investment when economic conditions are adverse.
To keep only one main determinant I chose to deal with the notion of risk. Indeed, in some cases competition can be linked to the notion of risks. For instance, a poor competition is often due to complex projects that create high construction risks turning to high financial risks from the lender’s and sponsor’s viewpoints. This prevents companies from tendering (a very expensive process in PPP projects) and lowers the competition. Moreover, the Organisation for Economic Co-operation and Development (OECD, 2008:49) stated that achieving Value for Money was dependant on the “ability of the public and private actors to identify, analyse and allocate risks appropriately [...] the failure to do so translates into financial costs”

To conclude this part, it appears to me that for a one parameter analysis of Value for Money in PPP project, the risk is the variable to consider. It is crucial to find common determinants and interconnections in order to simplify the analysis. Even with this simplification, the analysis remains multifaceted since there are different types of risks involving different processes of risk allocation in order to achieve the optimal Value for Money. Besides some authors emphasize that risks are multi-dimensional, and can combine and interact to create instability so that projects become “ungovernable” (Grimsey and Lewis, 2004). Section 5 and 6 will deal with the concept of risk in greater details.

4.3 Evaluation process of the economical aspects of Value for Money

In this section I explain the basic evaluation process of the economical aspects of Value for Money in order to understand that the concept of risk is at the center of this process. This is to justify that I focus on the risk analysis only in section 5 and 6. The evaluation processes of efficiency are related to contract management and the evaluation processes of effectiveness are highly subjective; they are not presented in this section.

For a PPP project to be considered successful, literature suggests that it should provide more Value for Money than if it was procured using traditional procurement, using the same amount of money the public sector would spend for a similar project. This definition can be ambiguous since the “amount of money” spent by the public sector over a 20 or 30 year period (including construction, operation and maintenance costs) on a specific project is hard to compare with PPP projects that are still in the beginning of their operation phase, in other words whose payments to the private sector are not ended yet.

There are at least two basic factors showing the difficulty to prove rigorously that Value for Money is achieved when using the PPP route. First, PPP projects are anchored in a long-time perspective and only a few have reached the end of contract. Second, the lack of systematic evaluations with standard methodology and feedback on ongoing PPP projects makes it difficult to judge if Value for Money assessment is suitable. As I will present them in section 6, most of the analytic tools and studies are focused on cost and risk analysis depending on quantifiable and (partly) objective variables. It seems even more complicated to assess the “subjective” component of
Value for Money and only a few authors challenged this task\textsuperscript{12}. I am aware of those limitations; moreover I will deal with only a small part of the objective and quantifiable variable of Value for Money by focusing on risk analysis and strategies only.

Now that the limitations have been established I present the different processes of evaluation of Value for Money:

Value for Money evaluation processes are of different types depending on the country concerned. According to Grimsey and Lewis (2005), four main approaches exist, from the most to the least complex there are:

- Full cost-benefit analysis of both public and private sector alternatives
- PSC-PPP comparison prior to bids invitation
- PSC-PPP Value for Money assessment after bids
- Reliance on a competitive process. Value for Money assessment once PPP route is initiated

In these approaches, PSC stands for Public Sector Comparator. The first approach is implemented in Germany, the second and third in Australia and United Kingdom and the last one is often used in France, through road concessions. It is important to notice that only few countries like UK or Australia use a methodic and systematic PSC procedure when assessing Value for Money. It raises issues about the validity of this assessment and it proves that there is still a lack of consistent knowledge and know-how.

The Australian national PPP guidelines give the following definition of PSC (Infrastructure Australia, 2008):

“The PSC is an estimate of the hypothetical, whole-of-life cost of a public sector project if delivered by government. The PSC is developed in accordance with the required output specification, the proposed risk allocation and is based on the most efficient form of government delivery, adjusted for the lifecycle risks of the project. [...] A PSC is a model of the costs (and in some cases, revenues) associated with a Proposal under government delivery.”

The PSC-PPP comparison consists in doing a calculation of the benchmark cost of providing the specified project under traditional procurement (the PSC) and to compare it with the cost of providing the same project under a PPP route. This comparison is made by the client (the public sector) prior to final approval of the

\textsuperscript{12} see Siemiatycki, 2010 for a comparison between PPP/traditional procurement regarding urban planning theory issue
deal. The public sector prepares a hypothetical set of costs for a similar project delivered through public procurement, including the value of the risks borne by the public sector. This hypothetical costing is then compared with the cash flow to be paid to the private sector provider over the project’s life cycle, plus the value of the residual risks retained by the public sector (Grimsey and Lewis, 2005). So basically, the PSC-PPP comparison—which is supposed to say whether or not Value for Money is achieved—considers only financial and economical aspects, as mentioned in the beginning of that section. The figure 4.1 below summarizes this comparison.

The following explications describe figure 4.1:

**Base costs** (also known as raw PSC): they should be priced according to the usual commercial terms in force. They include:
- pre-construction costs (feasibility studies, planning work, approvals)
- construction costs
- lifecycle costs (for projects including operating and maintenance phase)
- hard and soft management costs

**Transferred risks**: a proper allocation of risks is the principal objective in all PPP projects. In the PSC, the value of the risks to be transferred to the private sector

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Footnote 13: Hard management refers to building mechanical and electrical services. Soft management refers to “everyday” management, i.e., cleaning, pest control, security, waste management.
(under a PPP route) is assessed and added. For the PSC, the full risk assessment is priced and included whereas for the PPP route, only the risks retained by the public sector are added to the overall PPP cost. (Grimsey and Lewis, 2005). More details about the risk analysis and allocation will be given in section 5 and 6.

Retained risks: These are risks that are not transferred to the private sector. Typically, force majeure risk or political risk.

Competitive neutrality: In certain cases, the base costs under PPP delivery include insurance fees and taxes intended to the private sector. The corresponding cost may be not present under PSC since the public sector has lower or no taxes and may “self-insure” – though this point is highly questionable in such an economic crisis period – To counterbalance this economic advantage, an additional cost must be added in the PSC Base Cost, it is called the competitive neutrality adjustment (Infrastructure Ontario, 2007 and Grimsey and Lewis, 2005)

Other diagrams exists when evaluating the PSC as showed in figure 4.2 enclosed in Appendix 3.

From a broader viewpoint, the PSC calculation is based on estimations of total costs, revenues and risks expressed in cash flow terms and discounted at a public sector rate to a Net Present Value14 (Grimsey and Lewis, 2005). There are strong criticisms regarding the role of PSC, the way it is calculated and its limited accuracy when assessing Value for Money. Despite these criticisms, I explain briefly how it is assessed. Firstly, two general considerations have to be made:

Regarding the procurement costs, only the costs related to the implementation of the reference projects should be included in the PSC. The cost of running the PPP route must be considered but added to the NPV of the PPP bids. (Grimsey and Lewis, 2005). The reference project and PSC should be developed with the same output specifications and performance standards as under the PPP route. In the end, when all calculations are made, a diagram similar to the figure 4.1 is obtained.

4.4 Interdependence between Value for Money and Risk Management

According to Grimsey and Lewis (2004), PPP cash flow models are highly dependent on risk and uncertainty and most of all, these are dependent on the way risk and uncertainty are assessed. There is still no consensus on the correct approach but this interdependence between PPP cash flow modeling (and consequently Value for Money) and risk assessment is clear. It brings us to the concept of risk management and especially risk assessment, in order to discuss the good and bad practices that lead to more or less Value for Money than in traditional procurement.

The difficulties in the assessment of Value for Money are well captured by English et al. (2010) who argue that judging performance regarding economy and efficiency is hard because of the poor specifications of performance measurements at both practical and theoretical levels. It is even harder with the effectiveness issues.

14 see explications of Net Present Value in Appendix 7
5 MANAGING UNCERTAINTY AND RISKS IN PPPs

In section 5.1, risk and uncertainty are defined. The importance of risk analysis in PPPs is explained in section 5.2 and a model of risk management is displayed in section 5.3. An interesting conceptual discussion and model is presented in Appendix 3.

5.1 Risk and uncertainty: definitions

The notion of risk being the central issue in this paper, it is essential to give a proper definition. As for PPP and Value for Money, quite a lot of definitions of risks co-exist. The UK HM Treasury (1997) describes risk as “referring to the likelihood of something going wrong” and uncertainty as happening when “the outcome of a course of action is indeterminate or subject to doubt”. Those two descriptions seem rather close at first sight but there is a fundamental difference between risk and uncertainty which relies in quantifiable probabilities. In fact, uncertainty is a future state where there is no possibility to put a quantifiable numerical probability on whether a particular incident will occur or not, whereas with risk notion, numerical probabilities can tell the chance of a particular future event occurring (Demirag et al., 2011).

In a risk situation, the probabilities of the variety of future results are known either mathematically (i.e., with figures) or from past experience (i.e., through benchmarking). In a situation of uncertainty, the probabilities of the future results are by nature unquantifiable and therefore these figures seem to be “wild guesses” (Grimsey and Lewis, 2004). The table 5.1 summarizes the definition chosen for this thesis:

<table>
<thead>
<tr>
<th>Uncertainty (immeasurable)</th>
<th>Refers to a future state where no probability distribution can be assigned to the occurrence of a future event</th>
</tr>
</thead>
<tbody>
<tr>
<td>Risk (measurable)</td>
<td>Refers to a future state where a probability distribution can be assigned to the occurrence of a future event by the decision maker thanks to available data.</td>
</tr>
</tbody>
</table>

Finally, a more detailed definition from the OECD (2008) is given: “uncertainty is a case where measurable objective or subjective probabilities cannot be calculated and ascribed to the range of possible and foreseeable outcomes” Nonetheless, different scenarios can be imagined for a project (worst-case and best-case scenarios typically) and ordinal probabilities such as “very probable” or “unlikely” assigned to each scenario. This is one way of dealing with uncertainty when no information is available. There are different degrees of uncertainty –as illustrated by Winch in Appendix 3– and sometimes events can just not be anticipated. Typical examples are
September 11\textsuperscript{th} and the nuclear catastrophe of Fukushima. In fact, the probability that two planes simultaneously skyjacked by terrorists crash into two adjacent buildings is not statistically measurable – so it is not a measurable risk – but before it happened it would have seemed completely insane to put substantial subjective probabilities that such an event happens.

In construction projects, risk managers have to deal with both risk and uncertainty, and the latter must not be neglected in unique and one-off projects like PPPs.

Finally, uncertainty can be seen from a more practical point of view, it can be seen as a measure of the client’s specifications when defining the project. Actually, as pointed out by Demirag et al., uncertainty about project specifications (i.e., lack of clear output specifications and coherent vision) increases risks substantially. This is illustrated by a quote from an equity provider who was also contractor in a PPP project:

“\textit{So the clarity from the client was probably the number one area of reducing the risk from our perspective}” (quoted in Demirag et al., 2011:12)

5.2 Risk as a key factor in the analysis of PPPs

5.2.1 Introduction

“The \textit{key to understanding the role of risk in a PPP is the link between the carrying of risk and the efficiency of the project}” (OECD, 2008:47)

According to the literature, risk plays a major role in the success of a PPP. Indeed, whether or not an activity is procured “traditionally” or with the PPP route depends mainly on who bears the different risks and in what proportion (OECD, 2008; EPEC, 2011). Leidel et al. (2009) affirm that the strongest influence on success for the completion of a PPP project comes from a proper identification, evaluation, allocation and control of risks, in other words risk management.

In order to fully understand the crucial role of risk analysis in PPPs, I show the key objectives pursued by the stakeholders and the means they use to achieve these objectives.

The public partner is not driven by profits and use allocative efficiency\textsuperscript{15} in order to maximize social profit and utility. When a government or a state is allocative efficient, we can roughly say that it achieves Value for Money. Indeed, the public partner tries to maximize social profit and utility by planning new infrastructure when there is a need for it. The public partner is not interested in making direct profits but in building a prospering society. Private companies are driven by profits so they tend to be both technical-efficient and X-efficient. They try to influence different factors so that expected outcomes converge as much as possible with the actual outcomes.

\textsuperscript{15} allocative efficiency = the use of resources in order to maximize profit and utility

technical efficiency = using minimum inputs and having maximum outputs

X-efficiency = preventing the wasteful use of input

These definitions come from OECD, 2008
In a PPP agreement, the public partner uses incentives in the contracts—construction risk borne by private partner, financial risk sharing—so that the private partner is more motivated and efficient regarding completion of the project within budget and schedule. (OECD, 2008) Besides, the efficiency of the private partner depends mainly on its risk management capacity. (OECD, 2008)

So if we combine all these implications, we can see that in order to achieve Value for Money in PPP projects—the ultimate goal of the public partner—an appropriate risk management from the private sector is necessary.

At this point of the paper, the fundamental role of risk management in PPP projects is demonstrated. Before showing how to manage risks, I introduce the risk classification that I have chosen in the next sections along with the inherent problems with risk management in PPP projects.

5.2.2 Risk classification

There are various types of risks in PPP projects and classification of risks may differ between studies used in this thesis. It has been difficult to prioritize one classification in particular since many authors have their own argument to defend their own classification. I present here three “typical” classifications; I chose to focus on the first one for two reasons: the reliable source (the OECD) and the fact that it fits with the analysis I make in section 6.

