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Risk analysis and contract management for Public Private Partnership projects in Egypt

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RISK ANALYSIS AND CONTRACT MANAGEMENT FOR PUBLIC PRIVATE PARTNERSHIP PROJECTS IN EGYPT

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Abstract

In the light of the current political and economic conditions in Egypt, Public Private Partnership projects appear as an effective solution in order to help the government in enhancing its infrastructure, utilities and services using the technical skills and capabilities of the private partner. Although Public Private Partnerships are used all over the world, they can be of particular importance in developing countries which seek a quick and effective in improving its projects. Accordingly, Public Private Partnerships started to be used in Egypt and there are several projects under study for future implementation. The two key success factors for PPP projects are a proper risk allocation and a suitable contract so that the risks are adequately covered and are properly assigned to the party who is the best at managing them.

In this research, the top 59 risk factors that affect PPP projects are identified from the Literature Review and are grouped into several critical risk groups and included in a questionnaire which is distributed among a number of experts (25 experts) who worked internationally and in the Egyptian Market. The results of the survey showed that the top 26 risks are from the following groups: Financial and Macroeconomic risk group, Commercial risk group, Legal risk group, Political risk group, Regulatory risk group, Government maturity risk group, Technical risk group, Production risk group, and Unforeseen risk group.

An attempt for mapping the identified risks and the risk allocation identified in the survey is done to contract clauses of two PPP projects contracts where the risk allocation is defined clearly in the clause (public private or both). In some cases, the risk allocation

according to the survey results was perfectly conforming to the risk allocation according to the real case contracts such as in the case of the Performance Security risk, the Permits risk, the Unforeseen Geotechnical conditions risk and the Latent Defect risk. In other cases, the risk allocation according to the survey results was not conforming to the risk allocation according to the real case contracts such as in the case of Nationalization/expropriation risk and the Government Corruption risk.

In addition, a prototype for Risk Decision Support System for the top ranked risks in the survey was developed using Crystal Ball software in order to determine the overall severity and the overall contingency percentage of the project.

Finally the top risks are compared to the critical risks obtained from the previous studies in China, India and Singapore and the top risks identified were conforming to a great extent.

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List of Abbreviations

(AU): Alexandria University

(BOO): Build Own Operate

(BOOT): Build-Own-Operate-Transfer

(BOT): Build-Operate-Transfer

(CRG): Critical Risk Groups

(CSF): Critical Success Factors

(DB): Design-Build

(DBFMO): Design-Build-Finance-Maintain-Operate

(DBFO): Design-Build-Finance-Operate

(DFBMT): Design, Finance, Build, Maintain and Transfer

(GWI): Global Water Intelligence

(ERSAR): Water and Waste Services Regulatory Authority

(EU): European Union

(EWRA): Water Sector Regulator

(IFC): International Finance Corporation

(IRAR): Institute for the Regulation of Water and Waste

(MENA): Middle East and North Africa

(MHUUD): Ministry of Housing

(MoF): Ministry of Finance

(MoI): Ministry of Investment

(MRV): The Minimum Revenue Guarantee

(NIE): New Institutional Economics theory

(NUCA): New Urban Communities Authority

(O & M): Operation and Maintenance Contracts

(PFI): Private Finance Initiative

(PPI): Private Participation in Infrastructure

(PPIAF): Public-Private Infrastructure Advisory Facility

(PPP (P3 or P^3)): Public Private Partnership

(PRC): People's Republic of China

(PTB): Partnership Technical Bureau

(RDSS-PPP): Risk Decision Support System for Public Private Partnership Projects

(ROT): Rehabilitate-Operate-Transfer

(SPV): Special Purpose Vehicle

(TRC): Toll Revenue Cap

(VFM): Value for Money

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Chapter 1: Introduction

1.1 Overview

Public Private Partnerships (PPPs) came into existence as a result of continuous challenges facing the public sector in its attempts to improve its services, facilities and infrastructure which is in many cases demanding challenging economic resources. Accordingly, the public sector resorted to the partnership with the private sector in order to deliver projects or public services by benefiting from the private sector's experience, financial ability, management and technical skills. Consequently, PPP was used in various sectors all over the world especially in the infrastructure sector as it is considered as a *"catalyst for economic growth"* (Babatunde, 2012). PPP scheme is believed to be able to deliver better value for money especially for infrastructure projects (Hwang et al., 2012).

In order to ensure the success of the partnership between the public and the private sectors, many aspects have to be taken into consideration to get the best outcomes out of such collaboration. One of the most important factors that should be thoroughly studied in projects executed under the PPP scheme is the proper and appropriate risk management. Otherwise, PPP can in this case raise the cost of the project instead of realizing better value for money (Marques and Berg, 2011). The first step towards a good application of risk management is conducting a sound risk identification and risk allocation between the private sector and the public sector in a way that each party bears the risks that it can manage the best (Hwang et al., 2012). Accordingly, some risks will be borne by the public sector; other risks will be borne by the private sector while the rest of the risks should be shared between both parties or transferred to third parties.

The main objective of this research is to identify the critical risk factors associated with PPP projects in Egypt especially under the current economic and political conditions (post January 2011 revolution). These major risk factors are identified through a comprehensive Literature Review, a contract risk analysis and an extensive process of interviewing experts. The obtained risk factors are qualitatively and quantitatively analyzed in order to obtain a comprehensive risk ranking to develop a proper risk allocation between parties.

All the risks obtained through the Literature Review and through asking experts are mapped to two actual PPP contracts in order to determine which risks are covered and how the covered risks are allocated between both parties. The risk allocation obtained from the real case contracts is compared to the risk allocation obtained through the survey results and a complete interpretation is developed for all risks.

Also, the top ranked risks obtained from the survey are compared to the top ranked risks associated with PPP projects in different countries which are China, India and Singapore. This is considered as a validation process for the risks obtained.

Afterwards, from the most critical risks which have the highest severity, a computerized Risk Decision Support System is developed to help the end user (who can be from the public or the private sector) in calculating the overall severity of the PPP project in addition to the contingency percentage associated with the whole project. Developing the

Risk Decision Support System is based on data obtained from the first PPP project in Egypt (New Cairo Waste Water Treatment Plant).

1.2 Problem Statement

The long term nature of PPP contracts require to identify the key concepts present in the relationship between the public partner and the private partner such as the management of risks, quality of service required, value for money, how to handle disputes and how to deal with changes that may occur during the project's lifetime.

There are several success factors that contribute to the success of any PPP project such as the effective procurement, project implementability, government guarantee, favorable economic and political conditions and available financial market.

However, there are two major causes of PPP failure which are the contractual incompleteness in addition to the imperfect allocation of risks. Accordingly, drafting proper PPP contracts, having a complete set of PPP documents and careful risk allocation are crucial in order to guarantee the success of any PPP project. Proper risk allocation can decrease the costs associated with risks during the project's lifetime. Accordingly, many benefits may arise from a proper contractual arrangement between the private and the public sector (Marques and Berg, 2011). This can be achieved through bringing the strengths of both parties together.

Therefore, both the public partner (the government) and the private partner (the developer) should cooperate from the start of the project in order to reach the optimum risk allocation for both parties. Proper risk allocation can help in developing a successful risk matrix. Generally, typical risks associated with PPP projects are legal, technical, political and commercial risks. The public partner should not transfer all the risks to the private partner; rather, the risks should be allocated by being transferred to the party who will be better in handling this specific risk. The public partner should play the role of a regulator, facilitator and policy maker for the private partner to work under the PPP scheme. On the other hand, the private partner should always seek optimized solutions for the benefit of the project and to realize the “Value for money” as unlike other projects, PPP projects are “output focused”.

It has been noticed that there is an increasing attention towards the PPP scheme especially in the developing countries as PPP is a way for the public authorities to improve their infrastructure, provide better services to the end user through educational, water and wastewater, transportation projects with the help and expertise of the private sector (Ke et al., 2009).

In this research, the risk analysis procedure for PPP projects will be applied in Egypt. There has been an increasing involvement of the private sector with the public sector in various projects after many efforts have been deployed by the Egyptian government to standardize the process of partnerships between the private and public sector. This was done through the issuance of laws and through the establishment of the PPP Central Unit affiliated to the Ministry of Finance. Hence, the need for a proper methodology for drafting contracts and for risk analysis of PPP projects is crucial in order to get the best outcomes of the projects executed under the PPP scheme not only for the public and private sectors involved in each project but also for the customer (the service user) who will get a better service that will help in enhancing the economic reform in the country. The second PPP Investment Summit was held in Egypt from March 24th 2013 to March 27th 2013. The major objectives of this summit were to understand the laws and regulations behind the establishment of PPP in Egypt, to discuss the problems related to the foreign exchange fluctuation, to deeply understand the role of lenders (bankers) and their perspective and to provide a better chance for the private sector to communicate with the public sector. The summit addressed various types of PPP projects, in transportation, healthcare, wastewater and water treatment and finally, power and electricity sectors. This summit was attended by representatives of the government in various sectors, representatives of the private sector in major contracting companies and banks representatives in order to bring together all the points of view in an enriching and beneficial discussion (2nd Annual PPP investment Summit Egypt, 2013).

Accordingly, in order to solve the deficiencies that may occur in PPP projects due to poor contract drafting and inadequate risk allocation, a strong and sound process should be applied to the Contract Management and Risk Analysis of PPP projects in Egypt. The aim of such process is to ensure that all the risks that may affect the project are properly covered and allocated to the suitable party that is able to manage them.

1.3 Objectives

The major goal of this study is to perform a contract and risk analysis for PPP projects in Egypt by:

1. Identifying and ranking the various risks affecting PPP projects in Egypt and determining their allocation.
2. An attempt for mapping the identified risks and the risk allocation identified in step 1 to contract clauses where the risk allocation is defined clearly in the clause (public private or both)
3. Developing a prototype for Risk Decision Support System for the top ranked risks.

1.4 Research Assumptions

In order to conduct the research and in order to get the suitable output from the Decision Support System developed, it is assumed that the public party is the Egyptian government. Also, the second assumption is that the PPP projects that are implemented in Egypt and throughout this study can be in any sector: infrastructure, transportation, health, education, etc. The type of Public Private Partnership can be any type of agreement executed under the PPP scheme; it can be either Contractual or Institutionalized PPP. The different types of PPP are explained in the second chapter (Literature Review).

1.5 Methodology

The most common and popular research methodology in this type of topics consists of four major steps which are listed and identified in the below figure (Ke et al., 2009):

1- Topic Identification
2- Data Collection
3- Data Analysis and Processing
4- Data Validation and Verification

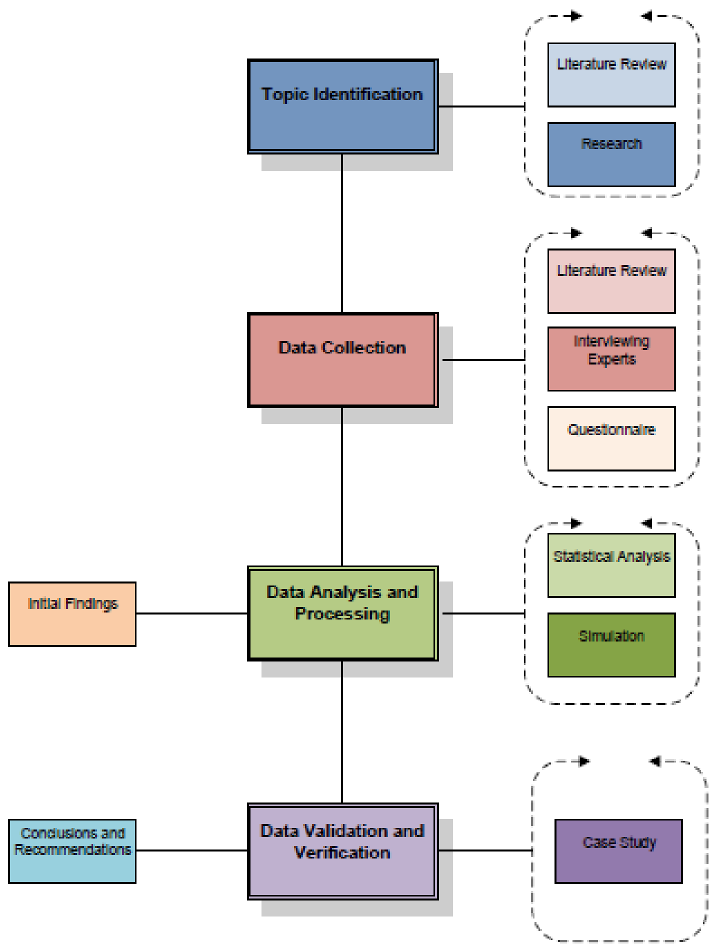


Figure 1: General Research Methodology (2009)-Source: Ke et al.

1.5.1 Topic Identification (Identifying Risk Factors for PPP projects)

This is done through extensive Literature Review from journals, conference papers, books, articles, reports, etc. (Ke et al., 2009). This is in addition to interviewing experts in order to know the major risk factors that can affect projects developed under PPP scheme in Egypt.

1.5.2 Data Collection (Questionnaire/Survey)

A questionnaire is developed for all the risk factors obtained from the Literature Review and experts. The questionnaire's objective is to seek from each respondent to identify and assess the probability (likelihood of occurrence) and impact of each risk factor. Also, the respondent should determine, based on his/her own experience whether this risk should be better allocated to the private partner, the public partner or whether it should be shared between both parties. The respondents can be from the public, private or academic sector with a considerable background in PPP projects.

1.5.3 Data Analysis and Processing

In this step, the data obtained from the survey is statistically analyzed and normalized. After the survey is conducted, the risks can be ranked according to their severity based on the weights assigned by respondents. Based on the questionnaire's outcomes and data analysis, each risk should be allocated to the party that will be able to manage the most this specific risk.