This first classification sorts risks according to their intrinsic nature. The European PPP Expertise Center (EPEC) broadly divided PPP risks in commercial risks on one hand, and legal and political risks on the other. Commercial risks are about supply and demand risks. Supply risks concern mainly the ability of the PPP Company (SPV) to deliver the project; they can be subdivided into construction risk and supply-side operation risks, including financial market risk due to, for example, changes in the cost of capital or changes in exchange rates and inflation. Demand risk relates to insufficient user volumes compared to base case assumptions. It happens typically in road or railway projects when the ultimate payer is the user. Legal and political risks relate to, among other factors, the legal framework, dispute resolution, the regulatory framework, government policy, taxation, expropriation and nationalization (EPEC 2011:11) The private sector is believed to be better placed to assume commercial risks—even if demand risks concern both public and private parties in certain contracts—and the public sector is better placed to assume legal and political risks.
Chronological classification:
A chronological classification of risks exists and is presented in Dey and Ogunlana (2004). Risks are associated with the chronological phases of the project:

- Development phase: typical risks are technological risks, credit risks, competition and bidding risks
- Construction phase: the risks encountered are construction delays, cost overruns, force majeure, political risks, infrastructure risks, etc.
- Exploitation phase: typical risks are raw material supply, market risks, performance risks, operation and maintenance risk, financial risks due to foreign currencies payments.

Li Bing (2005) provides an interesting classification with three levels of risks: macro, meso and micro levels:

- Macro level includes exogenous risks i.e., external to the project itself. Typical risks at this level are of political and legal nature, of macroeconomic conditions, social conditions and bad weather. These risks are not caused by internal project factors but their effect can be huge.
- Meso level includes endogenous risks, i.e., risks that have their sources in the project itself and they impact the project itself if they occur. Construction risks, demand risks, supply risks and operation risks are typically in this category.
- Micro level includes endogenous risks internal to the project but whose sources are not directly related to the project itself. This level includes organizational risks, risks of inappropriate partners -lack of experience, engagement, motivation of one partner etc. This category is made to highlight the difference of objectives and viewpoints of the public and private partner.
whose objectives are radically different hence relationships can be problematic.

This classification is useful because it assists the public and private stakeholders in a strategic approach to risk management. For instance the public sector will focus on the macro level, the private sector on the meso level, and in order to reduce the risks on the micro level, a real “partnership” should be implemented between public and private partner.

5.2.3 Challenges and problems

In theory, risk management is aimed at achieving the following objectives (Boussabaine, 2007):

- to demonstrate Value for Money (during feasibility studies i.e., preparation and conception)
- to identify risks inherent to PPP procurement system (during tendering and awarding)
- to understand the risk allocation processes (during tendering and awarding)
- to deliver a robust financial and contractual structure for the project (during feasibility studies tendering and awarding)
- to create a risk management process during procurement and operation of the facility (during construction, operation and maintenance)

Now that the theoretical objectives in risk management are described I present the difficulties encountered in actual risk management in a PPP context. Risk management activities are strongly influenced by three dimensions specific to PPP projects, as illustrated in figure 5.6. The three dimensions are discussed below:

Figure 5.6 the three dimensions of risk management in PPPs. source: adapted from Leidel, fig. 1, 2009
Value for Money evaluation in PPPs: difficulties and developments

(1). Life cycle considerations and long-term risk allocation:
The complete lifecycle of a PPP project is rarely less than 20 years and this long-term agreement is both the rationale of PPPs and one reason why risk management is so complex. The different stages in a PPP project can be grouped as follows:

- Inception
- Feasibility study
- Procurement
- Construction
- Operation

Different categories of risks are managed at different stages of the project by different stakeholders. For instance, the demand risk – if it is a transport infrastructure e.g., a toll road – is managed by the public sector before the construction risk is managed by the contractor. For every phase of the project a specific risk profile is established, with the respective participants, their role and objective.

(2). Stakeholders perspectives
As mentioned previously, these differ between private and public sector both regarding objectives and risk perceptions, since these perceptions are closely linked to their organization’s objectives.

(3). Project risk management process.
The different stages are explained in a later section. This is a huge area of research and every stage of risk project management is a research topic taken individually.

The three dimensions should be understood separately and, according to Fischer et al., (2010) interconnected into an “integrated risk management system”. Based on this model I will discuss potential reasons that might lead to less Value for Money than expected.

As mentioned before, risk has a strong influence – if not the strongest – on the success of a PPP project. However, the literature (based on qualitative studies and interviews) indicates at least two major dysfunctions regarding the way risk management processes (3) are handled in PPP projects.

- the risk notion is not understood correctly: focus on the impact of a risk event and the optimal response
  There is a general focus on the possible loss rather than the risk notion, and many managers in design, schedule or budget “prefer to think in deterministic terms of optimal solutions, rather than probabilistic terms of robust solutions” (Winch, 2010:346). Demirag et al. (2011) confirm this statement arguing that managers prioritize their decision according to the worst-case orientation even if it has few chances to occur, instead of calculating explicitly the probabilities of expected values for different decision outcomes.

- the risk notion is understood but not in a common and consistent way
  The literature suggests a more standardized approach to risk management, some authors argue that the complexity of contracts and the fact that uncertainties are in practice buried deep in the PPP contracts instead of being explicitly considered makes the risk management even more challenging (Demirag et al. 2011). In certain
PPP projects, risk management has been performed at different stages but with no consistent and global framework (Leidel, 2009). The choices for cost and quality assurance through active control of risks are not explicit enough and have not been proved efficient, still according to Leidel, (2009).

Section 5.2 discussed the importance of risk management in PPP projects and its specificities. Risk management in PPPs is a challenging task due to the long-term nature of the projects, the different stakeholders involved and the lack of consistent and global framework. Those issues are discussed in section 7 in relation to the Value for Money.

5.3 The risk management process

5.3.1 Model of risk management process

Prior to explaining the risk management process model, some important remarks must be made. Generally speaking, risk management can be studied in two distinct but interrelated dimensions:

- Company risk management: deals with risk-related strategic objectives, organizational guidelines and operational activities.
- Project risk management: deals with the systematic risk management of an operational project (Leidel, 2009).

In my thesis, I focus on the risks inherent to single projects since it is too complex to deal with company risk management in the meantime.

The figure 5.7 below shows the whole risk management process for a specific project. This model is widely spread in the literature\(^\text{16}\) and though differences exist there are generally four main phases: identification, analysis, management of risk with appropriate strategies, followed by a monitoring and control phase. The communication of risk is present all the way through the loop, in order to constantly give an accurate picture of all the risk-related activities. A detailed post-documentation at the end of a project is essential for future project, in order to correct, redefine and optimize the decisions to be made.

The next sections explain the different steps of the model.

\(^{16}\) See for instance Boussabaine, 2007
Figure 5.7 The risk management model within a specific project. Source: Fischer et al., 2010, figure 8
5.3.2 Risk identification

The high complexity of PPP projects makes this step critical. Proper risk identification must be made at the inception and is crucial for the rest of the project. Since PPP are often unique projects, identification techniques cannot be standardized and are mostly based on the knowledge of experts in related fields (Fischer, 2010), which brings us again to the notion of perceptions and subjective probabilities mentioned by Winch. Interviews with experts and lists of specific risks are widely used and it is recommended to use several methods in order to display the whole range of possibilities.

Some examples of identification techniques and their application taken from Akintola et al., (2003) are given in Appendix 5.

As a general rule, PPP projects involve a wide range of experts in finance, design, environment, planning, etc. Once the risk is identified and put into the specific context of the project, the next step consists in analyzing it.

5.3.3 Risk analysis and assessment

This process is used to gain knowledge and understanding on the risks identified at the previous step. The likelihood and magnitude of the risks identified are assessed through qualitative, semi-quantitative or quantitative tools.

Qualitative methods:
These usually consist in compiling a list of the main risk sources and describing their likely consequences, without trying to quantify their probability of occurrence. Then a risk prioritization should be made but it is often neglected due to limited amount of time and resources according to Ishida et al. (2005).

The most commonly used qualitative tool is a risk register; it is usually a table database which lists all risks relevant to the project along with useful information to manage them. Risk registers are simple and convenient but they suffer from limitations that are (Ward, 1999, in Ishida et al.)

- Insufficient description of individual risks drivers, thus creating ambiguity and misunderstanding
- Unawareness of risk inter-dependencies
- Limited guidance on the relative importance of individual risk drivers

Semi-quantitative methods
In addition to the analysis and assessment of risks, a prioritization is made regarding the importance of risks. To quantify a risk, two dimensions should be considered: the impact and the probability of the event. The risk percentage (or risk exposure) can be defined as:

\[ \sum_{i=1}^{n} P(\text{RE}_i) \times I(\text{RE}_i) \times 100 \]

\( P(\text{RE}_i) \) = probability of the risk event number \( i \).
\( I(\text{RE}_i) \) = impact in term of total losses due to the risk event number \( i \) if it occurs.
It can be summarized in a risk matrix as illustrated in figure 5.8.

<table>
<thead>
<tr>
<th>Probability</th>
<th>VL (0.5)</th>
<th>L (0.1)</th>
<th>M (0.2)</th>
<th>H (0.4)</th>
<th>VH (0.8)</th>
</tr>
</thead>
<tbody>
<tr>
<td>VH (0.9)</td>
<td>4.5%</td>
<td>9%</td>
<td>18%</td>
<td>36%</td>
<td>72%</td>
</tr>
<tr>
<td>H (0.7)</td>
<td>3.5%</td>
<td>7%</td>
<td>14%</td>
<td>28%</td>
<td>56%</td>
</tr>
<tr>
<td>M (0.5)</td>
<td>2.5%</td>
<td>5%</td>
<td>10%</td>
<td>20%</td>
<td>40%</td>
</tr>
<tr>
<td>L (0.3)</td>
<td>1.5%</td>
<td>3%</td>
<td>6%</td>
<td>12%</td>
<td>24%</td>
</tr>
<tr>
<td>VL (0.1)</td>
<td>0.5%</td>
<td>1%</td>
<td>2%</td>
<td>4%</td>
<td>8%</td>
</tr>
</tbody>
</table>

**Caption**

<table>
<thead>
<tr>
<th>Risk Level</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>High Risk ≥ 20%</td>
<td>Re-assess the risk in detail. Modify the risk mitigation strategy</td>
</tr>
<tr>
<td>5% ≤ Medium Risk &lt; 20%</td>
<td>Control and monitor the risk development. Develop emergency action plans</td>
</tr>
<tr>
<td>Low Risk &lt; 5%</td>
<td>Update the risk register. Anticipate emergency action plans</td>
</tr>
</tbody>
</table>

VL=Very Low, L=Low, M=Medium, H=High, VH=Very High

Figure 5.8 the risk matrix Probability/Impact. Source: Adapted from Peter W. G. Morris, Jeffrey K. Pinto 2004, p. 40

The matrix presented in figure 5.8 represents a semi-quantitative approach where probability and impact of risks are subjectively assessed by using qualitative scaling factors (very high, high, medium, low and very low). Then ranges of values are assigned to the qualitative scaling factors and risk exposure can be derived from the formula above. Finally, the most important risks (i.e., with the highest risk exposure) are prioritized.

**Quantitative methods**

These are used to explicitly represent the likelihood and impact of risks in terms of common planning measures, such as time, money and quality (Grey, 1995 in Ishida et al.) A risk pricing is often performed; it consists in putting a monetary value to each of the risks, consistent with their probability, impact and timing. (Boussabaine, 2007) The most utilized quantitative risk analysis techniques are deterministic and probabilistic analysis techniques; they are discussed in the section 6.3.2

### 5.3.4 Risk allocation

An optimal risk allocation is necessary to achieve Value for Money in a PPP project; otherwise it easily turns into financial costs (Fischer et al. 2010, OECD, 2008). It is a common knowledge that risk should be borne by the party best able to assess, manage and control it, at the lowest cost, thereby reducing the long-term cost of the
project (OECD, 2008, Yong, 2007). Empirical studies have shown that the public partner tends to transfer too much risk to the private partner in PPPs, thus creating two problems: it costs more money since the private partner demands insurances and *premium* when bearing an additional risk and the project is more exposed to risk when the private partner is not able to correctly manage this additional risk.

There is an optimal level of risk allocation —including the *premiums* and fees paid to the private partner— when maximizing Value for Money as presented in the diagram below, but this situation is hardly reached in practice (Li *et al.* 2005; OECD, 2008).

![Diagram of optimal risk transfer](image)

**Figure 5.9 Principles of optimal risk transfer. Source: OECD (2008) p. 50**

During the risk allocation phase, risks can be categorized in two parts: endogenous and exogenous risks. The first category refers to internal risks that can be controlled in theory; they are drivers of efficiency in a PPP. Exogenous risks refer to risks that cannot be controlled, such as *force majeure*, changes in regulatory context, etc. Empirical studies showed that most of the project-specific risks were allocated to the private sector while political and property risks were allocated to the public sector. Other exogenous risks were however shared between private and public sector. This arbitrary allocation of exogenous risk can reduce Value for Money, according to the OECD, since risks that cannot be controlled by definition will not be best managed by the private sector, but a *premium* will be paid to the latter. In theory, the point of optimal risk-sharing is reached where “the marginal cost of the increase of public sector risk absorption equals the increased marginal benefit of private sector involvement” (Dewatripont and Legros, 2005, quoted in OECD, 2008: 52).

In practice, there is no standard model for risk allocation due to the uniqueness of PPP projects. The different stakeholders in PPPs are willing to bear certain risks depending on their objectives and their ability to correctly manage those risks. The allocation of risks is made through legal institutions and instruments, typically through contracts and other legal agreements.
Based on the literature, the main problems faced with risk allocation come from a lack of transparency and perception bias (see De Palma et al., 2009) that lead to less accuracy and credibility of the indicators used by the stakeholders when they decide to participate in a project and when they decide to bear a specific risk.

5.3.5 Risk mitigation strategies

Risk mitigation strategies can be divided into measures that can reduce the probability of a risk event or the impact of the event if it occurs. They can act on either risk source or consequences of the risk event, as presented at the beginning of this section. A risk is rarely entirely eliminated but the risk exposure can be lessened to an acceptable level (Fischer et al., 2010).

The tools and techniques of risk mitigations are varied and depend on the stakeholders and their risk perception, function, experience and phases they are involved in PPP project (OECD, 2008, Fischer et al., 2010). They include “contractual arrangements, insurance, export credit agency guarantees, political risk insurance and employment of financial derivatives” and are of five kinds (OECD, 2006a:26-27):

- Risk avoidance: the source of risk is eliminated or the project is cancelled to avoid the risk. This usually happens when no other strategy is appropriate.
- Risk prevention: the probability of risk event or the impact of the event is reduced by stakeholder’s actions. Studies showed the importance of risk minimization in the contracts before the project begins (Akintola et al., 2003) in order to be able to prevent the future risks, especially from banks and financial institutions’ viewpoints.
- Risk insurance: when a stakeholder buys an insurance plan; it is a very common form of financial risk transfer.
- Risk transfer: stakeholders reallocate risks to other best able to manage it in return of a premium. Compared to the price of keeping the risk, the premium which is paid in return should be the most cost-efficient option. Financial institutions are often responsible of this risk transfer process and usually, construction risks are borne by construction companies, exploitation risks by exploiting companies and political and legislative risks by the public sector (Akintola et al., 2003).
- Risk retention: when risk management costs are too big with regard to the probability of risk event or the impact if it occurs, the risk is retained.

5.3.6 Risk monitoring and control

Risk monitoring and control consists in implementing risk mitigation strategies, tracking identified risks, monitoring residual risks, identifying new risks while evaluating the risk management process during the project life. (See figure 5.7)

This risk monitoring process gives a global picture of risks, strategies implemented and responsibilities of every stakeholder. Risk monitoring is important for retained risks that could have negative financial consequences (Fischer et al., 2010).
6  FINANCING OF PPPs: RISKS AND STRATEGIES

In the previous section I presented the concept of risk and uncertainty in a project and a general risk management model. In this section, I present the practical methods to deal with financial-related risks. The ultimate goal is to discuss these methods and their consequences for Value for Money assessment.

In order to present the importance of financial characteristics in PPPs, the financial structure, the financiers’ perspective and their key role is described and discussed in detail in this section. If the reader is familiar with private finance issues this section can be considered as an update course.

6.1  Introduction

Why did I choose to focus on financial-related risks?

My first idea was to focus on the construction risk since it is the risk I have more familiarity with due to previous internships in building companies. Then I acquired more knowledge and I understood that the notion of risk in PPP projects was much more complex than I thought and could not be limited to “construction risks” only. After having carefully read and studied articles and reports from the financier’s perspective but also from non-financial perspectives, it turned out that financial-related risk was a risk to consider carefully because of its central importance and its interdependencies with some other important risks.

According to Kurniawan et al. (2010), a sound financial evaluation is of great importance in large infrastructure projects like PPPs where strong financial support is needed. Moreover, even construction risks are assessed by financial institutions like Moody’s or Standard and Poor’s. Their role is to evaluate different construction risks in financial terms so that financial stakeholders in the project can have a wider picture of risk management. The methods of financial risk analysis and strategies are normally applied before launching the tender, according to the European PPP Expertise Center (EPEC, 2011). My study deals with this phase as well.
If we look at the figure 6.1, we can notice that “Legal and political risks” are much harder, if not impossible to assess and quantify correctly compared to “Commercial risks”. Within “Demand risk” and “Supply risk” categories I explain to what extent financial-related risks are ubiquitous and how they are assessed. The significance of financial aspects explains why I have chosen them as common determinant. Moreover, financial risk is the only risk perceived as a major risk during both preparation phase, tendering phase, construction and operation, whereas other risks like operation risks are only present during a specific phase\(^\text{17}\) (Demirag \textit{et al.}, 2011).

Even if “Legal and political risks” are out of the scope of this paper, they have a strong influence on financial-related risks: a report from the EPEC (2011) states that a lack of confidence in the stability of the regulatory framework represents a considerable risk for investors.

To conclude this introduction, I would like to emphasize that the involvement of private financing in PPPs gives rise to new financial risks compared to traditional procurement method. This situation explains my focus on financial related risks\(^\text{18}\).

### 6.2 Financial flows and financial structure in PPPs

#### 6.2.1 Time-profile of financial flow

As explained before, a PPP bundles investment and service provision of infrastructure into a single long-term contract. PPP projects require large upfront investments provided by different groups of investors. Those initial investments are

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\(^{17}\) Yet “design and development risks” should not be underestimated as pointed out by a contractor who was also investor in a PPP project: “Design and development is what wins a project, so that’s a key risk in terms of are you backing the right horse” (quoted in Demirag \textit{et al.}, 2011:9)

\(^{18}\) See the quote from Barett, 2003:4 in English \textit{et al.} (2010:68) for further reasons.
paid back once the operation phase starts. After completion of the construction phase, the SPV receives a stream of payments as a compensation for capital expenditure and operation expenditure. The payments can come from the public authority (in schools or prison projects), from the user fees (toll roads) or from both. This is illustrated by figures 6.2 and 6.3 which represent the typical time profile of the financial flows in a PPP project. Figure 6.2 is very simplistic but provides a clear vision and Figure 6.3 is more detailed.

![Cash flow profile in a PPP project. Source: Gawlick, 2007, figure 3-1](image)

![Time-profile of financial flows. Source: Engel et al., 2010, figure 1](image)

Year 0-4: Capital expenditures (Capex). Debt is paid off at year 25. Revenues grow at 5% per year. Debt payments grow at 3.5% per year. Interest rate = 12%

**Capex**
Capex is the abbreviation of Capital Expenditure. It is the cost of developing the project, regardless of funding sources. Assuming a greenfield project (a construction
project where there is no need to refurbish or demolish an existing structure), the investment costs for an infrastructure project usually include (Gawlick, 2007):

- Land and site development costs
- Buildings and civil works
- Plant and machinery
- Technical and engineering fees

*Operating cash flow*

The simplest form of operating cash flow means revenues minus expenses. The objective of debt financiers is normally to assess the project’s ability to service debt i.e., to repay both principal and interest of the loan; therefore they assess a project’s cash flow based on revenues before interest, tax, depreciation and amortization (EBITDA)\(^{19}\).

6.2.2 Project Finance Organization

In this section I explain financial arrangements for PPPs and the structure around the SPV so that the importance of financial structure and influence of financial actors is highlighted.

![Figure 6.4 Typical PPP Transaction and contractual structure. (Engel et al., 2010, figure 3)](image)

\(^{19}\) The calculation of a fictive cash flow is presented in Appendix 6
The expansion of PPP as a method for infrastructure projects is linked to the development of project finance, which is a financial technique based on lending against the cash-flow. Lenders and investors rely either exclusively (“non-recourse” financing) or mainly (“limited recourse” financing) on the cash flow generated during the operation phase to repay their loans and earn return on investment respectively (EPEC, 2011; Engel et al., 2010).

Investors are generally willing to lend money if projects are legally and economically self-contained. Investors generally pay special attention to risk management since in case of project failure their investment would have the character of sunk costs (Engel et al., 2010). Indeed, highly specific and technical projects involve large initial investment but are almost of no value in case of abandon if the project cannot be put into use. For instance, it is unlikely that a state or a private company is willing to pay anything for a bridge that is not completely built. The purpose of the project finance structure is to align the interests of the main lenders with those of the public authority, so that both public and private parties’ objectives are met and the project succeeds (EPEC, 2011).

6.1.2.1. Sources of capital within the SPV

The creation of a Special Purpose Vehicle (SPV) is partly due to financial reasons and among these the stand-alone nature of the SPV, meaning that money invested and future cash flows are dedicated to the SPV only. Consequently, there are no diverting resources as it can be the case for a division in a larger corporation. (Engel et al., 2010:49)

The main function of the SPV is to put various private sector actors together for the purpose of the PPP project deal. It is done through a system of contracts as illustrated in figure 6.4. With this system of contracts, risks can be transferred from the SPV to the other companies. The SPV therefore becomes a low-risk structure and is able to attract risk-adverse financial investors like banks. (Pollock and Price, 2004)

At the beginning of a PPP project, the SPV is created and funds (capital) are injected. The capital structure is made up of equity, debt and quasi equity/debt. Theoretically speaking, the optimum of each financing source is reached “when the capital structure balances the risk of bankruptcy with the tax savings of debt” (Simerly R. and Li M., quoted in Gawlick, 2007, p.13)

This “optimum” level of debt and equity for a project is:

- not static (it depends on the stage of development in the project, for instance construction or operation phase),
- dependant on the project nature and the financiers risk perceptions
- dependant on access to financial markets

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20 Capital structure is slightly different from financial structure that includes short-term debts whereas the capital structure includes only long-term debts, but this distinction is ignored in this paper.

21 The tax savings of debt refers to the fact that from a tax perspective it is cheaper for firms and investors to finance with debt than with equity. Under a majority of taxation systems around the world, firms are taxed on their profits and individuals are taxed on their personal income but not on debt (Wikipedia, 2012)
Different sources of capital have different characteristics and a different risk/return profile based on their claim to assets (Gawlick, 2007). As illustrated in figure 6.5, debt capital is “cheaper” than equity meaning it is a less risky source of funding. Indeed, debt holders have a prior claim to revenue and assets, they have priority over the cash flow compared to the other stakeholders. It means two things: they are the first stakeholders to be repaid, and in case the project faces financial difficulties, they will have priority to any cash flow.

Prior to explain the proportion of debt and equity in the financial structure and their relation with risks the notions of debt and equity is clarified.

**Debt**

Debt financing is money borrowed to debt holders whose investment return is limited to the interest earned on the principal.

i. Characteristics

Regardless of its source or structure, debt has specific characteristics that differentiate it from equity (definitions comes from Gawlick, 2007):

- **Maturity** – All debt has a maturity date at which time the outstanding amount is repaid in full.
- **Repayment Provision** – Debt instrument has generally a repayment provision which specifies how and when the interest and principal are to be repaid.
- **Floating versus Fixed rates** – Interest rates on debt instruments can be either fixed or floating. Fixed rates are set for the term of the loan and are based on existing rates for similar term loans.
**Voting Rights** – Unlike equity holders, lenders are not considered as owners and therefore do not have any voting powers. However, their influence and power in the project is considerable since they are generally the major source of funds.

**ii. Sources**

Debt financing can originate from different sources with commercial loans usually ranked as senior debt and all other debt being subordinated debt. Senior debt has priority over the cash flow and assets compared to subordinated debt and equity.

*Senior debt* is commercial loans lent by banks or financial institutions. These funds can be secured by the project’s assets, the financial strength of the borrower and the expected cash flow of the project.

*Bonds* are long-term interest bearing debt instruments often purchased by institutional investors through the public capital markets. Due to restrictions on investment mandates, many institutional investors may require a credit rating for the project from an independent credit rating agency.

*Subordinated debt* is represented by other types of loans and has a higher rate of return than senior debt due to the increased inherent risk.

**Equity**

Equity financing is long-term capital provided by an investor (a sponsor or government) in exchange for shares in the company or project in the case of a PPP. There is a fundamental difference between equity providers and debt holders. Equity holders get dividends based on net earnings distributed only after all debt holders have been paid. If a default occurs, equity providers will be the least prioritized regarding payback. On the other hand they have unlimited residual returns compared to debt holders whose investment returns are limited to the interest earned on the debt.

**Grants**

Grants are provided without any repayment right by organizations willing to see the project developed (typically public authorities). They are useful to reduce risk exposure and therefore can encourage developers and investors to consider risky projects with uncertain returns.

**6.2.3 Financial structure in different phases of a project**

**6.2.3.1 A risk dependent financial structure**

“The changing sources of finance match the evolving pattern of risks and incentives over the life cycle of PPP projects.” (Engel et al., 2010 p.42)

The financial structure of PPP is not static as the capital requirements and cash flow depend on the project phase. I illustrate it in the figure 6.6:
The highest level of risk exists during the construction phase when construction delays and cost overruns can have serious consequences on the project success. Construction is subject to significant uncertainty, the diligence of the sponsor (specificity of the drawings, changes in design) and the ability of the building contractor (construction delays, cost overruns, technical problems) being the two factors to monitor. According to Engel et al., there is especially high scope for moral hazard during the construction phase. For this reason, banks (providing senior and subordinated debt in other words providing the major part of financial resources) generally perform a monitoring role over the SPV which in turn controls the building contractor. One method is to disburse funds gradually after some milestones are reached, meaning some elementary phases are completed. Here again, one can notice that even if banks are not directly involved in the construction project they can exert control over other stakeholders through financial instruments and they consider risks very carefully.

The financial structure changes once the construction phase is completed and operation begins. The risk perceived by the different stakeholders is normally reduced and the possible risks occurring can only affect primarily the cash flow. So the “expensive” equity and debt structure is refinanced using “cheaper” debt and consequently lowering the cost of capital. This “cheaper” debt comes often from bond finance, which is appropriate for risk-adverse investors willing to invest small amounts of funds. Bond holders are normally involved only after the construction phase is completed because their concern is only in the cash flow and not in the project itself and they are not directly involved in management or control of the PPP (Engel et al., 2010)
Looking at the SPV’s financial structure (e.g., 80% debt Vs 20% private equity\textsuperscript{22}) one can easily understand the lender’s concern regarding a careful risk management since they are the most significant source of finance.

6.2.3.2. Other factors that influence the financial structure

**Taxes**
The debt and equity mix must be carefully defined because it determines the cost of capital\textsuperscript{23}, which is important for sponsors of the project. In cases where taxes can be deducted from interests on debts, it can reduce the overall cost of capital for the project and since the debt is “cheaper” than equity, sponsors are encouraged to use debt instead of equity to finance projects. (Gawlick, 2007)

**Financial Risk and Flexibility** (Gawlick, 2007; Engel *et al.*, 2010; EPEC, 2011)
Financial risks and the need for flexibility influence the financial structure and the other way around. Depending on the project type and the current situation, the debt-to-equity ratio must be modified. For instance, by having too much debt in a project with fluctuating cash flow (high volatility) the project may not be bankable\textsuperscript{24}. To maintain some flexibility in case of unexpected events or in highly technical and complex projects, it is preferable to have high levels of equity, even if it is causes higher cost of capital.