The survey results are compared to two actual case contracts for PPP projects in Egypt in order to determine how the risks are addressed and allocated in actual PPP contracts.

Also, a Risk decision Support System (computerized quantitative risk model) is developed using Crystal Ball for the most critical risks. The Model's objective is to obtain an overall contingency value for the whole project and to calculate the contingency percentage that should be taken into account for the project.

1.5.4 Data Validation and Verification

The verification is conducted by comparing the top risks identified through the survey results and included in the Risk Decision Support System to the ones identified in China, India and Singapore.

1.6 Thesis Structure

The thesis starts by an introduction about PPP projects in the first chapter. Then, in the second chapter, a Literature Review is performed concerning PPP projects in the various continents as well as about risks and proper risk allocation methods and finally about questionnaires. In Chapter three, the problem statement is explained and detailed along with the methodology used for the study. Chapter four is dedicated for the analysis of the data obtained from the survey. Chapter five is concerned with the Contract mapping of risks included in two actual PPP contracts with the ones obtained through the survey results. Chapter six is concerned with the Risk Decision Support System development, its analysis and its verification. Finally, the seventh chapter includes the research's main conclusions along with further recommendations for future studies.

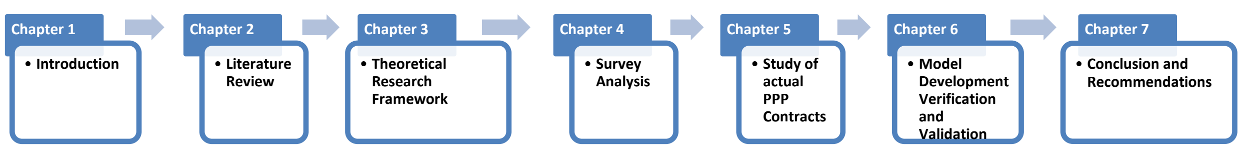


Figure 2: Thesis Structure

Chapter 2: Literature Review

2.1 Overview for PPP

2.1.1 Background

Public Private partnership (PPP, also referred to as P3 or P³) is described as a venture between the government from one side and one or more private companies from the other side in which responsibilities, risks and rewards are shared between the public and the private parties for the aim of delivering a clearly defined and agreed upon activity which is collectively needed such as public services. PPP is an output-oriented long term relationship between the public and the private party (Marques, 2012). Being focused on outputs rather than on inputs is a distinctive characteristic of a PPP project (Guidelines for Successful PPP Projects in Egypt).

"PPP is best described as an arrangement between the private and public sectors to deliver cost effective and high quality services to the public sector over an extended period of time" (Quick, 2006) .

The Canadian Council for PPP (2009) defines it as *"A cooperative venture between the public and private sectors, built on the expertise of each partner that best meets clearly defined public needs through the appropriate allocation of resources, risks and rewards."*

According to the Guidelines for Successful PPP Projects in Egypt published by the PPP Central unit, *"A PPP is a contractual agreement between a Public Authority (the Client) and a private corporate entity (the Partner) spanning an extended term over 10 to 20* *years or more for the provision of assets and related services. The Client defines its requirements by way of outputs and results without specifying (but validates) the detailed engineering."*

Based on the General Regional Policy guidelines for successful Public Private Partnerships published by the European Commission Directorate (2003), the Private sector has 4 major roles under the PPP scheme which are as follows:

- to provide supplementary capital;
- to provide alternative management techniques and a good use of skills;
- to provide value added to the consumer and the public at large;
- to provide better identification and response to the public needs through the optimum use of available resources.

Hwand et al. (2012) mentioned that in general, if an infrastructure project is expected to have a value greater than $50 million, then, the involvement of the private sector should be considered. Also, sometimes, the need for the private partner comes as a solution to some problems caused by the deficiencies present at the public partner's side. Recent years have witnessed an increased cooperation between the private and the public sector especially in the infrastructure sector all over the world as it is believed that PPP can deliver a better Value for Money (VFM) for facilities, projects and services. According to the World Bank (2013), since the financial crisis which took place from 2008 and until 2011, the involvement of the Private Sector in Infrastructure and Public Services projects, whether in developing or developed countries can help in providing a source of funding for the projects. The Public sector will benefit from the efficiency and skills of the Private Partner while incentivizing it to deliver the PPP projects on time and within budget.

The following chart shows the amount of PPP investment in US $ billions in the domain of infrastructure between 1990 and 2007 in developing countries (Ke et al., 2009):

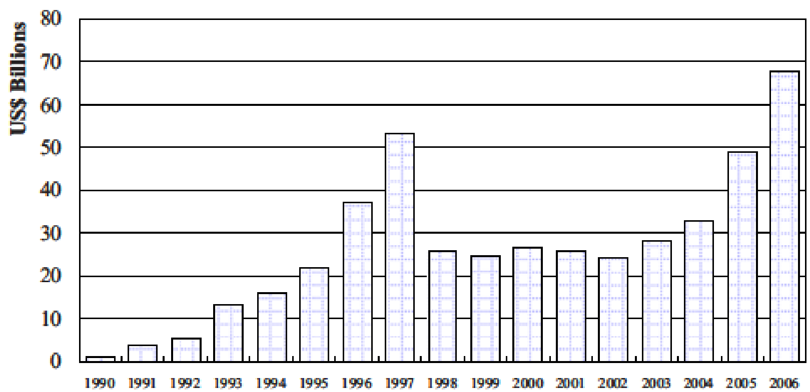


Figure 3: PPP investment in infrastructure projects in developing countries (2009)-Source: Ke et al.

From the above chart, it is noticed that the investment amount in PPP projects has been increasing since 1990 and till 2006 when it reached more than US $ Sixty Billions. This obvious increase shows an expanding interest in the Private Sector involvement in order to meet the funding gap that faces the Public Sector especially in infrastructure projects.

Among the various attempts done by the Egyptian Government in order to enhance the PPP projects in Egypt, Egyptian Law No. 67 for the year 2010 which was established and dedicated to PPP projects in Egypt, defines a "PPP Contract" as *"Contract concluded between the Administrative Authority and a Project Company under which the Project Company is entrusted to undertake all or some of the following activities: financing, constructing, equipping and operating infrastructure projects and public utilities and making their services available or financing and rehabilitating such utilities"* such that the facility or the project is capable of providing the service to the end user throughout the lifetime of the PPP Contract.

2.1.2 History and Start

The idea of PPP was initiated in the 19th century in England when Sir Edwin Chadwick, the social reformer, started applying the principle of operating a monopoly through doing an auction in which the winner bidder will be the one who presents the best offer. This idea appeared in order to solve the problems caused by the franchising. This principle was applied in Europe as well as in the United States in various infrastructure projects. In this case, the government played the role of the regulator (Marques, 2010). Starting from the 20th century, this concept started to extend by Harold Demsetz, the economics professor at University of California at Los Angeles (UCLA), whose idea was that the competition between different bidders should be through an open bid under the supervision and responsibility of the government. However, some points in Demsetz' principles needed more improvement such as quality of service and network expansion. *"In the 1980s and the 1990s, neoliberalism and the funding requirements of capital projects for essential infrastructures*" made several countries choose the privatization which was a better option for energy and telecommunications projects while PPPs were preferred for the water sector and transportation projects (Marques, 2010). According to the statistics done in 2012, the Private Participation in Infrastructure (PPI)[1] Project

[1] *"The Private Participation in Infrastructure Projects Database is a joint product of the World Bank's Infrastructure Economics and Finance Department and the Public-Private Infrastructure Advisory Facility (PPIAF). Its purpose is to identify and disseminate information on private participation in infrastructure projects in low- and middle-income countries. The database highlights the contractual arrangements used to attract private investment, the sources and destination of investment flows, and information on the main investors. By providing critical data and analysis to government policy-makers, consumer representatives, the donor community, and other stakeholders, the database contributes to the public debate on the private provision of infrastructure."* (World Bank, 2012)

Database contains information on more than 6,000 infrastructure projects in 139 low- and middle-income countries (World Bank, 2012). According to the PPIAF (Public Private Infrastructure Advisory Facility), starting from 2006, Albania, Egypt, Malawi, Mozambique, Nigeria, Tanzania and Turkey established PPP units (Tserng, H.P. et al., 2012). There has been an increasing attention towards PPP projects which was as well reflected in the number of papers written and addressing PPP. Ke et al. (2009) performed a study concerned with the research trend of PPP in Construction journals and it was found out that from 1998 till 2009, 170 papers out of 4106 papers (around 4.14 %) were about PPP related topics.

2.1.3 PPP structure among Project Procurement Options

There is no standardized nomenclature used for describing the different PPP categories as each case has to be studied and understood separately. This is a proof of the continuous evolution in the domain of PPPs. However, there is a scale for Public-Private Partnerships which is defined by the degree of the Private sector involvement which ranges from the Design Build (DB) where the private sector only designs and builds the project up to the privatization (Private Divestiture) by giving the private sector not only full control over the investment, operation and maintenance but also a permanent ownership of the facility's assets. In this case, the government only plays a regulatory role ensuring the protection of the customer from monopoly in addition to requiring some minor maintenance and/or investment in some cases. Privatization is done either by selling the facility's assets to investor(s), by performing a management buyout or by selling the facility's shares in the national stock market. The private divestiture can either be complete or partial where the government can still have a certain level of control over the facility by owning a certain percentage of the company's assets (Guidelines for Successful Public-Private Partnerships, 2003).

In the "Finance Only" model which is located at the start of PPP spectrum, the private partner provides financial services to the projects through lease payments which transfer the commercial risks to the private entity. This type of agreement can last for a period ranging from five to fifteen years. The involvement of the private entity can take place in another type of PPP called "Operation and Maintenance Contracts" (O & M) also known as "Operation and Management Contracts". In this type of contractual agreement, the ownership stays public while the private partner operates and maintains the facility for a short period of time (which can be extended though). This type of PPP is useful for communities with recent PPP history or for a private partner who wants a little risk exposure. Also, this type of agreement ensures a smooth transition from public ownership. Another type of PPP is called "Build-Finance" in which the private partner is responsible for building the project or facility as well as financing it during the construction period only (Canadian Council for Private-Public Partnerships, 2009). In the lease or affermage contracts, the assets of the project are owned by the Public Partner who is also responsible for the investment costs. However, the end users (the consumers) in this case deal with the Private Partner and not with the Public Partner. In a lease contracts, a portion of the payments by the end users goes to the Public Sector as owner of the assets in the form of a lease fee and the remainder is given to the operator (The Private Partner). In this case, the Public Partner bears less risk as it is guaranteeing a fixed payment irrespective of the revenues. In the case of an affermage, the Private sector retains its fees and the additional fees (that are charged to customers) are paid to the

Public sector. In this case, the Private Sector is the party that is guaranteeing receiving its fees (World Bank, 2013).

According to the European Union, PPPs can be categorized into two major types: ***Contractual PPPs*** and ***Institutionalized PPPs*** (Marques and Berg, 2012). In the case of a "Contractual Public Private Partnership", the exact relationship between the private and the public partner as well as the rights and responsibilities of each party relative to the other are clearly specified in the contractual terms. One of the best models to describe this relationship is the "concession model" in which the private sector concessionaire is in direct contact with the final user (the customer) by undertaking the investment, constructing, operating and maintaining the service or the facility for a certain period of time, charging customers for such service and afterwards, the ownership goes back to the public partner. The concession contracts are characterized by being long term relationships (usually between 20 and 35 years or even longer) between the private and the public partner. They can be used in various sectors especially in water and transportation (such as highways). Design-Build-Finance-Operate (DBFO) or Design-Build-Finance-Maintain-Operate (DBFMO) is another type of PPP which is similar to the concession model except for the fact that in this type of PPP (DBFO) or (DBFMO), the project or facility recovers its costs not through charging the users for the service but mainly through public subvention. The DBFO and the DBFMO differ in the fact that in the latter, the private partner carries also the responsibility of the maintenance of the facility or project (Marques, 2012).

One of the most well-known forms of PPP is the "Build-Operate-Transfer" (BOT) system in which the private partner builds and operates the project or facility, transferring it to the public partner at the end of the contractual period. In this case, the ownership of the facility remains, during the whole contractual period, in the hands of the public sector. BOT system is considered as the most popular type of PPP used and adopted (Ke et al., 2009). However, the whole idea in this type of PPP consists in transferring the construction and operation risks to the private partner. The Private party in BOT projects is generally referred to as “the concessionaire” (2010). In the Build-Own-Operate-Transfer (BOOT) form, the facility's ownership becomes also private during the whole contractual period. According to the Guidelines for Successful PPP Projects in Egypt published by the PPP Central unit, there are other versions of PPP such as Rehabilitate-Operate and Transfer (ROT) or the Build-Own-Operate (BOO). Each type of the aforementioned PPP types has its own strengths, weaknesses and risks which have to be taken into consideration for each project (Ke et al., 2009).

The below table shows a summary for the most common types of PPP:

Name	Meaning	Role of private sector
DB	Design and Build	Designs and Builds
OM	Operation and Management Contracts	Operates and maintains the facility
Concession		Undertakes the investment, constructs, operates and maintains the project
BOT	Build Operate Transfer	Builds, operates and transfers the project at the end of the contractual period.
BOOT	Build Own Operate Transfer	Builds, owns operates and transfers the project at the end of the contractual period.
DBFO	Design Build Finance Operate	Designs, builds, finances and operates the facility
DBFMO	Design Build Finance	Designs, builds, finances, maintains and

	Maintain Operate	operates the facility
ROT	Rehabilitate, Operate and Transfer	Does the necessary repairs for the facility, operates and transfers.

Table 1: Summary for the Most Common types of PPP

There are various spectrums explaining the different kinds of PPP. According to the Canadian Council for PPP (2009), below is a figure explaining the categorization of PPPs based on the degree of the public and private sector involvement and based on the extent of risk allocation between different parties (Ke et al., 2009).