6.2.4 Payment Mechanism

A critical question is whether revenue streams (cash flows) can cover operating costs, can service debt finance and can provide an adequate return on capital at the same time.

The main purpose of the payment mechanism is to pay the SPV enough so it is willing to enter into the PPP contract and provide the service (EPEC, 2011). From a public sector perspective, the payment mechanism is designed to create incentives and to provide an adequate allocation of risks.

The analysis of a project’s cash flow is important since it is the cash flow that is used to service any debt obligations. That is why the first step in completing a financial appraisal is generally the development of a cash flow model. Cash flow models are set up on a case-by-case basis and can be very simple or extremely complex depending on the type and size of the project (Gawlick, 2007).

There are basically two types of payments to the SPV, either by the public partner –it is called availability payments– or directly by the user through user fees

\textsuperscript{22} This is only an example; the debt-to-equity ratio differs between projects of different types.

\textsuperscript{23} “For an investment to be worthwhile, the expected return on capital must be greater than the cost of capital. The cost of capital is the rate of return that capital could be expected to earn in an alternative investment of equivalent risk. If a project is of similar risk to a company’s average business activities it is reasonable to use the company’s average cost of capital as a basis for the evaluation. A company’s securities typically include both debt and equity; one must therefore calculate both the cost of debt and the cost of equity to determine a company’s cost of capital. However, a rate of return larger than the cost of capital is usually required.” Wikipedia

\textsuperscript{24} A project is **bankable** if it has high enough predictable cash flows or other financial guarantees so that it is able to raise project finance.
Value for Money evaluation in PPPs: difficulties and developments

(e.g., highway tolls). These two different payment mechanisms can also be “mixed”, hence providing more flexibility.

The public partner might be willing to pay the SPV a fixed-price for each unit of service available in compliance with the quality specifications (for example a fixed-price will be paid when the foundations of the bridge are built). This is called unitary payments and this is a kind of availability payment. Another type of availability payment is a “lump sum” payment: the whole payment might be made after the construction phase is completed. This type of payment is suitable for short-term project like Build/Finance or Design/Build/Finance, in other words where the private sector is not responsible for Operation & Maintenance. This is, as underlined by the EPEC report, in accordance with the PPP principles stating that payments should be made only if the service is available and conform to the quality standards, as opposed to “cost-plus” contracts where payments are based on the contractor’s building costs.

In theory, a lump sum availability payment provides the SPV with strong incentives to meet the requirements, but in practice the SPV generally demands a premium to bear the excessive risks. When such a premium cost is not sufficiently offset by efficiency gains then this type availability payment is not suitable.

Moreover, the following principles should be applied when appropriate (EPEC, 2011):

- “Indexation” of payments to the SPV to offset cost increases due to inflation
- Deductions applied to the payment to the SPV in case of poor performance. The deduction is linked to the degree of deficiency in the service quality and should compensate the losses that the public authority or users cope with
- Partial transfer of demand risk from the SPV to the public authority
  The user charge can be gradually increased as demand falls. Also, a minimum revenue agreement can be implemented (i.e., SPV is paid a certain sum even if actual demand falls below an agreed minimum).

For transport PPP projects, the traffic revenue risk (or demand risk) is generally crucial. It is usually shared between the SPV and the public authority through a mix of “availability-based” payments to cover operating expenses and debt service and “direct user fees” payments to provide the equity return. Examples of such models are listed below (EPEC, 2011):

- revenue-sharing bands: lower and upper thresholds for sharing traffic revenue risk between the SPV and the public authority if traffic is outside the thresholds;
- flexible-term contracts: the PPP contract ends when the SPV has received a certain amount of revenue from users
- financial re-balancing: requirements to change the economic balance of the PPP contract if traffic is much lower/higher than expected
6.3 Risk management from financiers’ perspective

The evaluation of the financial viability of a PPP can be complex. Usually, banks and other financial institutions perform a full risk analysis including a technical/engineering assessment of the project (Kurniawan et al., 2010).

From a survey of Fischer et al. (2010), it can be concluded that the equity providers have the best knowledge about risk management methods and their application compared to other stakeholders. According to a PricewaterhouseCoopers report (2005) the lenders (debt holders) also play a major role by analyzing the robustness of all costs, the realism of revenue forecasts as well as the projected costs for operation and maintenance. However, those two studies and several others highlight the lack of appropriate risk assessment methods within the public sector and to a greater extent, the preference for easy-handling qualitative methods instead of quantitative methods that are time and cost consuming.

Yet lenders and equity providers, much more familiar with both qualitative and quantitative methods, use them very often. For these two reasons – major role in the risk assessment process and better knowledge and competence – I present financial-related risks from an equity provider’s perspective and from a lender’s perspective.

A general description of some major financial risks and their impact is presented in Table 6.1 below:

<table>
<thead>
<tr>
<th>TYPE OF FINANCIAL RISK</th>
<th>DESCRIPTION OF THE IMPACTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Failure to achieve financial clause</td>
<td>Delay or abandon of the project due to too high market uncertainty</td>
</tr>
<tr>
<td>Financial structure risk</td>
<td>Non optimal financial structure leading to default risk (debt-to-equity ratio too high) or less return on equity (debt-to-equity ratio too low)</td>
</tr>
<tr>
<td>Foreign exchange rate risk</td>
<td>Cash-flow volatility</td>
</tr>
<tr>
<td>Inflation rate risk</td>
<td>Increase of previously estimated life-cycle costs due to increase of inflation rate.</td>
</tr>
<tr>
<td>Interest rate risk</td>
<td>Fluctuation of loan interest rate thus fluctuation of debt services.</td>
</tr>
</tbody>
</table>

Table 6.1 Description of financial risks and their impacts. Source: author

6.3.1 Key Performance Indicators

Net Present Value
To understand risk analysis methods and processes used by financiers, it is necessary to identify the key goals and targets they consider in a project, here named Key Performance Indicators.

First of all Net Present Value (NPV) is a common method to evaluate different projects:
The NPV of a project is the sum of the all future cash flows discounted to their present value. It is a standard method to assess long-term project where the “time value of money” is involved.

A calculation of the NPV of a project indicates and quantifies if the project will add value to the firm. In financial theory, if there is a choice between two exclusively independent alternatives, the one with the higher NPV should be selected, from the financier’s viewpoint or from any other person who will get paid in the project. A summary of the meaning of relevant values of NPV is given in Table 6.3 and an example is given in Table 6.4, both enclosed in Appendix 7.

Equity provider

The equity providers (also called sponsors) are generally focused on the project internal rate of return (PIRR or Project IRR) which represents the yield of a project regardless of the financing structure (Gawlick, 2007). Internal rates of return provide evaluation of the desirability of projects; the higher the IRR for a project, the better from an equity provider’s perspective. Therefore equity providers use risk management policies to mitigate the potential impacts on this internal rate of return. An example of IRR is given in table 6.5 enclosed in Appendix 7.

Debt funder

The primary concern of the debt funders (or lenders) is the full repayment of the debt by the SPV and the amount of interest earned. The key difference between the lenders and the equity providers is that there is no opportunity for additional gain in a project for the senior lender. The maximum gain is calculated at the beginning and corresponds to the payment of the loan plus the interests.

Therefore lenders focus on the coverage of the income stream over the term of the debt and they generally perform a risk and robustness analysis of the project by using cover ratios and comparing them with ratios of reference or other historical data. (Grimsey and Lewis, 2002, Gawlick, 2007). For instance, the more the

\[ NPV = C_0 + \sum_{n=1}^{N} \frac{C_n}{(1 + r)^n} \]

\( C_0 \) – initial investment where \( C_0 < 0 \)

\( n \) – year or period

\( C_n \) – net cash flow at year \( n \) (inflow minus outflow)

\( r \) – the discount rate

25 The discount rate used is often equal to the weighted average cost of capital (WACC) - The WACC is the minimum return that a company must earn on an existing asset base to satisfy its creditors, owners, and other providers of capital, or they will invest elsewhere (Wikipedia).

26 The “time value of money” can be explained through a basic example: one person can be paid 100€ now or put this 100€ in a bank with an assumed and guaranteed 5% interest, and thus get 105€ after one year: the value of 100€ paid now or 105€ paid exactly one year after is the same.

27 Cover ratios are explained and illustrated in Appendix 8.
predictable and guaranteed cash flow, the lower the risk perceived by the financiers, thus the lower the ratio requirements.

Coverage ratios are decision-making tools for financiers, and the requirements regarding those ratios depend mainly on the actual or perceived risk.

<table>
<thead>
<tr>
<th></th>
<th>Natural Resources</th>
<th>Roads User-pays</th>
<th>Power</th>
<th>Water</th>
</tr>
</thead>
<tbody>
<tr>
<td>DSCR min</td>
<td>1.25</td>
<td>1.25</td>
<td>1.25</td>
<td>1.20</td>
</tr>
<tr>
<td>LLCR min</td>
<td>1.75</td>
<td>1.50</td>
<td>1.35</td>
<td>1.30</td>
</tr>
<tr>
<td>PLCR min</td>
<td>2.00</td>
<td>1.80</td>
<td>1.50</td>
<td>1.40</td>
</tr>
</tbody>
</table>

Table 6.2 Example of minimum ratio requirements by Partnerships Victoria, Australia. Source: Gawlick 2007

The table 6.2 above represents minimum coverage ratio requirements specified by Partnerships Victoria, Australia. This is an example of limit requirements but different financiers can specify their own thresholds based on their own criteria and analysis. In this example cash flow revenues from water projects are more predictable (i.e., less risky) than those coming from toll-roads; therefore, coverage ratio requirements are lower.

6.3.2 Qualitative and quantitative financial risk assessment

In this section I develop the qualitative and quantitative methods used by financiers.

Qualitative Assessment
It consists mainly of finding realistic assumptions and scenario regarding each risk, and then being able to create two additional scenarios: a downside and an upside scenario. The methods used vary between different companies and different projects. For instance, a global company which undertakes many similar PPPs around the world (e.g., only toll-roads or only hospitals) will have a consistent risk database and enough experience to calculate its in-house risk management capabilities. On the other hand, for innovative and highly complex projects, the building company might lack appropriate risk management. In these cases, lenders and equity providers will more often perform careful risk analysis based on similar projects.

Quantitative Assessment
Quantitative assessment used by the equity providers:

Probabilistic Analysis: The equity providers are generally focused on the Internal Rate of Return as mentioned before. Therefore they look at the parameters that could influence this rate during the life-time of the project. The IRR is equal to the discount rate when the NPV equals zero. Thus the only factors influencing the IRR are the cash flows (both positive and negative). Each identified risk in the project is then associated with three different scenarios: a base-case, a realistic downside and a realistic upside scenario.
These assumptions and scenarios can be based on historical data (if previous similar projects were carried out by the company), or they can come from expert opinions, workshops or purely subjective judgments (Chee and Yeo, 1995).

If the cash flow model is expressed as a continuous distribution of probability the model allows for a Monte-Carlo simulation. The detailed theory behind Monte-Carlo simulation is extremely complex and is not treated in this paper.

Equity providers often use Monte-Carlo simulations through software like @Risk or DynRisk in order to model the overall risk impact on the cash-flow model. Ideally, they want to analyze whether even in the downside scenario their Internal Rate on Return is kept on acceptable thresholds.

Quantitative assessment used by the lenders

Since debt holders cannot claim additional gain in the case of an upside scenario, their main concern is about the downside scenario and a worst-case scenario. To generate “quantified” realistic scenarios, they perform sensitivity analysis.

A sensitivity analysis, sometimes called “what-if” statement, shows the potential impact on the cash flows based on changes to various inputs. To a greater extent, a sensitivity analysis illustrates the effects on the outcome of the project after changes in the value of each risk variable occur. By testing all these assumptions, they can aggregate the worst risks to build worst-case scenario. If the key performance indicators (like debt cover ratios) are still acceptable also in a worst-case scenario, then the financiers might be confident with the risk level of the project. The main problems encountered with sensitivity analysis are that:

- Equal probabilities of occurrence are given to all scenario –they should be weighted according to their likelihood
- Inter-dependencies between variables are ignored; computerized simulations would be too costly and complicated
- Combination of all variables can create a too large set of scenarios

6.3.3 Upstream and downstream securitization

A comprehensive identification of risk enables financiers to determine whether risk mitigation strategies should be implemented and if so, how it should be made. Risk mitigation has two aims; one is to reduce the likelihood of a risk event, the other is to reduce the consequences if the risk event occurs. So when the financial model and the financial risk analysis are performed, financiers generally set up appropriate risk mitigation strategies. According to the extensive study of Demirag et al., three factors are carefully considered by financiers:

- The availability of swaps to mitigate interest risks

28 This brings us again to the problems raised by Winch about subjective probabilities. In fact, sometimes the qualitative analysis in itself is not well performed or there is simply some data missing but the quality and robustness of quantitative analysis are directly linked to the accuracy and reliability of qualitative assessment.
• The ability to transfer risk to sub-contractors
• The availability of insurance

**Swaps**
The debt of a PPP project paid by the SPV to the lenders is usually priced on “the underlying cost of funds to the lender plus a fixed component expressed as a number of basis points to cover default risk and the lender’s other costs” (EPEC, 2011) such as operating costs, opportunity costs and profit. This cost of funds is evaluated on the basis of floating interest rates that fluctuate with market movements. In distinction to these floating rate funds and debt service obligations, the SPV gets fixed revenues. This mismatch is typically offset by “hedging” strategies like “swaps.