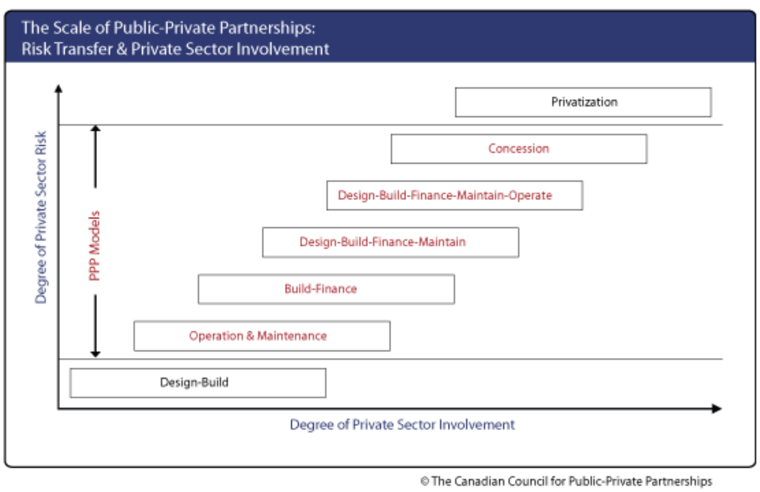


Figure 4: The Scale of Public Private Partnership according to the PPP council (2009)-Source: Canadian Council for PPP

Also, according to the World Bank (2011), the below figure shows another spectrum explaining the different PPP arrangements.

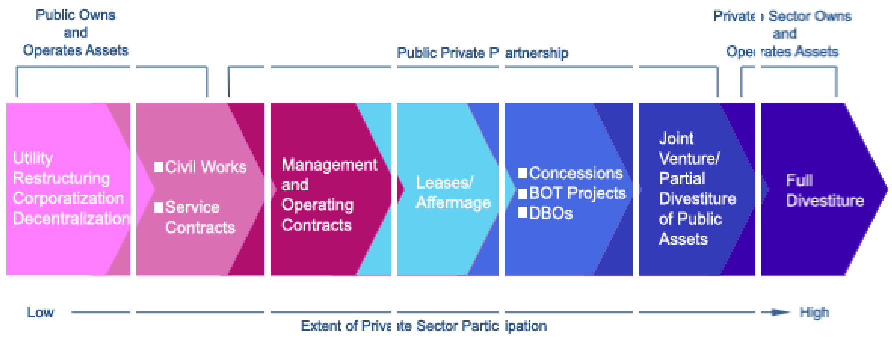


Figure 5: The Scale of Public Private Partnership according to the World Bank (2011)-Source: World Bank

Concerning "Institutionalized PPP", it means creating a joint entity or more precisely a third company formed by the public and the private sectors in order to ensure delivering the necessary benefit to the public. This can be achieved as well through selling a part of the assets of the public sector to the private sector. Usually, the third party or company that is designed to bear the risks is called a "Special Purpose Vehicle" (SPV). In this case, the public sector remains in control though remaining as a shareholder or through some special rights while the private sector is responsible for the technical management and operations. This type of relationships can be very beneficial as it gives the public sector the power and authority over the project while the public sector will benefit from the private sector's experience. However, on the other hand, problems and conflicts may arise between both sectors which can have negative implications on the end customers through higher service rates (Marques and Berg, 2012).

Quick (2003) discussed the fact that the private sector is more suitable to directly provide the service to the end user in exchange for a fee in the case of economic infrastructure such as toll roads and concessions are the optimum solution in the cases where the private sector provides the service to the public sector in other projects such as hospitals, prisons, schools, courts and police stations.

According to the Guidelines for Successful PPP Projects in Egypt published by the PPP Central unit, the below figure describes the different degrees of private sector participation in projects ranging from the Works and Services Contracts up to the Concessions Contracts and finally the Privatization.

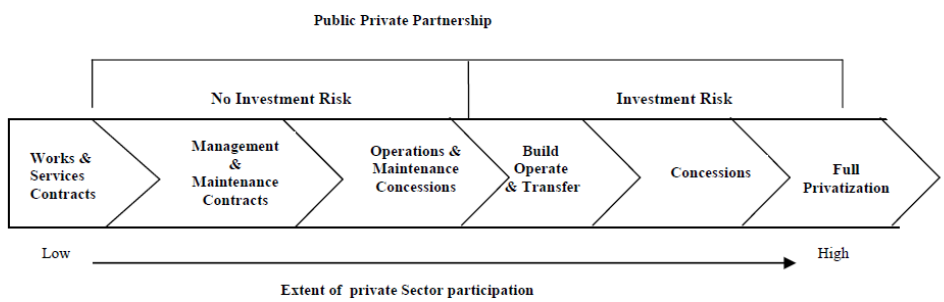


Figure 6: Degree of Private Sector Participation in PPP projects according to the PPP Central Unit in Egypt-Source: Guidelines for Successful PPP projects in Egypt

2.2 PPP around the world

2.2.1 The Americas

In the United Stated the BOT (Build, Operate and Transfer) method is the same as the BOOT (Build, Own, Operate and Transfer) method in Canada, Australia and New Zealand. In some cases, BOT projects have not witnessed success such as in Mexico where the Mexican government had to take over 23 BOT toll road projects as well as pay $5 billion in debt to the Mexican Banks and $2.6 billion to construction companies. The failure of PPP projects is accordingly caused by improper risk allocation whether to private or public partners as well as some supply and demand related problems. In the United States, in order to solve the demand problems, two major principles are applied. The Minimum Revenue Guarantee (MRV) is a way of support provided by the government in order to solve the problem that may arise for the private company if the revenues are less than anticipated. On the other hand, the Toll Revenue Cap (TRC) is applied if the demand is higher than anticipated. This principle consists in sharing the extra revenues between the private and public sectors (Ashuri, B et al., 2011).

2.2.2 Oceania

2.2.2.1 Australia

The involvement of the private sector in the public infrastructure projects has started particularly in New South Wales (NSW) and in Victoria especially in the provision of roads. Victoria witnessed the prosperity of the partnership between the public and the private sector. This was named “Partnerships Victoria”. Partnership Victoria was focused on a main objective which is “Value for Money.” This term is generally used to describe a commitment established in order to ensure that the money spent brings the best possible results and outcomes. It is based on the philosophy of “Gain-share, pain-share”. (Quick, 2003)

The Australian PPP market is characterized by the lack of standardization which is widespread in the various Australian states, a lack of international contractors, some unfair tendering processes and a common trend for risk transfer. Many experts think that Australia should improve its contract documents, its ethics as well as adopt better risk management in order to improve the application of PPP concepts (Quick, 2003).

According to the Australian Centre for Public Infrastructure, the PPP agreement is output focused. This is the basic difference between the PPP and the traditional procurement model. The government is rather focused on the end use of the project/facility rather than on the methods or techniques that are used to achieve this end use. This makes the government play the role of the regulator or more precisely “eyes-on/hands-off” (Quick, 2006).

According to Quick (2006), typical project documents for PPP projects in Australia are:

- The Concession deed (or Project Agreement)
- Output specifications
- Construction Contract
- Operation and Maintenance agreement
- Financing documents.

Starting November 2003, the Victorian State Government promoted a "National PPP Ministerial Council" in order to provide better enhancement for PPP Projects as well as to develop a new national PPP market. (Quick, 2006)

In 2005, PPP projects accounted for approximately 8 % of the total infrastructure projects executed in Australia (Ke at al., 2009).

2.2.3 Europe

2.2.3.1 European Union

According to General Regional Policy guidelines for successful Public Private Partnerships published by the European Commission Directorate, in Europe, recent years have witnessed a great increase of PPP projects. The history of Member States countries of the European Union (EU) differs from one country to the other. The European Commission that is responsible for the regional policy has shown a great attention to the implementation of PPP projects. The continuous efforts and studies implemented by the European Commission in this domain helped in having a complete view about the strengths and weaknesses of the PPP projects. It has been found that *"successful PPPs require an effective legislative and control framework and each partner should recognize the objectives and the needs of the other party"*. There are major issues that have to be ensured when applying PPPs such as time impact, choosing the most suitable PPP type for the project, ensuring that the goals and objectives of the end user are realized, conforming to the regional regulations and avoiding monopoly (2012). According to Hwang et al., the PPP scheme occurs to a great extent in the water sector with different forms. For instance, in France and Spain, the private sector is mainly responsible for the operation of the whole water system. In Holland and Belgium, the private sector is only partially responsible for the operation of the water system. In England and Wales, the private sector may own the assets while the public sector is the party responsible for the water provision (Hwang et al., 2012).

2.2.3.2 Portugal

A comparison was established between the two major types of PPP (Contractual and Institutionalized) in the water sector in Portugal. The major outcome of this study was that proper risk allocation is a crucial tool that ensures the success of any project under the PPP scheme. In Portugal, the private participation in governmental projects started in 1993 through purely contractual PPPs. As the government wanted to have a proper regulation and supervision over the private companies entering into PPPs, a special institute was established for that purpose called “the IRAR” (Institute for the Regulation of Water and Waste) which was replaced afterwards by “the ERSAR” (Water and Waste Services Regulatory Authority) which aimed at supervising the service quality and which had a “nonbinding” opinion concerning all the tender documents. Until that time, PPPs were only of contractual type. Starting from 1998, PPPs started to take the institutionalized type as well by creating mixed companies between the public and the private sectors. The private partner is always chosen for both cases (whether contractual PPPs or institutionalized PPPs) through an open bid. However, it has been noticed that there has been problems associated with the implementation of PPPs in Portugal whether for contractual or institutionalized PPPs. For instance, statistics were developed in December 2009 mentioning that at that time, 25 of the 30 signed PPP contracts were concessions (contractual PPPs) while the rest were institutionalized PPPs with 60% of the

PPP projects that were negotiated. The main causes of such a problem is related to an improper risk allocation between the private and public sectors which proves the importance of a good application of risk allocations and risk study before the start of the project(Marques and Berg, 2011)

2.2.3.3 Turkey

In Turkey, the concession method was rarely used under the Concessions Law of 1910. However, the Concessions Law of 1910 provided only general guidelines but not detailed procedure. Concessions contracts are reviewed by the Council of State. In 1984, the first BOT law (Law No. 3096) was established. The amendments to the aforementioned law appeared in 1994, in law No. 3996 in a new law applicable in various sectors such as energy, transportation, communication and municipal services. In Turkey, the BOT system is now used for most of the infrastructure projects especially airports while the normal concession scheme is used to give the private party the right of operations of public properties such as ports. However, the PPP scheme in Turkey has shown some proofs of deficiencies due to the absence of any entity affiliated to the government whose role is to monitor and supervise the PPP projects in hand. Consequently, in 2009, a draft law was proposed which includes amendments and improvements to the previous laws and regulations such as the following:

- Defining PPP according to the law. Accordingly, PPP is a general term under which many definitions can be extracted such as BOT, BO, etc.
- The draft PPP law encloses a standardized format that can be followed by nearly all PPP projects.

- PPP can be used in any project type such as state hospitals, prisons, water and energy projects, transportation, etc.
- Risks should be properly allocated between the private and public partners according to one criterion: the partner that is better able to manage the risk will be the one who bears it (Ozeke, 2009).

2.2.3.4 United Kingdom

It has been found that the United Kingdom takes the first place in performing studies about PPP projects in terms of the number of published papers. The United Kingdom is considered as the founder country of the PPP concept. The countries that follow are the United States, Singapore, Hong Kong, Australia, China and Germany (Ke et al., 2009). There is a term used in the UK called Private Finance Initiative (PFI) which is considered there as one of the types of PPP. It is based on the fact that the public sector pays periodically (monthly or annually) the private sector provider for the supply of service or project delivered through an asset developed by or transferred to the private sector provider (Quick, 2006) (Marques, 2010). This type of partnership started for health projects (such as hospitals) and educational projects (such as schools) and is now used for other sectors such as transportation, water and wastewater treatment plants. This concept can be useful and effective in projects where costs are difficult to be paid such as projects in developing countries. This concept started to be widely used in the UK and was encouraged by the government in 1992. By 1997, PFI projects in the domains of transportation, health, defense, office accommodations, prison, education and water started to be delivered. In fact, 1997 is considered as the year when PPP projects were officially introduced in the English community (Ke et al., 2009).

However, there was an obvious delay in the delivery of those projects. Since this date, various efforts have been undertaken to improve this concept in the UK through the Bates Committee who attempted to get the public sector more acquainted with PFI. In the year 2000, a major entity mainly owned by the private sector was established in order to further develop PFI concept by offering the public sector project management skills, by providing support to them and by providing initial capital for projects. New guidelines were established as well for whole life cycle service costing for PFI. In the period from 1999 to 2004, the standardization of the PFI scheme continued over 4 editions (SoPC1, 2, 3 and 4) until reaching the phase where all PFI schemes in the UK should be compliant with this standardized form of Contracts. This standardization aims at reducing the time and costs associated with various negotiations throughout the project as well as allowing for a proper risk allocation technique instead of allocating all the risks to the private sector (Quick, 2006). According to the National Audit Office report that is assessing the performance of PFI construction projects in the United Kingdom and that was issued in 2009, PFI projects were on time 69% of the time and on budget 65% of the time till that year (Quick, 2006). In 2005, PPP formed around 15 % of infrastructure projects performed in the United Kingdom (Ke et al., 2009).