A swap is an agreement whereby two parties agree to exchange currencies, interest payments or commodities at predetermined future dates. These financial strategies are used to reduce losses as a result of future price movements when high fluctuations in interest and/or exchange rates occur.

**Interest rate swaps**
Interest rate swaps is considered as one of the most important financial strategy
d29
It is used to mitigate risks when an interest payment mismatch occurs (Gawlick, 2007). PPPs are often financed based on a floating rate but the revenues are based on a fixed revenue stream. Therefore the SPV has fixed guaranteed revenues but has to face variable payments and debt service due to the floating rate contract, so it is highly exposed to interest rate volatility. In this case, the SPV can enter into an interest rate swap agreement: it pays a fixed payment rate to a financial institution and in exchange gets a payment based on the current floating rate, so that no mismatch occurs. This strategy is illustrated in the diagram below: the SPV’s debt service (with a floating rate) is matched by the floating rate cash flow received from the financial institution. The final result is that SPV is able to eliminate the risk caused by interest rate volatility in exchange of a fixed payment to a financial institution.

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29 According to Demirag et al, and it has been confirmed through informal discussions with a Financial Manager in charge of a PPP railway project in France.
**Currency swaps**

Currency swaps are like interest swaps but instead of fixed and floating interest rate payments, they involve the exchange of different currencies. (Gawlick, 2007).

Imagine that a loan is in one country currency but the revenues are in another then the parties are exposed to risk caused from exchange rate fluctuations. With a currency swap, the SPV can exchange its local currency revenues for foreign denominated revenues. Hence the structure of the cash flow matches the debt service obligations and volatility in income is eliminated.

![Figure 6.8 Example of a currency swap. Source: Gawlick, 2007](image)

**Insurance**

The risks that are known but impossible or too costly to manage are usually covered by insurance contracts. For instance the SPV can buy an insurance that will protect the project against *force majeure* or political risks. In case of such risk event, the money claimed to the insurer should allow the sponsor to restore the project situation to its status before risk event or at least to repay any outstanding loans (Gawlick, 2007).

**6.3.4 Illustration through a case study**

In the absence of usable practical data to illustrate a risk analysis study, I used the study conducted by Grimsey and Lewis in 2002 that concerned a water treatment facility in Scotland. I extracted the useful information in order to illustrate how a risk analysis from a financier’s perspective looks like in practice. The case study and interpretations are presented in Appendix 9.
7 FINDINGS AND DISCUSSION ON HOW TO REACH A BETTER VALUE FOR MONEY IN PPPs

In section 5, the notions of risk and risk management in PPPs have been discussed. Issues and difficulties associated with risk management processes have been raised and a comprehensive risk management model has been presented and explained.

In section 6, the financial structure of PPPs and its associated issues have been introduced and finally risk assessment and strategies from financiers’ perspective have been explained.

In that way, section 5 and 6 provide the theoretical background to the questions raised in section 7.

7.1 Hypothesis and issues raised

As mentioned in the very beginning of the paper, the initial goal of PPPs is to provide a better overall Value for Money compared to traditional publicly procured infrastructure projects. Value for money can be divided in two components: objective and subjective.

The objective part refers to all economic and financial aspects; in theory it is possible to measure and quantify it in monetary terms (see section 4). The subjective part refers to social benefits and satisfaction and to greater extent ecological aspects. Therefore if we combine both objective and subjective parts we can compare Value for Money with the Sustainability concept as a whole and its three dimensions that are:

- Financial sustainability: refers to the possibility of public authorities to meet their financial requirements resulting from investments in infrastructures both in a short and long-term perspective (Enserink and Koppenjan, 2009)
- Environmental sustainability: refers to the impact of public infrastructures on the urban population (health, well-being), urban environment (quality of air and water, traffic jams) and the nature nearby (ecological impacts, scarcity of natural resources, etc). (Enserink and Koppenjan, 2009)
- Social sustainability: refers to the impacts of urban infrastructure on the equity and access to public services by all groups within urban society. It refers also to the consequences on livability and social inclusion in the urban environment. (Enserink and Koppenjan, 2009)

In this report, I have focused mainly on the so-called “objective components” of Value for Money, in other words I focused on the economical and financial aspects of sustainability. If we look at the map of thought presented in introduction and in Appendix 1, these objective components refer to Economy and Efficiency.

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30 The sustainability concept is summarized in figure 7.1 in Appendix 10
31 Economy: minimizing the cost of resources used and required – spending less
The initial issue studied can be summarized as:
“How to optimize Economy and Efficiency so that Value for Money is maximized?”

I have studied this issue from a risk analysis perspective since risk is a key driver of the objective component of Value for Money. Finally, I have focused on risk analysis from financiers’ perspective since they are strong stakeholders in PPP projects. In the next sections, I attempt to assess the consequences of these risk analysis processes on Economy and Efficiency, i.e., on the objective component of Value for Money.

The second issue introduced in this part can be summarized as:
“To what extent the subjective component of Value for Money is considered in PPPs and how can it be maximized?”

By “subjective” value, I mean the Effectiveness with which the project is delivered and other social and ecological aspects. Or in other simple words, to what extent the private sector involvement contributes to social and ecological sustainability in PPPs and how to integrate social and environmental aspects of sustainable urban infrastructures beyond the financial advantages of PPPs?

7.2 Overview of the current problems

7.2.1 Economy and Efficiency in Value for Money assessment

7.2.1.1 General risk assessment issues

*Premium costs and risk transfer:*

As mentioned in section 4 and 5, the transfer of risks from the public to the private sector is the reason why the latter gets a *premium* when bearing additional risks. It raises two questions:

- Is there any rationale for the public sector to pay this *premium*?
- If so, does the value of risk transferred match the value of the *premium* paid?

The public and the private sector generally do not have similar approaches as regards risk assessment and risk pricing. In privately financed projects like PPPs, a market value is given to the risks whereas in publicly financed project, the government approves the risks without making a charge (Pollock and Price, 2004). Therefore, in privately financed projects, the public sector must pay a risk *premium* to the private sector in exchange of a risk transferred to the private sector.

The extent to which risk is transferred is one of the central issues in Value for Money assessment when it is decided to choose either traditionally procured infrastructure or PPP. Indeed, a project delivered with traditional procurement is
often cheaper before the amount of risk transferred is priced, and once it has been priced, PPPs can become cheaper.

According to Pollock and Price, the validity of the risk transferred pricing made in early Value for Money assessments has not been proven and is very difficult to audit due to the structure of PFI contracts and the lack of available data\textsuperscript{32}. It is well illustrated by this quote of Jeremy Colman, former Auditor General of Wales, who is reported to have said:

“People have to prove Value for Money to get a PFI [PPP] deal… If the answer comes out wrong you don’t get your project. So the answer doesn’t come out wrong very often.”\textsuperscript{33}

The way the risk allocation is made within the SPV structure and the often complex web of contracts is problematical as well. It is widely known (Grimsey and Lewis, Pollock and Price, Demirag et al.) that the often complex web of contracts and legal structure allows the SPV to shift risks on to other companies. For instance construction and design risks are borne by the general contractor, performance and availability risks are borne by the Service Company, etc. This structure is required so that the SPV bears as little risk as possible. This way the SPV can obtain project finance from external financiers. Moreover, if we remember the payment mechanism, the public sector generally pays periodic revenue to the SPV to cover the risk transferred. The problem with this risk allocation process is that equity providers in the SPV are often also sub-contractors, for instance general contractors. This way, sub-contractor profits and risk premium received by equity holders are not clearly distinct and it is extremely difficult to audit due to the complexity of internal contractual arrangements\textsuperscript{34} (Pollock and Price, 2004).

### 7.2.1.2. Specific risk assessment problems

In this section I focus on the consequences of the risk management from financers’ perspectives on the economical aspects of Value for Money.\textsuperscript{35}

Following the financial crisis in 2008, interest rates on debt were increased, so did the cost of private finance\textsuperscript{36}. According to the National Audit Office (in Unison, 2011) it caused an increase to the unitary payments of up to 10% even if the risk profile is the same than before the crisis. In other words, the financial crisis might have substantially decreased the economical gains of Value for Money supposedly won through PPP contracts. An interesting issue for future studies is to evaluate whether or not it has increased Efficiency and Effectiveness, but given the difficulties to evaluate economical aspects only it seems rather hard to assess.

A recent paper from Shaoul et al. (2012:6) notices also the confidentiality\textsuperscript{37} of Business Cases and contractual documents in PPPs. Because of this confidentiality it

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\textsuperscript{32} See Pollock and Price, 2004, section 2

\textsuperscript{33} See Pollock and Price, 2004 p.6

\textsuperscript{34} To my mind, it is also an eventuality that the public sector does not want to deal with such complex issues that are costly and time-consuming.

\textsuperscript{35} Particularly with regard to the Economy as defined in note 28

\textsuperscript{36} I do not explain why the interest rates were increased; see Unison (2011) section 4.2 for more details and a partial analysis

\textsuperscript{37} To my mind, clauses of confidentiality are not restricted to PPPs. They are present in many other project delivery methods.
is often difficult to address the impacts of the new amendments and requirements expressed by the financiers prior to the financial close, while there are often big changes in the contracts that occur at the preferred bidder stage.

Also, the refinancing of PPP is criticized, with evidence of profits from the private sector and a failure to share these profits appropriately with the public partner but also within the private consortium. There is visibly a lack of regulation in this case, since the National Audit Office noted that of 107 audited PFI, only about 25% contained profit-sharing clauses (Shaoul et al., 2011). For instance the rate of return from the investors of four massive PPP projects in the UK has been tripled after refinancing 38.

Finally I would like to raise the issue of swap strategies. It is the responsibility of the SPV - the lenders and equity providers to be more accurate- to include hedging instruments into the financing structure since they are the best suited stakeholders to take appropriate actions. However, as stated by the European PPP Expertise Center, the public sector should take an active role in these decisions since the implementation of such strategies has consequences on the ultimate payer, i.e., the public partner or the end-user. Moreover, I think that transparency is not complete if the financial institution - whose source of revenue comes here from the implementation of a “swap” strategy - and the lenders have the same interest; actually the latter could influence risk management decisions and creates incentives to provide costly hedging instruments even if this is not necessary, thus raising unfounded profits.

To summarize the findings, the risk management processes applied by financiers in PPPs have led in certain cases to a substantial decrease of the economical savings compared to the situation before the financial crisis 39. Moreover, there is often an over confidence in financial evaluation tools and on the subsequent decisions made, whereas it has been stated that 88% of 113 financial model table inspected since 1995 contained errors due to misleading formula (Panko, 2008 in Kurniawan et al., 2010).

7.2.1.3. Asymmetry of information and perception bias

There are also criticisms regarding the way the PSC-PPP comparison is made in order to demonstrate Value for Money. It is closely linked to the extent risk management is affected by asymmetry of information and perception bias.

For instance “unrealistic high estimates of construction risk” combined with “unrealistic low estimates” of internal rate of return often occurs 40. These manipulations tend to support the PPP route over the traditional procurement although they are not always made on purpose but they result from perceptions biases from the decision makers (De Palma et al., 2009)

In addition, PPP route can be favored by choosing a higher discount rate. The higher the discount rate chosen for the NPV calculation, the more a discounted cash-flow analysis will favor the PPP route over a traditional procurement route 41. The choice of an appropriate discount rate is essential for long-term projects that are

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38 See Toms et al, 2011:674 for case studies of PFI refinancing
39 These findings and figures are valid in the UK only
40 See Unison, 2011 for examples and figures
41 See an illustrative example in Appendix 11
analyzed with the discounted cash-flow method but several official reports and articles from literature mention a lack of underlying principle with regard to the choice of discount rates\textsuperscript{42}.

Limitation of risk management: In every construction project and especially in large scale PPP projects, the uncertainty during the early stages of the project requires much attention on risk management. During the early phases, lots of decisions are made and guidelines are generated, when there is only few reliable data or future forecasts for a correct analysis. Actually these data are dependent on the perceptions and subjectivity of early decision makers. That is to say that the identification of risk sources at the definition of a project has major implications for the rest of the project life cycle. For this reason, it is mostly a matter of subjective perception of risks. Indeed, as opposed to a financial model that repeats the same routines, construction projects are one-shot plays for the project manager. In PPP projects, repeated plays are not the norm and even if many of the risk analysis tools are derived from theories and practice of financial fields, the uniqueness of PPP projects makes them less powerful and reliable.

I follow the idea of Fischer et al. (2010) who advocate for an integrated risk management framework, so that all stakeholders are aware of all the inherent risks of the project. More transparency leads to more efficient contract negotiations – negotiations are lengthy and costly for PPP projects compared to traditional procurement– and probably less future disputes.

7.2.2 Sustainability issues in PPPs

Beyond the supposed financial benefits provided with PPPs, there are concerns about the compatibility of the private sector’s goals (i.e., focus on short-term return on investment) and the long-term sustainability goals such as ecological and social equity (Enserink and Koppenjan).

There is a general focus towards financial advantages while the social and environmental aspects of sustainable development are less considered. In the next sections I exemplify current sustainability problems faced in PPP contracts.

7.2.2.1. Absence of public consultation

Siemiatecky is one of the few authors who studies criteria for evaluating PPPs from a planning perspective. In a research paper he developed a set of criteria that planners could use and he performed an empirical study of three PPPs transportation projects in which he evaluated those criteria. One of the short-term criteria is about public consultation in decision-making processes:

“Will it [PPP] limit meaningful community consultation and involvement?”

His hypothesis, based on an overview of the literature, is that the public involvement in infrastructure investment decision is critical, helping in raising citizen support and providing a wide range of viewpoints and various appropriate solutions. For a meaningful involvement of the public citizens in the decision-making processes

\textsuperscript{42} see for example Grimsey and Lewis, 2004
through workshops or other seminars with experts from both public and private sector, citizens should have open access to key documents and data; they should be represented in the decision-making process and their point of view should be seriously considered in the final decisions.