2.2.4 Asia

2.2.4.1 China

According to the study done by Xu et al. (2010), the Chinese economy has been recently prospering and growing at a fast rate: between 2006 and 2010, 2,400 infrastructure projects were developed with a total budget of RMB (Renminbi, the Chinese currency) 470 billion. This wide expansion is to serve the huge population of the PRC (People's

Republic of China) which is expected to jump from 536 million in 2005 to 827 million in 2025. This makes the government or the public sector in general look for the intervention of the private sector. The Bird's Nest (National Stadium) in Beijing and Beijing Metro Line 4 (BJL4) are two major examples of PPP projects in China. In order to ensure the success of the adoption of the PPP principle in China, studies were established in order to determine the critical success factors (CSF) for PPP projects. CSFs are defined as the areas of activity in which favorable results are crucial for a manager in order to achieve his goals. According to the study done in 2010, 18 critical success factors were identified in China and they were grouped into 5 main factors which are:

1- Stable macroeconomics environment
2- Shared responsibility between the public and the private sector
3- Transparent and efficient procurement
4- Stable political and social environment
5- Wise government control and supervision

However, it is important to note that these main factors can change from year to another based on the actual conditions in the country and based on the time at which the study was made (Chan, A. et al., 2010). The proof is that in 2001, the major critical success factors for BOT projects in China were slightly different (Hwang et al., 2012):

1- Appropriate Project Identification
2- Stable Political and economic situation
3- Attractive financial package
4- Acceptable toll/tariff levels

5- *Reasonable risk allocation*

6- *Selection of Suitable Subcontractors*

7- *Management Control*

8- *Technology transfer*

The following table shows a comparison between the critical success factors associated with PPP projects identified in 2001 and the ones identified in 2010 (approximately 10 years later) in China:

	2001	2010
Critical Success Factors for PPP projects in China	Appropriate Project Identification	Stable macroeconomics environment
	Stable Political and economic situation	Shared responsibility between the public and the private sector
	Attractive financial package	Transparent and efficient procurement
	Acceptable toll/tariff levels	Stable political and social environment
	Reasonable risk allocation	Shared responsibility between the public and the private sector
	Selection of Suitable Subcontractors	Wise government control and supervision
	Management Control	

Table 2: Comparison between Critical Success Factors for PPP projects in 2001 and 2010 (2012, 2010)-Sources: Hwang et al. and Xu et al.

According to the study performed by Xu et al. (2010) and which is aiming to develop a model that helps in calculating the risk level of PPP projects in China, it has been found that the top 10 risks affecting PPP projects are:

1- Government Intervention
2- Poor public decision making process
3- Government corruption
4- Financing risk
5- Inadequate law and supervision system
6- Public credit
7- Subjective project evaluation method
8- Interest rate fluctuation
9- Conflicting or imperfect contract
10- Change in Market demand

These risks were obtained through and extensive literature review and a 2 round Delphi survey which helped in identifying those risks. Then, data analysis was performed through statistical and analytical tools in order to rank those risks.

2.2.4.2 India

According to Lyer and Sagheer (2010), the necessary financing for infrastructure projects in India for the next five years is approximately $ 448 billion in the water, ports, roads and airports projects. However, this cannot be achieved in India without the intervention of the private sector. Public Private Partnership is considered as a solution to enhance and improve India's infrastructure. One of the best models and examples for Public Private Partnerships comes within the Sustainable Cities Programme (SCP) which is supported by the United Nations Development Programme (UNDP) started in 1990. The main objective of the SCP is to provide an improved and enhanced environment for management and planning. The Indian City of Chennai joined the SCP in 1995. Accordingly, in order to implement such programme which aims to improve the environmental and managerial conditions in the city, the private partner's participation along with the government is important and crucial and hence the "Private-Public Partnerships" (Sarangi, 2002). However, according to the study performed by Lyer and Sagheer (2010) which was conducted through and extensive literature review, interviews and case studies, the major risks affecting BOT projects in India are:

1. Preinvestment risks: The project may be prone to cancellation or inadequate bid preparation.
2. Delay in financial closure: The private party may not have enough financial ability to execute the project.
3. Resettlement and rehabilitation operations: These may be necessary for habitants due to the new project, such as in the case of road projects requiring the displacement of habitants to allow the work to take place.
4. Delay in land acquisition: This may be due to political opposition or delays in permits.
5. Permit/approval risks: This may be due to the government corruption, poor documentation or poor coordination among the public sector parties.

6. Technology risks: Sometimes, the technology adopted may not be beneficial or suitable for the project.
7. Design and Latent Defect Risk: These risks may occur due to poor geological studies or deficiency in design.
8. Cost Overrun risks: This risk occurs when the project cannot be completed within the specified budget. This can be due to a certain party's fault or may be due to reasons beyond the party's control such as inflation or interest rate fluctuation.
9. Schedule risk: This risk occurs if the project cannot be completed within the expected time.
10. Direct political risks: This may be due to changes in law, nationalization or problems in getting the necessary approvals for the project.

2.2.4.3 Taiwan

According to the New Institutional Economics (NIE) theory, *"a national PPP unit can be considered an endogenous equilibrium outcome of a game."* A national PPP unit is a large unit including several governments which is responsible for regulations and advice for PPP projects such as Treasury PPP Taskforce/ Partnerships UK, PFI Promotion Office in Japan, the National PPP taskforce on Taiwan and the Public and Private Infrastructure Investment Management Center in Korea. Taiwan has an abundant experience in PPPs. *"Of the 39 departments of the Taiwan government, only the Ministry of Transportation and Communications implements an average of 10 or more PPP projects annually."* One of the largest PPP projects in the world is located in Taiwan, which is *"Taiwan High Speed Rail Bank of Taiwan Project."* PPP in Taiwan represent around 12.7 % of the annual investment of Taiwan in the domain of infrastructure.

Below is a summary for the annual percentage of PPP in various countries with respect to the total number of projects in the country, according to 2011's statistics:

Country	PPP Contribution
United Kingdom	10-15 %
Australia	5-20 % (average 10 %)
Korea	5-14 %
Taiwan	12.7 %

Table 3: Annual PPP project percentage in different countries (2012)-Source: Tserng, H.P. et al.

According to Tserng, the key to successful PPP projects is Government credibility at the public opinion. Therefore, the National PPP taskforce in Taiwan helps in enhancing and increasing the trust and credibility between the private and public sectors (Tserng, H.P. et al., 2012).

2.2.5 Middle East

2.2.5.1 Kuwait

Kuwait is rapidly moving to the increase of PPP projects on its land. The number of potential Public-Private Partnerships (PPPs) projects in Kuwait is probably the most significant in the Middle East with over $25 billion worth of projects whether under study or already started. (2nd Annual PPP Investment Summit in Kuwait).In its attempts to improve the PPP scheme in Kuwait, the Kuwaiti Government has established a PPP project guidebook in addition to Law No. 7/2008 which established the basis for the application of infrastructure PPP Projects in Kuwait. According to the guidelines published by the State of Kuwait, the PPP law limits the PPP contract to 30 years. It can be however extended to a period that can reach 40 years. However, when no specific period is stated in the contract, it is deemed to be assumed as 25 years. "A Project exceeding KD 60 million must be carried out by a PPP Project company that will be a special-purpose vehicle formed as a Kuwaiti Joint Stock Company." The evaluation and supervision of PPP projects in Kuwait takes place in the Partnership Technical Bureau (PTB). The PTB helps in providing standardized PPP contracts, increase and enhance the credibility for the PPP market.

2.2.5.2 United Arab Emirates

The concept of PPP has been relatively recent for the United Arab Emirates especially that it was more common for the Emirati government to be responsible for the procurement for any project without much depending on a private partner. Actually, there are around 10 PPP projects all over the country which proves that PPP in the United Arab Emirates is still at its first stages of implementation. Therefore, political support is necessary in order to encourage the private partners to invest in the country. Also, it is crucial to get the end customer more knowledgeable about the PPP concept so that it can gain more credibility (Dulaimi et al., 2010).

2.2.6 Africa

In developing countries, the public sector is not the major responsible for development anymore. On the other hand, the private sector started to play an important role by taking part in the delivery of a public service, project or facility (Dansereau, 2005). According to the World Bank, "Cooperation between business, civil society and government can only produce a win-win situation for all as it provides long-term benefits to the business sector while meeting the social objectives of civil society and the state by helping create stable social and financial environments." (2002) In Nigeria for instance, there has been an increase in the projects executed under PPP scheme especially when it comes to infrastructure projects. In order for Nigeria to improve its infrastructure to meet the standards, the country needs from $ 12 to $15 Billion annually, thus, the role of the private sector became crucial in such developing countries. According to a study done for the projects that are most suitable for PPP application in developing countries and especially Nigeria, it has been found that PPP scheme can applied in approximately all the project types whether water and wastewater, power and electricity, transportation, educational and real estate. The study's output was also to determine the critical success factors (CSFs) in order to ensure the success of PPP projects which were as follows: "

1- Competitive procurement
2- Realistic assessment for costs and benefits
3- Favorable framework
4- Proper risk allocation
5- Government intervention and guarantees
6- Political support
7- Stable economic conditions
8- Sound economic policy
9- Availability of suitable financial market

The above critical success factors should be studied with utmost care in order to endure the success of PPP projects (Babatunde, 2012).

2.3 Egypt Overview: PPP in Egypt

In Egypt, in an attempt towards economic reform, the involvement of the private sector with the government has increased. A legal framework for PPP projects in Egypt has been issued called the PPP Law (67 for the year 2010) in addition to the establishment of standard PPP Contracts, procurement documents as well standardized procedures. In addition to that, a new body has been established at the Ministry of finance called the PPP Central Unit.

2.3.1 PPP Law:

The PPP Law in Egypt is "Law No. 67 for Partnerships with the Private Sector in Infrastructure Projects and Public Utilities." It was approved by the Parliament in May 2010. It is divided into 4 chapters as follows (and 39 articles):

1- Chapter 1: General Provisions
2- Chapter 2: The Supreme Committee for Public Private Partnership Affairs and the PPP Central Unit
3- Chapter 3: Tendering and Awarding Procedures
4- Chapter 4: Substantive Provisions of the PPP Contract

This law aims at unifying and standardizing the PPP scheme in the various projects as the PPP scheme is characterized by uniqueness.

2.3.2 Role of PPP Central Unit

According to the PPP Central Unit website, The PPP Central Unit is a unit that has been established by the Ministry of finance since June 2006 in order to supervise and assure the proper implementation of PPP projects in Egypt. The PPP Central unit seeks the help and advice of international experts in order to enhance the success of PPP Projects in Egypt through the following:

- establishing standard contracts for PPP as well as proper guidelines and methodology,
- *"Coordinating the PPP program across Line Ministries, private sector and funding market",*
- providing technical coordination over PPP projects,
- studying potential projects where PPP can be a better option ("PPP'able Projects"),
- studying tender documents,
- ensuring the application of proper risk allocation between the public and private sector,
- benefiting from the previous experience of other countries in the domain of PPP,
- acting as the "Public Face" for PPP in Egypt who is responsible for spreading news,
- issuing a quarterly PPP booklet to all stakeholders,
- Hosting a yearly PPP summit called "MENA Region PPP summit", (The summit took place from March 24th 2013 till March 27th 2013 in Cairo),
- Providing sessions, trainings and workshops for both the private and public sector in order to get them more acquainted with PPP projects.

2.3.3 PPP Projects in Egypt

2.3.3.1 First PPP Project in Egypt

The first PPP project that took place in Egypt was “New Cairo Waste Water Treatment Plant”. The PPP was an “Institutionalized PPP” in which the private sector’s duties was to design, finance, construct, operate, maintain and transfer the waste water treatment plant whose capacity is 250,000 m^3/day (Tarek, 2011).

The PPP’s duration for this project is 20 years at the end of which the private partner should transfer the plant in good operational condition as mentioned in the Contract. The Public entities in this project were:

- the Ministry of Housing (MHUUD),
- the Ministry of Investment (MoI) and
- The Ministry of Finance (MoF) and more specifically the PPP Central Unit.

The main consultant for the PPP Central unit was the International Finance Corporation (IFC). The IFC is considered as “the private sector arm of the World Bank group.” (Valente, 2010). Since 2006, IFC in Egypt has been giving advisory services to the ministry of Finance in order to enhance the application of PPP aiming to improve the PPP at the country (IFC, 2013).

While the World Bank “provides support to governments on developing the enabling environment for PPPs and sector reform, through technical assistance and as part of broader sector support facilities or facilities to support the development of PPPs. The

World Bank Group also supports a number of knowledge management tools and collaborates on initiatives to support governments" (World Bank, 2013)

The private partner was a joint venture between Orascom and Aqualia, a Spanish water company named "Orasqualia". The total value of Orasqualia's bid was $ 490 million. This joint venture is the one who won the bid face to other 6 bidders including Veolia, Befasa, Metito and Kharafi. In June 2009, the contract was signed. The Contract was signed between the New Urban Communities Authority (NUCA) and Orasqualia referred to as the Service Provider. NUCA is responsible for planning and developing new water and wastewater communities in Egypt (Osgood, 2009). The main regulator of the project is the Water Sector Regulator (EWRA) which is responsible for supervising, reviewing and monitoring all activities related to the water and wastewater sectors (Osgood, 2009). The project ended in 2012 with total project duration of 2 years. (Draz, 2012) Under the PPP scheme for water and wastewater projects in Egypt, the service provider (the investor or the developer) who is in this case Orasqualia will be periodically paid as soon as the plant enters in to the operation phase (Osgood, 2012).

New Cairo Waste Water Treatment Plant won the title of the "Water Deal of the Year" in 2009 which is a prize given by the Global Water Intelligence (GWI). (Tarek, 2011)

The following figure shows the project's structure:

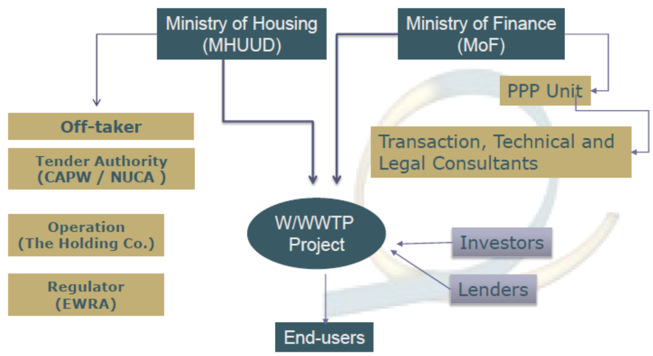


Figure 7: Key Stakeholders in Water and Wastewater Projects

2.3.3.2 Future PPP projects in Egypt

According to the PPP Central Unit Website, there are several PPP projects that have been and are being studied for future construction. Below is a list of projects which are expected to start and which are in the tendering phase:

1- Mowasat Specialized University Hospital Project

Location: Alexandria.

Contracting Authority: Alexandria University

Project Status: Construction will start on April 30th 2013

Work description: Design, Finance, Construct and Operate the hospital.

2- 6th of October Waste Water Treatment Plant Extension

Location: 6th of October City.

Contracting Authority: Ministry of Water and Wastewater Utilities

Project Status: Under Tendering

Project Capacity: 150,000 m³/day.

Work description: Design, Finance, Construct and Operate the wastewater treatment facility (Osgood, 2009).

3- Abu Rawash Waste Water Treatment Plant Upgrade

Location: West Bank of the Nile in Giza.

Contracting Authority: Ministry of Water and Wastewater Utilities

Project Status: Under Tendering

Project Capacity: 1.6 million m³/day.

Work description: Design, Finance, Construct and Operate the wastewater treatment facility.

Concerning the projects under the feasibility study, there are several projects with various ministries which are expected to take place under the PPP scheme and below is a list for those projects according to the PPP Central Unit:

1. Ain Shams to 10th of Ramadan Railway project
2. Al Zaqazeeq University Hospital Project
3. Cairo Contact Centers Park Project in Al Maadi
4. Hurghada Sea Desalination Plant
5. New Pediatric Hospital Project-Ain Shams University
6. Recycling Solid Waste into Energy Projects
7. River Bus Project

8. Safaga Industrial Port
9. Sharm El Sheikh Desalination Plant
10. Shubra to Banha Highway Project
11. Smouha Maternity University hospital and Blood Bank Project
12. Specialized center for neurosurgery and car road accident project-Ain Shams University
13. Suez Canal specialized University hospital project

2.4 Risks affecting PPP Projects

According to Ke et al. (2009), in the period from 1998 to 2003, the papers published and tackling PPP scheme were initially studying 3 major aspects in PPP which are the risks associated with PPPs. Procurement method in PPP and financial issue in PPP. Among these 3 major points of interest, papers published about risk management for PPPs account for approximately 21 % of the total number of papers published and concerning PPPs. The below figure shows the major points of interest of PPP papers from 1998 to 2008:

Topic	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	Total	%
Risk management	2	2	5	0	2	5	1	4	5	2	7	35	20.6
Integration research	4	3	0	0	6	1	2	5	6	4	3	34	20.0
Governance issue	0	1	1	3	0	7	1	1	6	4	7	31	18.2
Investment environment	0	1	2	2	0	5	2	1	4	2	2	21	12.4
Procurement	2	1	0	1	2	0	3	2	2	5	1	19	11.2
Economics viability	0	3	1	0	2	1	2	3	3	2	2	19	11.2
Financial package	1	0	0	2	0	4	0	1	2	1	0	11	6.5

Table 4: Areas of concern in PPP papers from 1998 to 2003 (2009)-Source: Ke et al.

Accordingly, it is noticed that risks associated with PPP along with their management techniques occupy a considerable percentage and is considered as an area of concern among the various topics and issues related to PPP. This is related to the nature of PPP projects which is characterized by the presence of many risks which demands a sound risk balance and allocation between both the private and public partner (Hwang et al., 2012). It is believed that a proper risk allocation among parties is the most challenging issue when designing a PPP contract. This is due to the fact that an improper risk allocation is one of the major causes of failure of PPP projects (Marques and Berg, 2011). ISO 2009 defines a risk as “The effect of uncertainty on objectives.” This means that risk is an uncertain event that can affect the project’s objectives or outcomes if it occurs.

Risks can affect three major aspects of any project which are cost, time and quality. Because of the long term nature of PPP projects, which can range from 20 to 40 years or even sometimes exceeds this period, and because PPP projects are based on expected and pre-specified assumptions, sometimes, these expectations and forecasts lack accuracy to a great extent as it may be difficult to make accurate predictions for 10 years especially in unstable economic, technological and political conditions as well supply and demand forecasts (Cruz and Marques, 2013). When the Traditional procurement method is used, risks do not disappear but they are simply passed to the end customer and taxpayers. The below figure is an illustration showing the difference in principle between the traditional procurement model and the PPP mode. When using the traditional model for delivering the project, the base cost is higher, in addition to the presence of a cost assigned for the inefficiency risk which is mainly due to the lack of experience of the government in certain areas such as construction and technology. However, in the case of project executed under the PPP scheme, along with a sound risk allocation between the private and public sectors, the base cost is reduced thanks to the PPP incentives. In spite of adding a risk premium to account for the different risks affecting the project in addition to the financing cost, the net result is that the total cost is less in the case of PPP projects than in the case of traditional project without passing the risks and the extra cost to the end user. Also, in general and in most of the projects executed under the PPP scheme, the payment to the private sector occurs when the project starts operating. This payment can be by the government (the public sector) or by end users. This is an incentive for the private partner to complete the project on time and within budget (Marques and Berg, 2011)

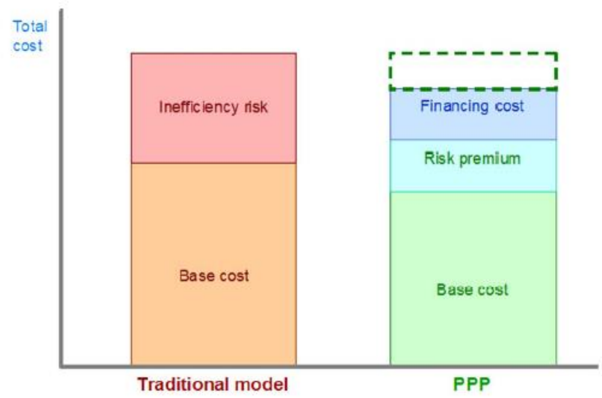


Figure 8: Comparison between PPP projects and traditional projects in terms of cost (2011)-Source: Marques and Berg

However, there is a point of view mentioning that not all risks are harmful since they can carry opportunities as much as threats in some cases (Marques and Berg, 2011).

There are several risks that can affect PPP projects, especially infrastructure projects which are: technical, construction, operations, revenue, financial, resources, production, force majeure, political, regulatory, environmental, commercial and unforeseen risks (Marques and Berg, 2011).

According to the Guidelines for Successful PPP Projects in Egypt published by the PPP Central unit, the most common risks affecting PPP projects are:

- Timing and Planning
- Unforeseen geotechnical conditions
- Technical design issues
- Operation Cost Overrun
- Time overrun during construction
- Supply and demand
- Operational service costs

- Inflation
- Change of legislation
- Insurance
- Technological risks

According to Marques and Berg (2011), the major risks affecting infrastructure projects executed under PPP scheme are:

- Technical risks
- Construction risks
- Operating risks
- Revenue risks
- Financial risks
- Force Majeure
- Regulatory/political risks
- Environmental risks
- Project default risks

Therefore, for each project, a proper risk allocation should be performed as well as the determination of the probability (likelihood of occurrence) and impact. This will help in expecting the financial and economic consequences of these potential risks. On the other hand, it should be noted that there is an optimal level of risk transfer beyond which, the desired Value for Money cannot be achieved for a specific project. This is because allocating more risks to the private partner may increase the project costs. The optimum level of risk transfer is shown in the following figure:

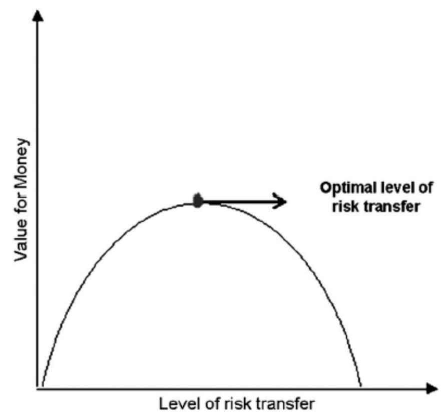


Figure 9: Optimum Level of Risk transfer to ensure realizing the Value for Money (2011)-Source: Marques and Berg

The following section shows in details the risk allocation method as well as the benefits of a proper risk allocation between the public and private partners.

2.5 Identification, Classification and Allocation of risks related to PPP Projects

According to the Guidelines for Successful PPP Projects in Egypt published by the PPP Central unit, “Risk allocation is at the heart of how PPPs are structured.”

The most well-known and efficient concept for risk allocation is known as the “Abrahamson” principle which is based on allocating the risk to the party who will be best in managing this risk. There are criteria that make the party eligible for bearing the risk which are:

- Having a risk that is within the party’s control and which can be dealt with efficiently.
- Having a risk that can be mitigated or transferred through different ways such as insurance or service premiums.
- Having a risk that gives the party bearing it an economical benefit (Quick, 2003)

Therefore, the party who will be better in managing the risk means the party who can handle this risk at “*the least cost.”* (Hwang et al., 2012)

In other words, if the public sector is able to bear a certain risk; then it should not be transferred to the private sector as doing that may increase the project’s costs. For instance, allocating customers related risks (such as supply and demand risks) to the private partner put its assets at the stake. On the other hand, the public sector (the government) can be better in knowing the consumption forecasts and accordingly can be more appropriate to bear such risk.

Marques and Berg (2011) specify a useful methodology that ensures a proper risk analysis and evaluation which is described in the below figure:

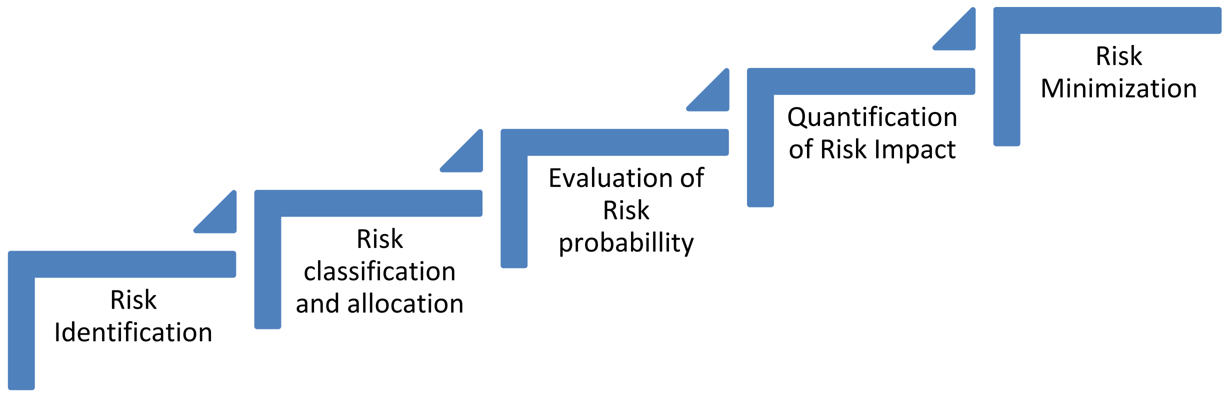


Figure 10: Proper Risk Analysis Methodology

This methodology starts by the step of the risk identification which is an essential step for the project and which should started as early as possible in the project's lifetime (Hwang et al., 2012). Then the risks should be properly classified. There are various classifications of risks; for instance, one of the possible classifications is dividing the risks as follows (Marques and Berg, 2011)

- **Macro Level Risks:** the Risks that are beyond the project's boundaries and however, have the power to affect the whole project,
- **Meso Level Risks:** the risks that occur within the project,
- **Micro Level Risks:** the risks that occur within the project parties in the project.

Another risk classification is dividing the risks into:

- **Global Risks (General Risks):** external risks affecting the project such as legal, political commercial and environmental risks

- **Elemental Risks (Project Risks):** risks within the project such as construction, operation, project default and revenue risks.

The following figure shows a third way to classify risks associated with PPP projects. This happens by dividing the risks into 3 major categories: Production risks, commercial risks and context risks.