Results of the study performed by Siemiatacky are unsurprising: during the planning process, confidentiality of commercial key information is invoked to protect key details of the project. Therefore public citizens –and sometimes representatives from the public sector, i.e., the client– do not have real influence on the planning phase and consequently on ecological or social sustainability issues. During the operational phase, their feedback or critics do not have real importance since contractual arrangements prevent the project from any future changes\textsuperscript{43}. This issue brings us to the question of flexibility in the contracts.

\subsection*{7.2.2.2. Lack of flexibility due to long-term contracts}

Among long-term criteria developed by Siemiatacky there is the question of flexibility due to long-term contracts:

\textit{“Will DBFO contract terms constrain future options?”} in other words will these contracts limit the future involvement of public bodies and especially planners in future decision making processes whose goals are to meet the evolving public interests. This is a key question because urban planners are key actors when it comes to sustainability issues –in the ecological and social sense– Therefore, the changing sustainability goals can hardly be achieved without urban planners in future decision-making processes.

Based on studies from three different transportation projects which “covered the range of possible financial and planning outcomes” so that results are not biased, results are unanimous\textsuperscript{44}: in any case there is a limitation of the government flexibility to adapt to future changing conditions and to integrate the public feedback. Noncompetition clauses and highly formalized and secured contracts prevent the public sector from performing changes and this has significant impact on the long-term infrastructure and urban planning, since PPP are very long-term agreements.

\subsection*{7.2.2.3. Lack of competition}

Another sensitive issue in PPP is the competition between bidders. One of the theoretical reasons for choosing a PPP is the high market competition that is supposed to provide Value for Money. In fact PPPs are often suffering from a lack of competition due to strong financial requirements from the bidder to enter such costly projects and due to high bidding costs caused by the complexity of development phase and contractual procedure. Without competition, transparency and accountability are not always ensured and this can generate market failures “leading to limited coverage of the population, inefficient use of resources and negative environmental and health impacts” (Enserink and Koppenjan p.291)

“Perfect markets” conditions do not exist in infrastructure provision and are characterized by natural monopolies –barriers to entry the market are too high,
therefore only a limited amount of firms are present in the market45- and legal monopolies through contracts that give exclusive rights to construct and operate infrastructures during a long-term period. In these conditions the private party can adopt an opportunistic behavior to maximize its profits and self-interests instead of improving social sustainability issues (Enserink and Koppenjan). Lack of competition might also have consequences on ecological sustainability. In fact, it impedes creativity and innovation hence the implementation of new ecological solutions and processes46.

7.3 Potential solutions to integrate sustainability in PPP projects

7.3.1 Balancing profits and sustainability

It is often costly for the private sector to implement sustainability measures and the long-term benefits are often disregarded compared to the high costs of implementation of such measures. If public authorities want to promote sustainable measures in PPPs, I think that most effective solutions can result from appropriate governance practices.

These practices depend on the regulatory context (within the legal context), the institutional context and the ability of in-house public sector partners.

There are three main challenges for the public sector to face: (Enserink and Koppenjan, 2009)

1. How to attract the private sector in sustainable projects?
2. How to create incentives for sustainability once the private partner is attracted by the project?
3. How to ensure the sustainability requirements are met once the contracts are awarded?

The first challenge depends mainly on the ability and knowledge of the public actors about sustainable projects. Governments and public representatives should be able to understand private investment decisions in order to have a clear perception of risk management and profitability issues of the private sector. On the other hand, a reduction of political uncertainty (in the meaning of unforeseen changes in regulations) is necessary so that the private sector is willing to invest. The asymmetry of information is then reduced and a real partnership can take place on a sound basis.

Once a private partner is attracted by a project, the public authority should create incentives for sustainability. It can be done through an appropriate choice of contract and legal measures that are implemented in order to stimulate private parties to improve sustainability. Setting up the right contract is crucial since it is designed to establish rules and performance requirements for a long-term. Contracts should be designed in a way that reduces effects of market failures and opportunistic behavior. Indicators of ecological sustainability should be set and social and economical

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45For instance there are only three groups involved in PPP projects in France in the water sector (Suez Environnement, Veolia and Saur) and the same number in big civil engineering projects (Vinci, Bouygues and Eiffage)
46 I admit that this opinion is highly questionable
sustainability should be promoted through tariff differentiations and price regulation respectively (Enserink and Koppenjan). Social sustainability issues like affordability problems often happen in developing countries where inequalities are significant. Since private investors tend to have a risk-averse attitude, they might restrict the service provision to profitable areas, e.g., wealthy residential districts, because they are afraid customers will not be able to pay their bills. To prevent these social inequalities, a differentiation of tariff aligned with the household income seems to be a good solution. These inequalities can also be lowered with government subsidies but this way, I argue that the financial risk is re-transferred to the public sector and it is in contradiction with the PPP principles.

Once the right contract is awarded and the service is delivered, a strong regulatory context is needed. It is necessary to prevent the service providers from an increase of prices or from a decrease of quality. There are plenty of cases where the private partner entered into a re-negotiation of contract that resulted in enormous increases in prices, especially in water supply projects (see e.g., Lobina and Hall, 2003). Consequently there is a need for a strong and competent regulatory body in order to stop opportunistic behavior but this requirement is often not met. In highly developed countries, the financial means are always bigger in private firms compared to public bodies, resulting in more expertise and professional staff in private companies. In poor countries the gap is even more visible, so is the asymmetry and information and the likelihood of opportunistic behaviors. The regulatory issues that have to be established are challenging, and even in rich countries with high-quality professional and competent civil services, governments are struggling with these issues (Pollitt 2002, in Enserink and Koppenjan).

To conclude this section, I would like to mention that there might be a need for strong and powerful regulatory bodies, not only focused on long-term financial sustainability but on social and ecological sustainability too.

I would also like to raise issues about the importance of contracts. Although contractual arrangements are useful tools, they might suffer from incompleteness, i.e., they are not detailed enough to cover every little detail in the project, and some risks and unforeseen events cannot appear in contracts. Hence, there will always be a room for uncertainty and opportunistic behavior in the contracts, and regulatory bodies will not be able to monitor every situation. Therefore, in addition of the achievement of original and appropriate contractual expectations, I think that there

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47 It is roughly the same thing as paying taxes to the state in the case of public goods.
48 That could be a supreme authority outside the contract, in charge of the legal issues. In parallel, the European PPP Expertise Center is the authority in charge of the communication and guidance around PPPs.
49 Between 2000 and 2010 in the UK, Partnerships UK was in charge of the policy making for PFI (PPP) projects. This limited company was owned by eight of the biggest investors in the PFI industry, together with the Treasury and Scottish government. In theory the role of Partnerships UK was to implement policy rather than not to make policy but in practice the differences between implementing and making policies became vague (Hellowell, 2010 in UNISON, 2011). For instance Standardised PFI Contracts, and thereby commercial terms of PFI contracts, was released by Partnerships UK. Given that it was mainly owned by large investors in this sector it creates obvious problems of ethics and opportunistic behavior
is a need for more trust and real “partnership” between the public and the private sector.

7.3.2 Reinforce the public bodies - creation of independent agencies dedicated to PPPs

There is a trend toward stronger standard setting with the creation of dedicated institutions at a European level such as the European PPP Expertise Center and this is supposed to provide guidance to public bodies. The objective of The Guide, released by the EPEC is to identify the best guidance currently available from national guidelines worldwide and research papers in order to “assist public officials responsible for launching and implementing PPP projects and to facilitate their understanding of the key issues and procedures involved in the procurement of PPP arrangements” (EPEC, 2010:5)

In countries that are familiar with PPPs like in the UK, new frameworks of accounting, audit and regulations have materialized in order to cope with bad practices of the private sector, like excess profits coming from refinancing or too high premiums compared to the risks really transferred.

Yet, it seems that ecological and social issues are barely considered in documents of reference like The Guide. There is no list of sustainability indicators or sustainability goals except for long-term financial aspects. This statement is not a critic of PPP project, to my mind it means that regardless of the procurement method, ecological and social issues have to be considered the same way, in the very early phase of the project. Choosing the PPP route would mainly influence financial aspects, and this explains the amount of research and literature only focused on these aspects. Coming back to the Economy, Efficiency, and Effectiveness that both form the concept of Value for Money, my opinion is that building a project based on a PPP or based on traditional procurement should be considered with regard to Economy and Efficiency only, Effectiveness being fixed by the public partner’s goals and visions in the early phase’s assessment. However, there is a need for strong regulatory bodies, acting both as “watchdog” and “sheepdog” so that Effectiveness is not botched once the PPP route is chosen.

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50 The terms “watchdog” and “sheepdog” are found in English et al. (2010). Broadly, the “watchdog” authority controls the compliance with contractual terms and the “sheepdog” provides guidance and advices so that best practices are chosen.
8 CONCLUSIONS

In this thesis I studied the influence of risk assessment and to a greater extent risk management on the Value for Money in PPPs, Value for Money being the rationale for choosing PPPs. After I introduced the topic, problem and methodology, I presented the concept of PPPs and Value for Money. I explained the reasons why I chose to focus on risk assessment as a key driver for Value for Money, so that the analysis is made with one variable.

The concept of risk and risk management are very complex so they have been clarified in section 5 and a model of risk management model has been given. In section 6, based on that model, the emphasis has been put on risk analysis from a financier’s perspective. This section has provided technical knowledge and vocabulary used by financiers when they assess risks in large PPP projects. Finally section 7 has tried to address one of the the initial problems that is how to maximize the Value for Money from a risk management perspective. Other aspects slightly different from risk management has been invoked in the discussion of Value for Money.

In the light of my findings based on the literature, informal reviews and personal opinion, I argue that the relation between risk management and Value for Money is really complex for two main reasons:

Lack of standardized definition and concept.
Even in countries like Australia, Canada or in the United-Kingdoms where special government PPP-units were created, the notion of Value for Money is still vague. There is no really detailed definition or framework to assess it in a systematic way. Therefore, a list of indicators should be created in order to facilitate the evaluation of Value for Money. There is an overemphasis on economical aspects regarding Value for Money while ecological and social aspects seem neglected, nonetheless there is no tangible evidence to affirm it certainly.

Another difficulty in the topic comes from the multitude of risk management models and the fact that risk management is usually made on a case-by-case basis. It therefore becomes very difficult to evaluate the relationships between two concepts that are not defined in a common way and that are multivariable.

Lack of empirical data.
Due to the lack of standardized framework, it is really hard to perform consistent analysis of Value for Money. To my mind there has not been any Value for Money assessment ex post, meaning during the operational phase. That was the initial goal of this thesis but for the reasons explained in section 2.2 it could not be achieved. For future large studies, a recommendation could be to assess the relationship between the Value for Money achieved and the way risk management has been performed. Here again, an appropriate framework is needed to assess Value for Money.

Despite these two limitations that prevent me from giving exact results and conclusions, I summarize some findings and opinions in the next paragraphs.
The notion of Value for Money can be described in terms of Economy, Efficiency and Effectiveness\(^51\).

Evaluation of the Economy is made with the Public Sector Comparator, in order to assess the cheapest solution comparing a PPP and a traditional procurement given the same quality standards. Financial risk assessments and risk allocation processes are led by financiers and they have a significant influence on the Economy. To prevent the private sector from bad practices that lead to higher costs for the public sector, a stronger regulatory context is needed together with better financial audit institutions and processes.

The Efficiency is dependent on the private sector abilities as well as the way contracts are managed. Better Efficiency could be achieved if contract incompleteness is reduced and if there is more transparency so that uncertainties are not buried in complex contractual terms. With a standardization of contracts, Efficiency could be increased but on the other hand it would reduce flexibility whereas flexibility is required so that future clauses in the contracts can integrate the changing goals of sustainability. The right balance between standardization and flexibility still needs to be found, probably modeled on practical rather than theoretical studies.

Effectiveness should not be undervalued whether the project follows a traditional procurement or a PPP route. There are currently only few assessments of Effectiveness and sustainable aspects of PPPs once in their operational phase. Given the long life expectancy of e.g., an urban infrastructure project, high sustainability goals should be set at present. This issue concerns all infrastructure projects, regardless of the form of procurement chosen, but I conclude that the influence of PPPs on Effectiveness has to be evaluated, whether it has positive or negative impacts.

\(^51\) See note 28 for the definitions
GLOSSARY

This glossary contains definitions of specific terms used in construction management, project finance and the construction industry. The definitions come from various sources used in this thesis.

Bid
In construction, it refers to the process of submitting a proposal (bid) to the client in order to carry out the construction project.

Bond
In finance, a bond is a formal contract to repay borrowed money with interest at fixed intervals. The authorized issuer –the borrower– owes the holder –the lender– a debt and, depending on the terms of the bond, is obliged to pay interest to use and/or to repay the principal at a later date.

Build and Transfer
Model of PPP contract: the government specifies the required outcomes and functionality, but is not necessarily prescriptive in how this is achieved. The private sector bears the risk and the asset is transferred to government to operate upon completion.

Build Own Operate Transfer
Model of PPP contract: the private partner is responsible for financing the entire lifecycle of the project (design, construction, operations and maintenance) and owns and operates the project through a concession period. In addition, the private partner bears all commercial risk. The asset is then turned over to the government at the end of an agreed term.

Build Own Operate
Model of PPP contract: as above, except private partner retains ownership of asset. Government agrees only to purchase services for a fixed period.