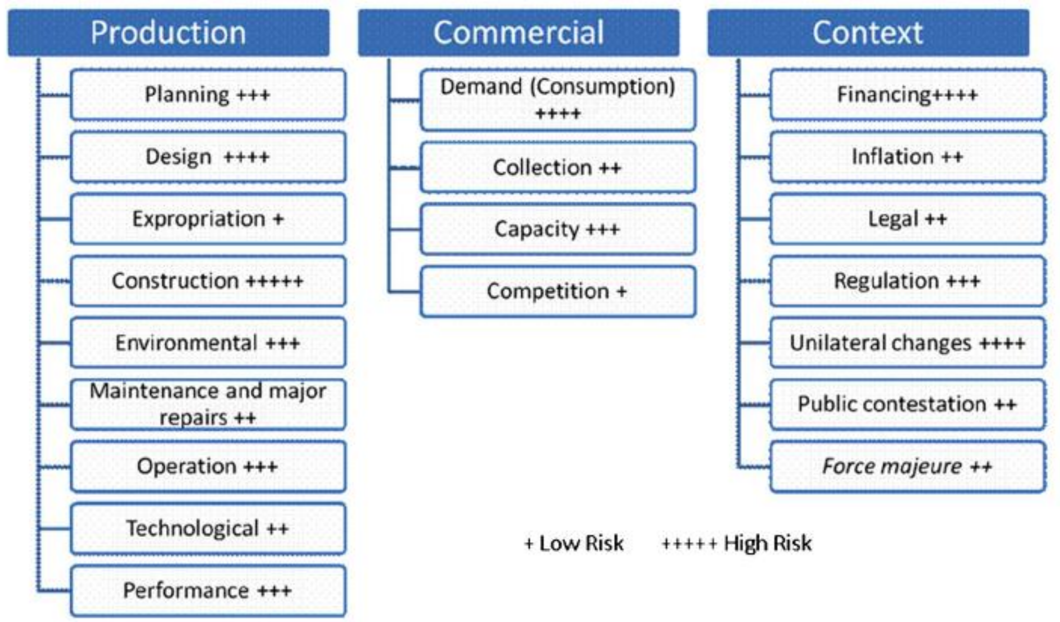


Figure 11: One of the adopted risks classification techniques for PPP projects (2011)-Source: Marques and Berg

A proper risk allocation is beneficial as it can decrease economic costs to both parties (the private and the public sector). In order to start a proper and effective risk management, first the risks that can affect a certain project have to be specified. Then, the probability and impact of each risk should be quantified. The severity of each risk can be determined by multiplying the probability by the impact for each risk. This way, all the risks can be ranked for a specific project (Marques and Berg, 2011). This stage has to be started from the bidding process. A complete risk matrix should be developed for all the risks associated with a certain project (Marques and Berg, 2011). In order to conduct a proper allocation of risks, some known rules can be applied. For instance, it is believed that the environmental, political and regulatory risks should be borne by the public sector. On the other hand, production risks, construction risks, supply and demand risks should be borne by the private sector. Some risks, such as operation, maintenance and design depend on the project conditions and circumstances. Some risks are controversial such as Force Majeure. The following figure shows a popular risk allocation matrix for general risks affecting PPP projects: (Marques and Berg, 2011)

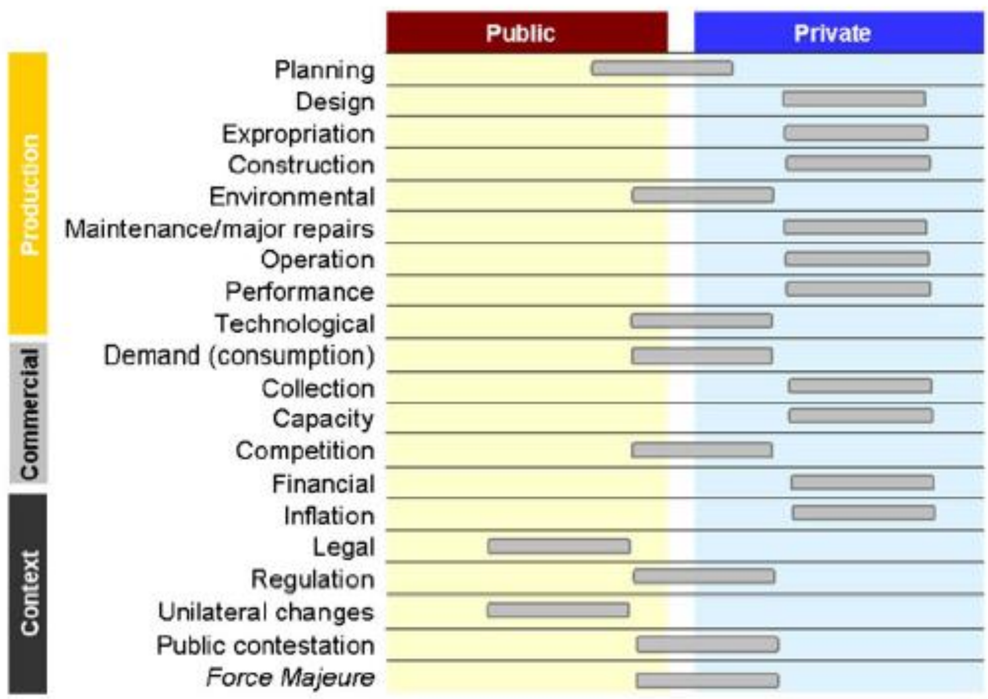


Figure 12: Risk Allocation Matrix for PPP projects (2011)-Source: Marques and Berg

2.6 Questionnaires

According to the guidelines published by the corporate research and Consultation team of the Kirkess Council, “A questionnaire is simply a ‘tool’ for collecting and recording information about a particular issue of interest. It is mainly made up of a list of questions, but should also include clear instructions and space for answers or administrative details.” The questionnaire can be either requesting qualitative or quantitative answers (or both).

The below are the major steps to develop a proper and sound questionnaire:

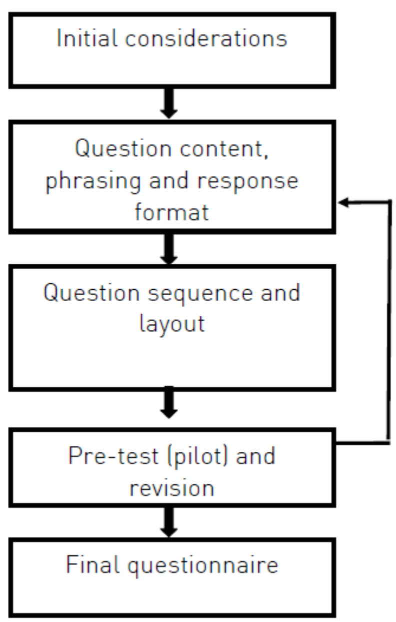


Figure 2-10: Major steps for developing a questionnaire-Source: “Questionnaires, Research and Consultation Guidelines”

One important aspect concerning the questionnaire is thinking about the output that the questionnaire will deliver. This will make a difference in the questionnaire design stage. Specifying the analysis method that will be used for the information and data extracted from the questionnaire is an important objective to take into consideration while developing the questionnaire.

2.7 Computerized models

According to Xu et al. (2012), developing a computerized tool is beneficial as it helps *"reducing human and mathematical errors as data can be directly inputted by project participants and data analysis is then performed by the computerized procedure instead of the manual calculation."* Xu et al. (2012) introduced a computerized risk evaluation model for Public Private Partnership projects which can determine the probability and severity of the risk factors associated with the PPP projects, it has the option of choosing the percentage and weight of the user's opinion compared to the experts' opinion which is part of the model's initial database. In other words, the data analyzed out of a questionnaire has been inserted in the model as the "experts' opinion". This opinion can affect the results obtained out of the model to a certain extent which can be chosen by the end user. Meanwhile, the end user's opinions also have a certain weight which will also be specified by him/her. Finally, after the end user chooses these factors, the model has the ability to compute the risk level of each factor as well as the overall risk level of the project and accordingly, the end user can choose whether this project is beneficial to go for or whether it is too risky to be considered.

Chapter 3: Theoretical Framework and Research Design

3.1 Description of research path

An adverse risk is an uncertainty concerning any event that may occur in the future and which, by its occurrence, will negatively affect the project by causing time impact, cost impact or both. PPP projects are affected by various types of such risks as they are based on collaboration between both the public sector and the private sector. In order to ensure the success of PPP projects, risks should be taken into consideration. In other words, there should be a proper risk allocation between both the private and public partner in order to ensure the success of the project. The risks should be identified to the public and to the private partner starting from the conceptual design phase of the project. Therefore, a proper risk analysis should be done for each project in which the PPP scheme will be applied to allow first the public partner to decide whether to go or not to go in the project and second once decided to go for the project, to allow the public and the private partners to work efficiently together.

There are various phases for risk analysis that should be carefully done in order to ensure properly taking all the risks into consideration. First the risks affecting the project should be identified. Then, the risks probability and impact should be determined in order to calculate the severity of the risks. Afterwards, the risks are ranked according to their severity and the top severe risk are the ones who will be taken to the next step which is the quantitative risk analysis through the statistical analysis as well as the model development using Crystal Ball. The next step involves presenting the results and validating the model development in order to check its applicability to the end users whether they are from the public sector or from the private sector. Concerning the last step which is "beyond presentation", it includes presenting the research findings, the recommendations in addition to any future work. The below figure illustrates the process:

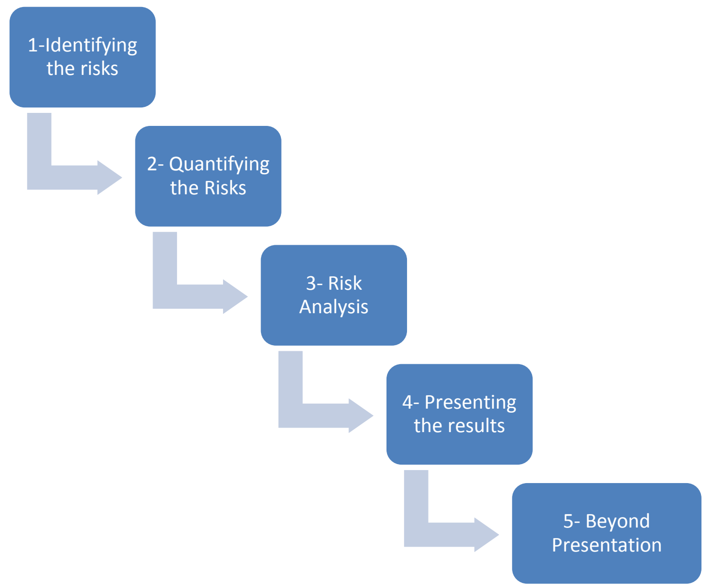


Figure 13: Risk Analysis Process

Moreover, the risks identified throughout the research will be mapped to actual contract clauses in order to determine how the risks are addressed and allocated in real PPP contracts in Egypt. An interpretation is added to each risk and its way of presentation in the actual PPP contract. In case the risk is not addressed in the contract, a proper wording is proposed to the risk. This section of the research aims to develop a template for the drafting of future PPP contracts.

3.2 Methodology

The methodology for this research was developed by adapting the framework adopted in two papers written by Xu et Al. in 2010 and in 2012. The first paper aimed at developing a computerized risk evaluation model for PPP projects in China while the second aimed at developing a risk assessment model for PPP projects in China. This research is focusing on applying the research framework to Egypt and by doing changes so that this research can cope with the actual conditions in the country. The figure below is an illustration for the methodology that will be used and explained in the next pages:

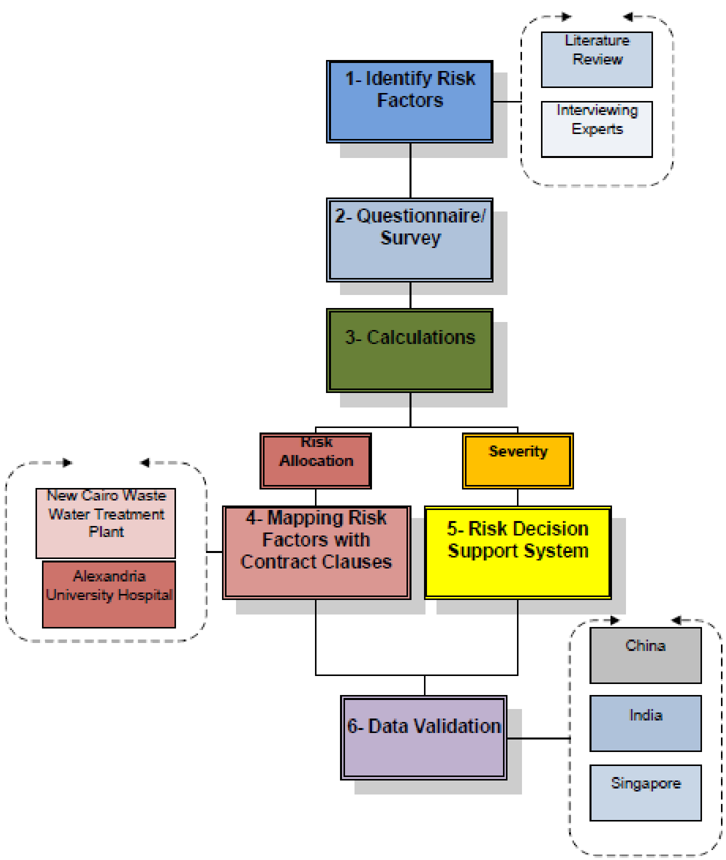


Figure 14: Thesis Methodology

3.2.1 Identify Risk Factors

The first step in the methodology consists of identifying the risk factors. This is done through the literature review (Chapter 2) and by interviewing experts. Then, similar risk factors are grouped into different Critical Risk Groups.

3.2.2 Questionnaire/Survey

3.2.2.1Questionnaire Design

The Questionnaire is composed of risk factors. Those different risk factors were identified from the literature review performed concerning various risks that can affect PPP projects around the world. After collecting all the risk factors from the literature review and after interviewing the necessary experts, the different risk factors were divided into different risk groups. The grouping of the risks was according to the literature review, namely, according to the study developed by Xu et Al. in 2012. Also, some of the risk groups were obtained by asking experts in the domain of risks and construction (working in both the private and the academic sectors) and the other were based on the personal knowledge of the researcher. Therefore, similar risks were included under the same title (under the same Critical Risk Group, CRG). The final grouping of risk factors with all the different risks under each group is as follows:

#	Risk Factor
Factor 1: Macroeconomic and Financial Risks	
1	Interest Rate Fluctuation
2	Inflation
3	Foreign exchange fluctuation
4	Price Change

5	Operation cost overrun
6	Revenue Risk
7	Inability of concessionaire
8	Subjective Project evaluation method
9	Insufficient project finance supervision
Factor 2: Commercial and Market Environmental Risks	
10	Market competition
11	Supply and demand
12	Change in Market demand
13	Public Credit
Factor 3: Legal Risks	
14	Performance Security Risk
15	Permits Risks
16	Delay in project approvals/permits
17	Legislation changes
18	Dispute resolution
19	Change in tax regulation
20	Government policy
Factor 4: Political Risks	
21	Political/Public opposition
22	Swings in Public Opinion
23	Political Risk
24	Nationalization/expropriation
Factor 5: Regulatory Risks	
25	Regulatory/Contractual Risk
26	Government Intervention
Factor 6: Government Maturity Risks	
27	Poor public decision making process
28	Government corruption
29	Inadequate law and supervision system
Factor 7: Technical Risks	
30	Imperfect contract documents
31	Deficiency of design
32	Quality Assurance
33	Quality Control
34	Latent Defect Risk
35	Lack of supporting infrastructure
Factor 8: Construction and Operational Risks	
36	Project/operation changes
37	Inability of concessionaire

38	Provision of transformers, substations or backup power
39	Construction Risk
40	Organization risk
41	Coordination risks
42	Land acquisition
43	Physical Obstacles that cannot be avoided
44	Maintenance Risks
45	Access and delivery of site
46	Connection of Public utilities to boundaries of site
47	Connection to boundary of Site of telephone lines and natural gas provision
Factor 9: Resources Risks	
48	Labor unavailability
49	Material shortage
Factor 10: Production Risks	
50	Third party delay/violation
51	Planning risks
52	Supervision, organization and control for inspection of Construction works
53	Technological Risks
54	Completion risk
Factor 11: Environmental Risks	
55	Sustainability Risk
56	Antiquities Risks
Factor 12: Unforeseen Risks	
57	Unforeseen Weather conditions
58	Unforeseen geotechnical conditions
59	Force majeure
Factor 13: Other Risk(s) (Please Specify)	
60	

Table 5: Risks and grouping of Risk Factors

In order to fill the survey, the respondent should specify the probability (likelihood of occurrence) and the impact of each risk on the project based on the respondent's experience and point of view. The probability and impact are both chosen on the Likert's scale raging form 1 to 5 as follows:

Risk Probability	Value	Description
Very Low (VL)	1	Almost no possibility of occurrence
Low (L)	2	Unlikely to occur
Medium (M)	3	Likely to occur
High (H)	4	Very Likely to occur
Very High (VH)	5	Almost certain to occur

Risk Impact	Value	Description
Very Low (VL)	1	No serious Influence on the project
Low (L)	2	Slightly affecting the project's performance
Medium (M)	3	Moderately affecting the project's performance
High (H)	4	Significantly affecting the project's performance
Very High (VH)	5	Catastrophic, where the project would be aborted

Table 6: Descriptive terms P and I

Moreover, the respondent should specify whether this specific risk will be borne by/allocated to the private party, the public party or whether it will be shared by both parties. Also, the respondent has the right to add any risk factor which was not before included in the aforementioned risks.

Below is a definition for the parties in order to unify the point of view according to which the survey is answered:

- The Private Party is the developer, the Service Provider or in other words the contracting company which is going to Build, Operate and Transfer the project at the end of the Concession period.
- The Public Party is the government to which the project is affiliated. For instance, in the case of a hospital, the public party is the Ministry of Health. Also, the researcher considered the regulator (such as the PPP Central Unit affiliated to the

Ministry of Finance) among the public respondents although their main role is to guarantee the service.

The finalized questionnaire is presented below:

#	Risk Factor	Probability					Impact					Private's Risk	Public's Risk	Both
		1	2	3	4	5	1	2	3	4	5			
Factor 1: Macroeconomic and Financial Risks														
1	Interest Rate Fluctuation													
2	Inflation													
3	Foreign exchange fluctuation													
4	Price Change													
5	Operation cost overrun													
6	Revenue Risk													
7	Inability of concessionaire													
8	Subjective Project evaluation method													
9	Insufficient project finance supervision													
Factor 2: Commercial and Market Environmental Risks														
10	Market competition													
11	Supply and demand													
12	Change in Market demand													
13	Public Credit													
Factor 3: Legal Risks														
14	Performance Security Risk													
15	Permits Risks													
16	Delay in project approvals/permits													
17	Legislation changes													
18	Dispute resolution													
19	Change in tax regulation													
20	Government policy													
Factor 4: Political Risks														
21	Political/Public opposition													
22	Swings in Public Opinion													
23	Political Risk													
24	Nationalization/expropriation													

Factor 5: Regulatory Risks														
25	Regulatory/Contractual Risk													
26	Government Intervention													
Factor 6: Government Maturity Risks														
27	Poor public decision making process													
28	Government corruption													
29	Inadequate law and supervision system													
Factor 7: Technical Risks														
30	Imperfect contract documents													
31	Deficiency of design													
32	Quality Assurance													
33	Quality Control													
34	Latent Defect Risk													
35	Lack of supporting infrastructure													
Factor 8: Construction and Operational Risks														
36	Project/operation changes													
37	Inability of concessionaire													
38	Provision of transformers, substations or backup power													
39	Construction Risk													
40	Organization risk													
41	Coordination risks													
42	Land acquisition													
43	Physical Obstacles that cannot be avoided													
44	Maintenance Risks													
45	Access and delivery of site													
46	Connection of Public utilities to boundaries of site													
47	Connection to boundary of Site of telephone lines and natural gas provision													
Factor 9: Resources Risks														
48	Labor unavailability													
49	Material shortage													
Factor 10: Production Risks														
50	Third party delay/violation													

51	Planning risks													
52	Supervision, organization and control for inspection of Construction works													
53	Technological Risks													
54	Completion risk													
Factor 11: Environmental Risks														
55	Sustainability Risk													
56	Antiquities Risks													
Factor 12: Unforeseen Risks														
57	Unforeseen Weather conditions													
58	Unforeseen geotechnical conditions													
59	Force majeure													
Factor 13: Other Risk(s) (Please Specify)														
60														

Table 7: Finalized Questionnaire

3.2.2.2 Population

The respondents for this survey are from the private Egyptian sector, public Egyptian sector and academic sector (who are teaching in Egypt) as well. All the respondents have worked in the domain of Construction Engineering in Egypt and abroad. All of them have worked in Egypt while some of them have, in addition to the Egyptian based experience, worked abroad whether in the Gulf, Africa, Australia, the United States and Canada. The guidelines of the questionnaire set by the researcher are to answer the questionnaire based on the Egyptian Construction market.

All of the respondents should have been involved in PPP projects in Egypt. Respondents should have been involved in different types of PPP projects: educational, water and waste water, residential and transportation projects. The page of the survey dedicated for the professional background of the respondent in the domain of Construction and in the domain of PPP is presented as follows:

Name of Respondent:	
Current Title :	

Experience of Respondent in the domain of Construction	0-5 years	5-10 years	10-15 years	more than 15 years

Domain of work of respondent	Public Sector	Private Sector	Academic Sector	Both and/or other (please specify)

Work location and background of the respondent	Egypt	Other (Please specify)

PPP experience of survey respondent	0-2 years	2-4 years	4-6 years	more than 6 years

Type of PPP projects that the respondent has been involved with	Transportation	Educational	Health	Other (please specify)

Work location and background of the respondent in the domain of PPP	Egypt	Other (Please specify)

Table 8: Background Info of the Experts

3.2.2.3 Sample Size

The sample size for this questionnaire is equal to 25 respondents all having a considerable background in the domain of Construction Engineering and in PPP projects in Egypt. The majority of the respondents have more than ten years of experience in the domain of Construction and more than two years (up to six years of experience) in PPP projects.

3.2.2.4 Definition of Risk Factors

Definitions are provided in the questionnaire for all the risk factors presented in the survey in order to get a unified point of view from all the respondents about each risk factor. The researcher included the definitions based on the understanding acquired from the literature review and after asking experts:

#	Risk Factor	Definition
Factor 1: Macroeconomic and Financial Risks		
1	Interest Rate Fluctuation	Risk that an interest-earning asset, such as a bank loan, will decline in value as interest rates change.
2	Inflation	A persistent increase in the level of consumer prices or a persistent decline in the purchasing power of money, caused by an increase in available currency and credit beyond the proportion of available goods and services.
3	Foreign exchange fluctuation	Change and swing in foreign exchange rates.
4	Price Change	Any changes that occur in the prices.
5	Operation cost overrun	Amount by which the actual cost exceeds the budgeted, estimated, original, or target cost.
6	Revenue Risk	Risks associated with the project's revenues coming from end users.
7	Inability of concessionaire	Financial inability of the private party in performing the works.
8	Subjective Project evaluation method	Subjective evaluations are open to interpretation, so one evaluator may be very different from another. This can be unfair to the project which may be evaluated more severely based on an individual's personal perspective. (and vice versa)
9	Insufficient project finance supervision	Lack of financial supervision on the project.
Factor 2: Commercial and Market Environmental Risks		
10	Market competition	In the case of competition on market, if there will be competitors for the project and/or facility.
11	Supply and demand	Risks associated with supply and demand of the end customer such as for instance toll roads or healthcare

		facilities.
12	Change in Market demand	If during the construction of the project and/or after the project's completion, the needs of the end user differ.
13	Public Credit	The reputation of, or general confidence in, the ability or readiness of a government to fulfill its pecuniary engagements.
Factor 3: Legal Risks		
14	Performance Security Risk	Bearing the risk of the performance security and getting it.
15	Permits Risks	Time and Cost impacts resulting from not getting the necessary permits for the project.
16	Delay in project approvals/permits	Any delay that occurs in the project due to legal reasons and issues for approval and/or getting necessary permits.
17	Legislation changes	Any changes to the countries laws after the tendering process.
18	Dispute resolution	Risks associated with disputes arising between the public and the private party, and/or arbitration (if it occurs)
19	Change in tax regulation	Increase of taxes which can have a cost impact on the project.
20	Government policy	Risks caused by poor governmental regulations and policies.
Factor 4: Political Risks		
21	Political/Public opposition	Risks associated with public opposition such as riots or protests.
22	Swings in Public Opinion	Change in public opinion such as lack of public support to the project or to the government. (Such as the ministry to which the project is affiliated.)
23	Political Risk	Any political risk that may affect the project.
24	Nationalization/expropriation	Risks associated with nationalization of the project.
Factor 5: Regulatory Risks		
25	Regulatory/Contractual Risk	All the risks associated with Egyptian regulations as well as with the Contract.
26	Government Intervention	Sometimes, the public sector (as he is generally the owner and regulator) does many interventions on the private party's work which can lead to delays.
Factor 6: Government Maturity Risks		
27	Poor public decision making process	Inadequate and poor decisions from the government's side and which have an effect on the project.
28	Government corruption	All the corruption problems related to the government.
29	Inadequate law and supervision system	If there is any deficiency in the laws as well as in the supervision of works.
Factor 7: Technical Risks		

30	Imperfect contract documents	Any problem in the Contract documents such as discrepancies between various documents or poor contractual conditions which do not reserve each party's rights.
31	Deficiency of design	If there is any problem in the design that can affect the project such as having an unsafe design or a non-constructible design.
32	Quality Assurance	The goal of QA is to improve development and test processes so that defects do not arise when the product is being developed. Lack of quality assurance can have cost and time impact.
33	Quality Control	The goal of QC is to identify defects after a product is developed and before it's released. Poor Quality Control can drastically affect the project as it may lead to great time and cost impacts.
34	Latent Defect Risk	Any present defect which will have a negative effect on the project such as materials defects or defects present in the produced works.
35	Lack of supporting infrastructure	If the already present and poor infrastructure negatively affects the project.
Factor 8: Construction and Operational Risks		
36	Project/operation changes	Risk caused by any change that occurs in the project due to the change of the owner's point of view. This change can be within the project's scope of work or in its operations.
37	Inability of concessionaire	The technical inability of the private party to execute the works on site.
38	Provision of transformers, substations or backup power	Risks associated with delivering power sources to the site.
39	Construction Risk	All risks associated with the construction process on site.
40	Organization risk	All risks associated with the organization of work on site such as the mobilization, equipment, materials, progress of work, etc.
41	Coordination risks	Proper coordination should be present on site between the Owner, Contractor and Consultant as well as between the Contractor and his subcontractors in order not to affect the works on site.
42	Land acquisition	Any problems that may arise and cause delays for the Contractor to continue his works due to the land.
43	Physical Obstacles that cannot be avoided	This risk refers to any physical prevention on site which avoids work and which was not accounted for.
44	Maintenance Risks	The risks originating from any maintenance operation required on site whether during the project or at the end of the project.
45	Access and delivery of site	Risks associated with delivering the site to the Contractor as well providing the necessary access to the site.

46	Connection of Public utilities to boundaries of site	Risks associated to the provision of utilities to the site such as potable water, sewage network, etc.
47	Connection to boundary of Site of telephone lines and natural gas provision	Risks associated to the telephone line and natural gas provision.
Factor 9: Resources Risks		
48	Labor unavailability	Lack of presence of labor or a certain type of labor (such as skilled labor) which affects the works on site.
49	Material shortage	Lack of presence of necessary material(s) on site which prevent the completion of construction.
Factor 10: Production Risks		
50	Third party delay/violation	The delays or cost impacts caused by a third party other the private partner and the public partner such as sub-contractors delays.
51	Planning risks	The risks associated with planning originate from poor project planning which can lead to delays and cost impact. Also, not following the project's time schedule and going out of schedule can seriously affect the project.
52	Supervision, organization and control for inspection of Construction works	Inspection of works on site can be challenging as poor organization of inspection can have time and cost impacts.
53	Technological Risks	Many risks associated with technology can affect the project such as introducing a new technology to the project, a new construction method, a new software, etc.
54	Completion risk	All the risks associated with the completion and handing over processes of the project.
Factor 11: Environmental Risks		
55	Sustainability Risk	Environmental risks associated with the project and which presence will affect sustainability and lean construction objectives.
56	Antiquities Risks	In the case any antiquities are found on site and they were not expected or accounted for, this may have time impact.
Factor 12: Unforeseen Risks		
57	Unforeseen Weather conditions	Unexpected weather conditions that are not accounted for and which do not conform to Egypt's expectations at that time of the year.
58	Unforeseen geotechnical conditions	Any geotechnical data discovered on site and which was not present in the geotechnical report and which will have impacts on the construction on site
59	Force majeure	Any events that happens as it out of the party's control and could not have been expected or accounted for

Table 9: Risk Factors Definitions

3.2.2.5 Limitations of the questionnaire

The questionnaire/survey depends essentially on the respondents opinions. However, there are many factors that can affect the opinion given by the expert, such as:

1- **Subjective Estimation of risk**

   a. **Anchoring:** This happens when the respondent starts with an initial estimate which is modified along the way while filling the questionnaire.

   b. **Linguistic Imprecision:** If the same word or expression can be interpreted differently by the respondents which will lead to a lack of unification in the point of view from which the question is answered.