Cost of capital
It is used to evaluate new projects of a company as it is the minimum return that investors expect for providing capital to the company. For an investment to be worthwhile, the expected return on capital must be greater than the cost of capital. The cost of capital is the rate of return that capital
A. Desgrées du Loû could be expected to earn in an alternative investment of equivalent risk

<p>| Design Build Finance Operate | Model of PPP contract: a combination of the Design &amp; Construction and Operate and Maintain. The Private contractor is also responsible for financing the projects construction. Upon completion the government buys the asset. The management stays with the contractor but government retains ownership. |
| Financial structure | The way in which a company’s assets are financed, such as short-term borrowings, long-term debt, and ownership equity. |
| Infrastructure | The system of public works in a country, state or region, including roads, utility lines and public buildings (OECD) |
| Issuer | A state, political subdivision, agency, or authority that borrows money through the sale of bonds |
| Monoline | Financial institutions that insure investors in the bonds guaranteeing that they will be paid. |
| Private equity | In finance, it is an asset class consisting of equity securities in operating companies that are not publicly traded on a stock exchange. |
| Procurement (Tendering) | It is the acquisition of goods or services. The goods/services should be procured at the best possible cost while meeting the needs of the procurer (buyer) in terms of quality and quantity, time, and location. In the construction industry, procurement processes promote fair and open competition while minimizing exposure to fraud. |</p>
<table>
<thead>
<tr>
<th>Term</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Special purpose vehicle (SPV)</td>
<td>The SPV is an entity created to act as the legal manifestation of a project consortium. The SPV itself has no historical financial or operating record which government can assess.</td>
</tr>
<tr>
<td>Regulatory context</td>
<td>The combination of institutions, laws and processes that, taken together, enable a government to exercise formal and informal control over the operating and investment decisions of enterprises that supply infrastructure services.</td>
</tr>
<tr>
<td>Retail Price Index (RPI)</td>
<td>In the UK, it is a measure of inflation published monthly.</td>
</tr>
<tr>
<td>Return on capital</td>
<td>Return on capital is a financial measure that quantifies how well a company generates cash flow relative to the capital it has invested in its business.</td>
</tr>
</tbody>
</table>
Appendix 2: Classifications of PPPs

<table>
<thead>
<tr>
<th>Public project</th>
<th>Public-Private Partnership</th>
<th>Private project</th>
</tr>
</thead>
<tbody>
<tr>
<td>Contract Type</td>
<td>Public-sector procurement</td>
<td>Franchise (Affirmative)</td>
</tr>
<tr>
<td>Construction</td>
<td>Public sector (2)</td>
<td>Private sector</td>
</tr>
<tr>
<td>Operation</td>
<td>Public sector (3)</td>
<td>Private sector</td>
</tr>
<tr>
<td>Ownership</td>
<td>Public sector (4)</td>
<td>Public sector</td>
</tr>
<tr>
<td>Who pays?</td>
<td>Public sector</td>
<td>Users</td>
</tr>
<tr>
<td>Who is paid?</td>
<td>n/a</td>
<td>Private sector</td>
</tr>
</tbody>
</table>

* Also known as Design-Construct-Manage-Finance (DCMF) or Design-Build-Finance-Maintain (DBFM)
** Also known as Build-Lease-Operate-Transfer (BLOT) or Build-Lease-Transfer (BLT)
*** Also known as Build-Operate-Transfer (BOT)
(1) In all cases, ownership may be in the form of a joint venture between the public and private sectors (cf. §17.5).
(2) Public sector normally designs the Facility and engages private-sector contractors to carry out construction on its behalf (design-bid-build).
(3) Public sector may enter into service (outsourcing) contracts (for operation and maintenance) with private-sector contractors.
(4) Ownership may be through an independent publicly-owned Project Company, i.e. a 'Public-Private Partnership' (cf. §17.2.2).
(5) The BOO Contract form applies to PPPs in the minority of cases where ownership of the Facility does not revert to the Public Authority at the end of the PPP Contract (cf. §15.11).

Figure 3.4 Classifications of the most common types of PPP (Yescombe, 2007 p.11)

Figure 3.5 Classifications of PPP with regard to the risk transfer to the private sector (OECD, 2008 p.51)
Appendix 3: Example of a PPP-PSC evaluation

On this diagram, Adjusted Shadow Bid corresponds to the total estimated costs to the public sector when delivering the same project under Alternative Financing and Procurement (other denomination for PPP in Canada).

**Base costs:** they are assessed identically as in the first model presented in section 4, with the exception that the *premium* (compensation for the additional risks transferred to the private sector) is included in this part. The *premium* is highly dependent on the degree of risk transfer as well as market conditions (Infrastructure Ontario, 2007).

**Competitive neutrality** is included in the base cost evaluation as well.  
**Financing costs** are higher in the PPP model because the private sector borrows money with higher interesting rates than the public sector.

**Ancillary costs** are depending on the project delivery method. They include project management costs and transaction costs. Under PPP those two costs are higher given the higher legal fees, transaction fees and engineering advisory fees among others.

Infrastructure Ontario methodology considers an equivalent level of innovation – without tangible evidence– in a traditionally delivered project or in a PPP project where the design, construction, financing and operations are assumed by a single entity, the SPV, and thus where innovations are supposed to occur. In this case it can be argued that the PSC-PPP comparison is unfavorable to private sector.

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Appendix 4: Theoretical discussions on the concepts of risks and uncertainties

In any particular project—and especially in construction projects—the objective is to provide the final deliverable within time, budget and quality specifications. To achieve this goal, appropriate decisions must be taken at a given time where there is still a lack of information required. The problem of risk management is precisely to take the good decisions when all information is not available. This is illustrated in figure 5.1.

![Figure 5.1 The definition of uncertainty (source: Winch, 2010, fig. 1.3)](image)

Figure 5.1 provides this way a first definition of uncertainty as a global concept. The substantial difference between risk and uncertainty is introduced later in this part.

![Figure 5.2 The project process as dynamic reduction of uncertainty through time (source: Winch, 2010, fig 1.3)](image)

The project process from the inception to completion goes together with the reduction of dynamic uncertainty with time, as shown on figure 5.2. Indeed, at the beginning of the project, there is just an idea that comes from a need, few sketches in best cases. Uncertainty is at its summit, but it should decrease with time as more information becomes available (design and technical ambiguities are solved,
regulatory approval and construction permits are obtained, contractors perform the work correctly, etc.). If there is a high level of complexity and no previous similar projects to inspire of, then uncertainty is very high; this is the case with PPP.

**Understanding risk and uncertainty through time**

The concept of risk is time dependant as illustrated on figure 5.3.

![Learning loops](image)

*Figure 5.3 Understanding “risk” through time (source: Winch, 2010, fig.13.1)*

Let us illustrate the different parts with a simple example of workers maintaining windmills:

*Risk source:* works on dangerous high structures - workers repairing windmills turbine -

*Risk (source) response:* harness and climbing equipment provided to specially trained workers

*Risk event:* a worker can easily fall and die

*Risk event response:* strict security procedures (indeed, if an employee dies while working and the company is judged responsible the compensatory damages for families will be huge)

IF no risk (source) response THEN risk event is likely to occur.

To prevent this type of accident, a specific risk response is provided before the accident occurs. It can be named a “pre-event response by mitigation of accident source” (Winch, 2010:347). In less extreme cases, the management can respond to the impact of a possible risk event (in other words it is accepted that an unpredictable and potentially dangerous event happens and some measures are taken to ensure less impact once this event occurs). A typical example of such “post-event improvement of response” (Winch, 2010:347) is the creation of emergency exits in public places in case of fire.

The relation between a particular risk source and an associated event is expressed in probability of occurrence given the risk source. As underlined by Winch, probability is therefore a property of the *event* and not the source. Indeed, a same risk source can lead to risk events of various impacts and the probabilities of these future events differ.
The cognitive model of Winch is presented in appendix. It develop interesting views on the risk perceptions.

**The cognitive model**

Prior to presenting the cognitive approach, a panel of the four different ways of thinking when defining risk and its relationship with probabilities is given (Winch, 2010):

The **objectivist** school: the probability of a future event can be deducted from a substantial number of observations of previous occurrences drawn from a known situation. This approach attempts to predict the future from available data on risk sources.

The **logical** school: as opposed to the objectivist approach, data set is not consistent and large enough to be used for statistical representation. Conclusions about possible risks are made by experts and engineers assumptions based on the design, scientific properties and natural environment if we deal with a new kind of bridge for instance.

The **subjectivist** school: this is a prescriptive approach giving advices for how future decisions should be made; it “emphasizes the degree of belief held by the decision-maker in the probability of a particular event”

The **behavioral** school is descriptive. It focuses on decision-making processes under uncertainty.

The cognitive approach established by Winch has characteristics from each of the four approaches mentioned above. It is called cognitive because it accepts the concept of subjective probabilities; that is an event occurs in the future because of a decision-maker acting in the present, and not only because of the external factors.

It is presented in figure 5.4:

![Figure 5.4 the cognitive model of risks and uncertainty on projects (source: Winch Fig 13.2)](image-url)
Winch uses the term *cognitive* to name its approach of risk and uncertainty. The basis of this theory is that risk depends on individual perceptions. Risk is thus not an external factor but a function of the decision-maker perception given the information available at the time of decision.

Explanation of the diagram:

- **Known knowns** is the *cognitive* condition of risks. The risk source is identified and given that, a probability can be assigned to the risk event.
- **Known unknowns** is the *cognitive* condition of uncertainty where a risk source is identified but no probability can be assigned.
- **Unknown knowns** is the *cognitive* condition of uncertainty where the risk source and related probabilities of a risk event are known but kept private and thus unavailable for the decision-maker.
- **Unknown unknowns** is the *cognitive* condition of uncertainty where the risk source has not been identified and thus the risk event cannot be known.

Logically, the occurrence of an event can be certain (probability = 1), impossible (probability = 0) or simply possible (probability ∈ ]0;1[). When an appropriate data set is available and fixed within the time of the project, it is possible to assign an event a probability on the continuum between 0 and 1 – vertical axe on figure 5.4. But since risk is time-dependant and is also dependant on individual perceptions, such fixed probabilities cannot be assigned precisely.

Since there is no clear explanation of the fig 5.4 I give my personal interpretation. The decision-maker will have different ranges of choices regarding the space of the area on the right. Actually, if we look at the smallest area –known knowns- the variety of choices is limited for the decision maker but still exists. On the other hand, if we look at the biggest area –unk-unks- which includes all the others, the amount of confidence and information is lacking and thus the decisions maker is facing a broad range of possible decisions.

It can be questionable to categorize those *cognitive* states in such a clear-cut way but that helps to understand more deeply the challenges faced by decision-makers (Winch, 2010). One relevant aspect raised by Winch is the *confidence* in the level of information available.

For known knowns, it can be assessed through analytic techniques since this is dependent on probability distribution this area is the core of risk management processes. We will focus on some of those techniques in the next section.

For known unknowns and unknown unknowns, it depends on judgment so it is highly subjective. The known unknowns are also explicitly considered in risk management processes.

And for unknown knowns, it depends on the level of trust and confidence with the other participants in the project. The unknown knowns area can be reduced thanks to a more transparent risk management system where information relevant to project risks is not kept confidential.
# Appendix 5: Risk identification techniques

<table>
<thead>
<tr>
<th>Risk identification from</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>corporate expertise:</td>
<td>When the consortium undertakes a PPP project in which it has no previous experience, associated risks are hard to foresee and manage. Yet, it is possible to requisite skills from sub-contractors that are more able to deal with some specific risks. Databases are intensively used as well.</td>
</tr>
<tr>
<td>a security standpoint</td>
<td>Regarding safety, it is easier to criticize past events and accidents than to plan future ones. By reviewing causes of accidents, the company creates new safety standards and procedures that are implemented for future projects.</td>
</tr>
<tr>
<td>intuition</td>
<td>When no tangible information can predict a long-term risk like regulatory change, intuition is useful for long-term non-predictive risks</td>
</tr>
<tr>
<td>brainstorming</td>
<td>When problems faced are unclear, brainstorming sessions are held. The interaction between the different stakeholders allows for a more comprehensive identification.</td>
</tr>
<tr>
<td>site visits</td>
<td>It is common practice in every construction project. Specific risks related to the environment of the project are found out. For instance, asbestos was used intensively as extra insulation and for the refurbishing of buildings, site visits were necessary to evaluate the presence of asbestos</td>
</tr>
<tr>
<td>organizational structure</td>
<td>The organizational structure provides a better understanding of the skills and qualified resource of the company. It provides a global view of the project and assigns a group of person responsible for every important task. For a PPP project, cooperation between the members of the SPV allows a share of resources and competences.</td>
</tr>
<tr>
<td>data flow</td>
<td>It is used to discover logistic related risks. With a control of the data flow, raw material, machinery and finished products are localized and analyzed. Some anomalies can be found out with this data flow analysis, like problems in material or machinery specifications.</td>
</tr>
<tr>
<td>interviews and polls</td>
<td>In certain projects, some risks cannot be identified with forecasting techniques. Polls and interviews can be useful. For instance, a construction company involved in a road construction project released a poll among resident associations to ask their opinion about the project in order to assess the risk of a strike that would interrupt and delay the project.</td>
</tr>
<tr>
<td>assumption analysis</td>
<td>When client demands are ambiguous, series of assumptions are made. These assumptions must be continuously controlled and revised</td>
</tr>
<tr>
<td>expert consultation</td>
<td>When in-house expertise is not able to identify all threats to the project, external experts and consultants are hired.</td>
</tr>
</tbody>
</table>
Appendix 6: Calculation of a fictive cash flow

The project sponsor defines net cash flow as revenues after tax (EAT) plus depreciation added back. This distinction exists because debt financiers are interested in assessing the cash flow used to service the debt, whereas project sponsors look at cash flow after taxes in order to assess a project’s return on equity (ROE) (Gawlick, 2007)

<table>
<thead>
<tr>
<th>Cash Flow</th>
<th>Debt Financier</th>
<th>Equity Provider</th>
</tr>
</thead>
<tbody>
<tr>
<td>Revenues</td>
<td>100,000</td>
<td>100,000</td>
</tr>
<tr>
<td>- Expenses</td>
<td>75,000</td>
<td>75,000</td>
</tr>
<tr>
<td>EBITDA</td>
<td>25,000</td>
<td>25,000</td>
</tr>
<tr>
<td>- Interest</td>
<td></td>
<td>1,500</td>
</tr>
<tr>
<td>- Depreciation</td>
<td></td>
<td>10,000</td>
</tr>
<tr>
<td>EBT</td>
<td></td>
<td>13,500</td>
</tr>
<tr>
<td>- Tax (30%)</td>
<td></td>
<td>4,050</td>
</tr>
<tr>
<td>EAT</td>
<td></td>
<td>9,450</td>
</tr>
<tr>
<td>+ Depreciation</td>
<td></td>
<td>10,000</td>
</tr>
<tr>
<td>Net Cash flow</td>
<td></td>
<td>19,450</td>
</tr>
</tbody>
</table>

Different types of cash flows from the debt financier’s and equity provider’s perspective. Source: adapted from Gawlick, 2007


**Appendix 7: Definition and calculations of NPV and IRR**

<table>
<thead>
<tr>
<th>If...</th>
<th>It means...</th>
<th>Then...</th>
</tr>
</thead>
<tbody>
<tr>
<td>NPV &gt; 0</td>
<td>the project would earn excess return for the investor</td>
<td>Equity holders will receive excess returns after the debt is serviced. The project should be accepted.</td>
</tr>
<tr>
<td>NPV &lt; 0</td>
<td>the project would lose money for the investor</td>
<td>Financial benefits are not enough to recover the costs. The project should be rejected.</td>
</tr>
<tr>
<td>NPV = 0</td>
<td>the project would neither gain nor lose money for the investor</td>
<td>This project adds no monetary value; the decision should be based on other criteria. NPV = 0 is the “base-case” used when developing a project, both by public and private sector.</td>
</tr>
</tbody>
</table>

Table 6.3 Relevant values and meaning of NPV

<table>
<thead>
<tr>
<th>Period</th>
<th>0</th>
<th>1</th>
<th>2</th>
<th>...</th>
<th>10</th>
</tr>
</thead>
<tbody>
<tr>
<td>Net Cash flow before financing</td>
<td>£-70,500,000</td>
<td>£10,158,463</td>
<td>£10,158,463</td>
<td>£16,413,357</td>
<td></td>
</tr>
<tr>
<td>Discount Rate (WACC)</td>
<td>0%</td>
<td>9.56%</td>
<td>9.56%</td>
<td>9.56%</td>
<td></td>
</tr>
<tr>
<td>Discounted Value</td>
<td>£-70,500,000</td>
<td>£9,272,266</td>
<td>£8,463,378</td>
<td>£6,588,344</td>
<td></td>
</tr>
<tr>
<td>NPV</td>
<td>£11,118,969</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

\[
\text{NPV}^{39} = \frac{10,158,463}{(1 + 0.0956)^1} + \frac{10,158,463}{(1 + 0.0956)^2} + \frac{10,158,463}{(1 + 0.0956)^{10}} - 70,500,000
\]

\[
= 11,118,969
\]

Table 6.4 Example of NPV calculation for a 10 year period. The discount rate is fixed at 9.56%. Source: Gawlick, 2007

**Internal Rate of Return**

The IRR of a project is the discount rate at which the NPV equals to zero, meaning that the net present value of costs of the project equals the net present value of the benefits of the project. Unlike the NPV where the discount rate r is stated and the NPV is then calculated, the IRR is calculated by setting NPV = 0 and then extracting r. It is clear that analytical solutions cannot be found, instead numerical and graphical methods are used but they are not presented in this paper.
The numerical or graphical method leading to this IRR is not explicitly written.
Appendix 8: Cover ratios

The debt cover ratios considered by lenders in PPP projects. Source: Gawlick, 2007.

Debt Service Coverage Ratio (DSCR). It is an historical measure that calculates the ratio between the cash flow for a previous period in relation to the amount of loan interest and principal payable for that same period (Gawlick, 2007). As it is a measure from the past, it only shows financial difficulties after the event, but it allows lenders identifying trends and is a useful benchmark for lenders when looking at investor’s financial strength.

Calculation: the DSCR is equal to the cash flow available for debt servicing divided by the amount of the debt service for a given, past period. The ratio should be equal to 1 at minimum, thus attesting the benefits of the project can service the debt.

Loan life cover ratio (LLCR): The Loan Life Coverage Ratio (LLCR), unlike DSCR, is forward looking as it gives a “snapshot of interest coverage on a given date based on the Net Present Value of the projected cash flows from that date until retirement of the loan relative to the loan outstanding on that particular date” (Gawlick, 2007).

Project Life Coverage Ratio (PLCR) is also a forward-looking ratio and is similar to the LLCR except that the NPV of the projected cash flows goes until the end of the project, as showed on the diagram. This ratio gives information to lenders to assess whether or not the project will generate sufficient benefits after the end of the loan in case the debt needs to be restructured (Gawlick, 2007)
Appendix 9: Case study

To summarize the incredibly complex web of contracts and the role of each stakeholder:

- Almond Valley and Seafield (AV&S) is the name of the project
- East of Scotland Water (ESW) is the procurer, in other word the public authority responsible for the future waste facility treatment.
- Stirling Water is the special purpose vehicle.
- Thames Water, MJ Gleeson and Montgomery Watson are the project equity providers, and also operators, contractors and designer respectively within Stirling Water.
- MBIA is the senior lender

**Financial structure** (for a total of £99 million):

<table>
<thead>
<tr>
<th>Percentage</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>79%</td>
<td>Senior debt</td>
</tr>
<tr>
<td>16%</td>
<td>Subordinated debt</td>
</tr>
<tr>
<td>5%</td>
<td>Sponsor equity</td>
</tr>
</tbody>
</table>

**Key Performance Indicators**

For Equity Providers, IRR is projected to be 16.56% nominal and 12.5% real at financial close.

**Payment Mechanism:**

The SPV of the project gets paid based on the volume of waste water treated. For the AV&S project there are three bands of payments corresponding to three ranges of volume treated. I summarized them on the graph below:
The aim of this structure is to allocate a sufficient volume risk to the SPV and to limit the payments to be made by the public authority. It is also a performance-based contract, meaning that poor performance from the facility would result in lower than forecast revenues. It is possible that there is not a precise match between the SPV revenues and forecast costs.

**Project Risks**
- Construction and operation risks are not retained by the SPV but allocated to construction and operation company.
- Maintenance costs are retained by the SPV
- Environmental risks (too high concentration of pollutants) are retained by the SPV
- Legal and regulatory risk (risk of any adverse changes in law) is shared between the public authority and the SPV. After 10 years it is borne by the public authority.

**Risk Analysis and Assessment**
The flow chart below (figure 6.11) summarizes the risk perspective, key performance indicators and choice of risk analysis techniques used by each of the main actors in the project. If we look at the key performance indicators, we can see that they concern financial aspects, even for the procuring public authority.
Even if the stress was put on the role of the lenders and sponsors only, the role of the procurer is discussed here because of its strong implication in the financial close process.

**Procurer:**
Its aim is to get the lowest NPV of expected cost for a given quality of facility and service. The NPV of expected costs, whose discount rate $r$ is fixed at 6% by national guidelines, can be influenced by other factors like interest rate and inflation rate, since cash flow $C_n$ is a function of the interest rate and the inflation rate at year $n$.

$$NPV = C_0 + \sum_{n=1}^{N} \frac{C_n}{(1 + r)^n}$$

The procurer is in this case exposed to fluctuations of interest rates and of inflation rate and therefore a sensitivity analysis is performed for both rates, so that the overall influence on the NPV and thus the overall price to pay can be modeled. The results are summarized in both tables below:

As expected, an increase of the interest rates is translated into an increase of the NPV.
Sponsor

The risk analysis is focused on the potential impact on the equity return. The methodology used in practice was exactly as the one described theoretically before.

Definition of a realistic downside and upside scenario for each risk so that a triangular distribution is given. This was done by the procurer’s technical adviser. The risks included in the analysis were, volume risk, the risk of mid-life capital expenditure and asset management costs overruns, operating costs and operating performance. Construction risk was not included because the project’s sponsor was not contractually responsible for this risk which has been fully transferred to the construction contractor.

A simulation exercise using the @Risk software was performed. The @Risk software uses Monte-Carlo simulation processes and provides a distribution of the overall relevant risks. In this case, while aggregating the risks together it can calculate the ranges of probability of returns, in other words the ranges of possible IRR.

The results are summarized in the table below. One can notice that although the risk modeled contained upside potential, there is no likely financial upside for the sponsors. And they cannot come from the payment mechanism which is capped. In this case negotiations are likely to take place.

<table>
<thead>
<tr>
<th>Table 1</th>
<th>Procuer: interest rate sensitivity</th>
<th>Table 2</th>
<th>Procuer: inflation sensitivity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Interest rate</td>
<td>% increase/decrease in NPV of expected cost stream from base case</td>
<td>RPI assumption (%)</td>
<td>% increase/decrease in NPV of expected cost stream from base case</td>
</tr>
<tr>
<td>Base case -1%</td>
<td>-3.3</td>
<td>2</td>
<td>+4.79</td>
</tr>
<tr>
<td>Base case -0.5%</td>
<td>-1.7</td>
<td>3</td>
<td>+1.47</td>
</tr>
<tr>
<td>Base case</td>
<td>Base case NPV</td>
<td>3.5</td>
<td>Base Case NPV</td>
</tr>
<tr>
<td>Base case +0.5%</td>
<td>+1.8</td>
<td>4</td>
<td>-1.36</td>
</tr>
<tr>
<td>Base case +1%</td>
<td>+3.6</td>
<td>5</td>
<td>-3.79</td>
</tr>
<tr>
<td>Base case +1.5%</td>
<td>+5.4</td>
<td>6</td>
<td>-5.90</td>
</tr>
<tr>
<td>Base case +2%</td>
<td>+7.5</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Senior lenders

As explained before, senior lenders tend to have a pessimistic view when doing a risk analysis and they focus on downside and worst-case scenario. In the AV&S project, they focus on two ratios:
Loan Life Cover Ratio (LLCR) and Annual Debt Service Cover Ratio (ADSCR). The latter measures the cash flow for the previous year and compares it to the amount of loan principal and interest for that same year. It is the DSCR explained in section 6.3.1 yet applied to one year only.

Before going into sensitivity analysis and cover ratios calculations, the lenders want to ensure that the Service Company is exposed to the fewer risks possible. The lenders exert tight control over Design&Construction and Operation&Maintenance contracts so that risks are allocated properly. Therefore, the first strategy used by lenders to mitigate risks is to allocate them properly through contractual agreements. Cover ratios calculations and sensitivity analysis are then performed, taking into consideration the risks retained. One of the risks retained by the Service Company is that in case of a dramatic increase of operating costs, the Service Company is willing to help the O&M contractor with financial contribution by increasing the selling price of services. In other words, the Service Company would rather pay more for the same service than running the risk of the O&M Contractor going into default or abandoning the contract.

To reflect this residual risk borne by the Service Company, risk sensitivity analyses are performed on both operating expenditures (OPEX) and capital expenditures (CAPEX). The results are summarized in the table below:

<table>
<thead>
<tr>
<th>Sensitivity</th>
<th>Changea (%)</th>
<th>ADSCR</th>
<th>LLCR</th>
</tr>
</thead>
<tbody>
<tr>
<td>Base case financial model</td>
<td>-</td>
<td>1.26</td>
<td>1.32</td>
</tr>
<tr>
<td>Construction cost</td>
<td>+ 3</td>
<td>1.26</td>
<td>1.32</td>
</tr>
<tr>
<td>OPEX</td>
<td>+ 12.5</td>
<td>1.08</td>
<td>1.15</td>
</tr>
<tr>
<td>Downside flow</td>
<td></td>
<td>1.07</td>
<td>1.12</td>
</tr>
<tr>
<td>Midlife CAPEX</td>
<td>+ 10</td>
<td>1.24</td>
<td>1.29</td>
</tr>
<tr>
<td>Operational performance</td>
<td>- 2</td>
<td>1.20</td>
<td>1.26</td>
</tr>
<tr>
<td>Combined downside; downside flow plus midlife CAPEX</td>
<td></td>
<td>1.04</td>
<td>1.10</td>
</tr>
</tbody>
</table>

a As defined by ESW’s technical adviser (see text).

Given that the minimum requirements for both ratios was 1.15 and that a default virtually occurs for a ratio below 1.0, the project is financially viable from a lender’s perspective as even in the combined worst-case scenario the ratio are superior to 1.0.
Appendix 10: The sustainability concept

Figure 0.2 Issues within the three spheres of sustainability. Source: University of Michigan, sustainable assessment, 2002
Appendix 11: The choice of a discount rate

Imagine two projects, A and B, both of which will end 35 years from now. Project A is similar to conventional procurement, as it involves expenditure of £110 in the first year, followed by 34 equal payments of £5. Project B is similar to a PFI, in that it involves no payments in the first year (i.e., the construction phase), and then 34 payments of £10 (i.e., the unitary charges). The cash payments relating to Project A sum to £280, while Project B will cost £320. On this basis, Project A is clearly cheaper, by some £40. However, if we discount these two sets of cash-flows by 3.5% (the rate mandated in government guidance), we end up with an NPC for Project A of £201.45 and for Project B £197.01. In other words, with a discount rate of 3.5%, the NPC of Project B is £4.45 lower than that of A.

Source (Unison, 2011: 11)
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