2- **Psychological factors affecting opinions**

   a. **Conformity:** This difference arises between a respondent answers the survey independently and another who answers it collectively (among a group of other respondents).

   b. **Bias:** If the survey is solved collectively, then, respondents may be affected by their seniors or managers in taking the decision.

   c. **Personality:** The personality of the survey's solver may affect his/her answers to the survey. (Rodger, C., Petch, J, 1999)

Accordingly and because of these limitations, it is preferred for each respondent to answer the survey individually to get the full point of view and vision without being affected by another person in his/her surroundings.

3.2.3 Calculations

3.2.3.1 Risk Allocation

Concerning the risk allocation analysis, its calculation is based on the "Majority Opinion". In other words, if more than 50% of the survey respondents allocated a certain risk to the public party, then this risk will be allocated to the public party. The same applies if the majority of the respondents (more than 50 % of the respondents) choose to allocate a certain risk to the private party or whether they choose that this risk will be borne by both the private and public sector (Shared risk). In the case that for a certain risk, neither choice exceeds 50 %, then, in this case, it will be assumed that this specific risk will be allocated separately based on the project ("Project Dependent") (Hwang et Al., 2012).

3.2.3.2 Risk Severity

The aim of the survey/questionnaire is to calculate the severity of each risk. The Risk Severity is calculated by multiplying the probability by the impact of each risk. (Which are both obtained from the survey results).

3.2.3.3 Risk Ranking (Qualitative Risk Analysis)

After calculating the severity of risks by multiplying the risk probability by the risk impact, the values are normalized. The objective of the normalization procedure is to unify and adjust the data to a common scale so it can be better interpreted and analyzed. In order to get the normalized value for each risk, the following formula is applied:

$$Normalized\ Value = \frac{(Average\ Actual\ Value - Average\ Minimum\ Value)}{(Average\ Mximum\ Value - Average\ Minimum\ Value)}$$

After the normalization is performed, then, the risks can be properly ranked according to their severity from highest to lowest. Only risks with values equal or greater than 0.4 will be selected to be entered into the crystal ball model for further analysis. According to Xu et Al., only the risk factors with a normalized value equal or greater than 0.5 are included. (2012) However, since the researcher found that there were risk factors with a value close to 0.5, such as values equal to 0.48 and 0.47, then, the researcher widened the range and took into account the risk factors with a normalized value equal to or greater than 0.4.

3.2.4 Mapping Risk Factors with actual Contract Clauses

All the risk factors and risk groups are then included in a survey in which the respondents are asked to fill, based on their personal experience, the probability and the impact of each risk and to allocate this specific risk to the party which, in their opinion will be able to manage this risk. In addition, the risk factors obtained from the literature and used in the survey will be mapped to two actual PPP contract clauses in order to determine how those risks are presented in real case contracts and whether they are properly covered or not. Also, the risk allocation obtained from the survey results as to public or private partner will be compared to the actual risk allocation in the contracts and accordingly, interpretations will be developed concerning the best and most beneficial risk allocation.

3.2.5 Crystal Ball Model Development (Quantitative Risk Analysis)

In this research, a model or in other words a Decision Support System is developed for risk analysis, "*A model is a spreadsheet that has taken the leap from being a data organizer to an analysis tool"* ("Oracle" 2008).

The Crystal Ball does a number of iterations through Monte Carlo Simulation and shows the overall risk level of the project (overall severity) in addition to the percentage of contingency cost according to the confidence intervals. Also, the Crystal Ball's output, through Sensitivity Analysis is showing the highest assumptions impacting the Decision Support System's results whether in terms of their probability or in terms of their impact. In other words, it specifies the criticality of the uncertain variables and determines which the uncertain values that have the greatest impact on the Decision Support System's deliverables. Crystal Ball can as well perform correlation and historical data fitting. "*If historical data are available, the data-fitting feature can be used to compare the data to the range of results and calculate the parameter values that yield the best fit to the data*" (Anderman, 2003).

3.2.5.1 Model Limitations

There are several limitations to the framework:

1. The public partner is Egyptian based. In other words, this survey/questionnaire is assuming that the public party is the Egyptian government or an Egyptian governmental agency.

2. The PPP projects are all done in Egypt.

3. The PPP projects that are implemented in Egypt and throughout this study can be in any sector: infrastructure, transportation, health, education, etc.

4. The type of Public Private Partnership is general, i.e. it can be a Build Operate Transfer (BOT) model or any other PPP scheme as explained in the literature above.

3.2.6 Data Validation

The data validation is performed through the comparison of the top ranked risks obtained through the survey results to the top ranked risks obtained from the literature review in China, India and Singapore.

Chapter 4: Survey Analysis

4.1 Background information of the respondents

The Questionnaire was distributed among 25 respondents form the Public Sector, Private Sector and Academic Sector. Among the respondents, 72 % (18 respondents out of 25) have a more than 10 year experience in the domain of Construction Engineering: 36% of the respondents have more than 15 years of experience in the domain of Construction Engineering and 36 % of the respondents have an experience in the domain of Construction Engineering ranging from 10 to 15 years. 28% of the respondents have an experience ranging from 0 to 10 years. This is illustrated in the below figure and the below table:

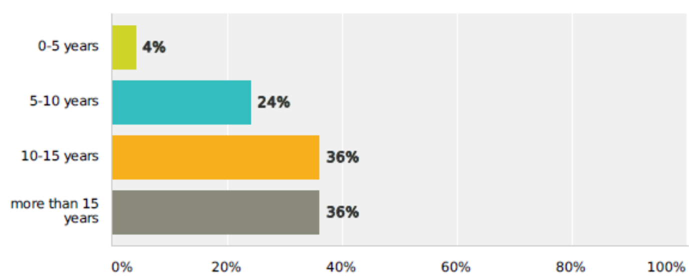


Figure 15: Experience of the respondents in the domain of Construction Engineering

Experience of Respondent in the domain of Construction		
Answer Options	Response Percent	Response Count
0-5 years	4.0%	1
5-10 years	24.0%	6
10-15 years	36.0%	9
more than 15 years	36.0%	9
	Total Number	25

Table 10: Experience of the respondents in the domain of Construction Engineering

Concerning the domain of work of the respondents, 92 % of them have worked or are working in the private sector. 20 % of them have worked in the public sector and 20 % have worked in the Academic sector as illustrated in the below figure and table:

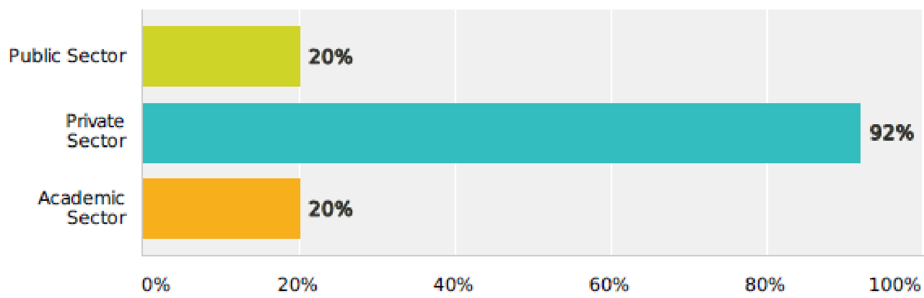


Figure 16: Domain of work of the respondents

Domain of work of the respondent		
Answer Options	**Response Percent**	**Response Count**
Public Sector	20.0%	5
Private Sector	92.0%	23
Academic Sector	20.0%	5
	Total Number	25

Table 11: Domain of work of the respondents

All the respondents to the questionnaire have worked and are currently working in Egypt as shown in the below table and the below figure.

Work location and background of the respondent		
Answer Options	Response Percent	Response Count
Egypt	100.0%	25
Other (please specify)		10
	Total Number	25

Table 12: Work location of the respondent

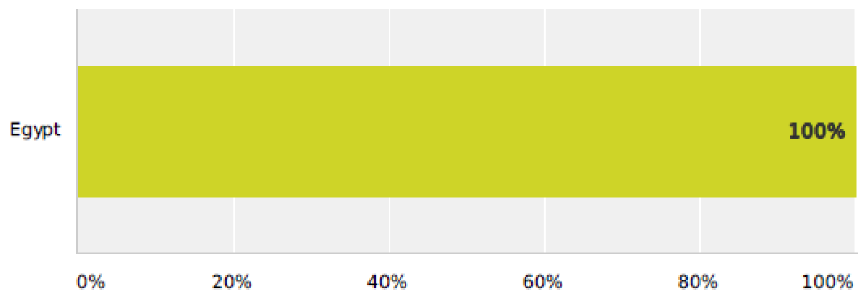


Figure 17: Work location and background of the respondents

However, 10 out of the 25 respondents have worked in other countries such as Australia, Saudi Arabia, Algeria, United States, The United Kingdom, Canada, Africa, etc. as shown in the below table:

Number	Other countries in which the respondents have worked
1	United Kingdom
2	Saudi
3	International
4	previous experience at the states of Qatar and Kuwait
5	Algeria, USA
6	Canada
7	Africa
8	Australia, Algeria, UAE
9	Gulf
10	Regional

Table 13: Other countries in which the respondents have worked

Concerning the experience of the respondents in PPP projects, 44% of the respondents (11 respondents out of 25) have an experience in PPP projects ranging from 2 to 4 years. 12 % of the respondents have more than 6 years of experience in PPP projects. 8 % of the survey respondents have an experience ranging from 4 to 6 years while 36 % of the respondents (9 respondents out of 25) have a recent experience in PPP projects which is ranging from 0 to 2 years.

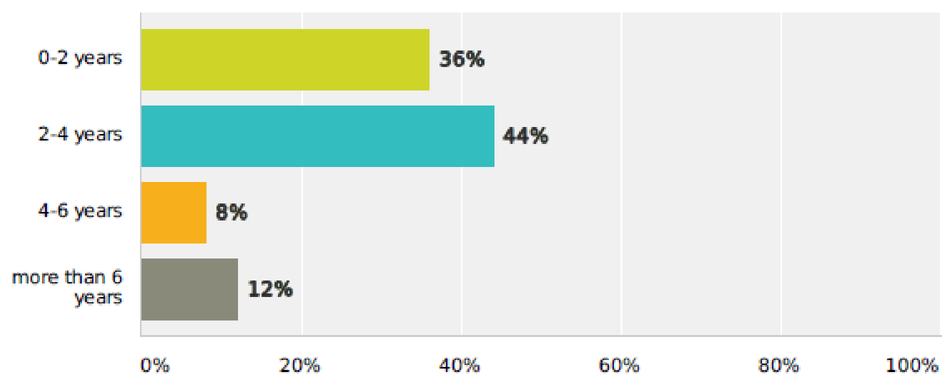


Figure 18: PPP experience of the survey respondent

PPP experience of survey respondent		
Answer Options	Response Percent	Response Count
0-2 years	36.0%	9
2-4 years	44.0%	11
4-6 years	8.0%	2
more than 6 years	12.0%	3
	Total Number	25

Table 14: PPP experience of the survey respondent

The respondents have worked in different types of PPP projects such as educational, transportation, health, wastewater treatment, housing, power, etc. Approximately, 80 % of the respondents have worked in transportation PPP projects, 56 % of the respondents have worked in health PPP projects and 45% of the respondents have worked in educational projects as it is shown in the below figure:

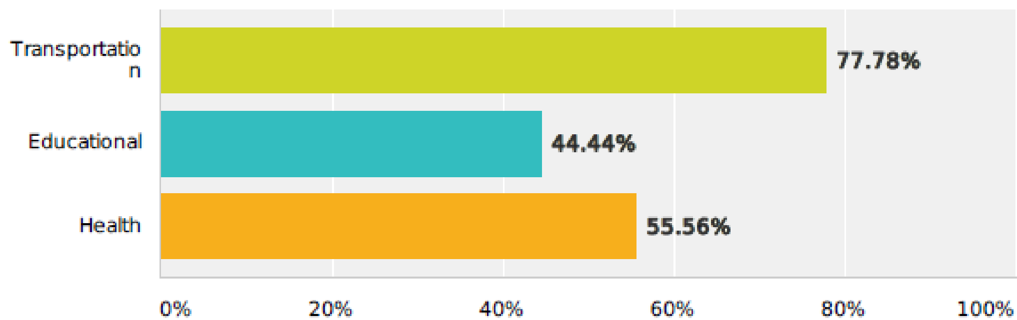


Figure 19: Types of PPP projects that the respondents have worked in

Answer Choices	Responses	
Transportation	**77.78%**	7
Educational	**44.44%**	4
Health	**55.56%**	5

Table 15: Types of PPP projects that the respondents have worked in

On the other hand, 20 respondents out of the 25 have worked in other PPP project types than the above mentioned transportation, educational and health projects as shown in the below table:

Number	Other PPP project types
1	Water Treatment
2	Water Treatment
3	Wastewater
4	Sewage Treatment
5	Sewage Treatment Plant
6	Water Treatment Projects
7	Infrastructure-Waste Water Treatment
8	Water

9	Wastewater Treatment
10	Infrastructure
11	Infrastructure (wastewater Treatment Plant)
12	Sewage treatment Plant
13	Waste Water Treatment
14	Waste Water
15	Waste and Airports
16	Housing
17	Residential
18	Affordable Housing project
19	Utilities
20	Utilities and power

Table 16: Other PPP project types that the respondents have been involved with

All the respondents have been involved in PPP projects in Egypt while 5 respondents have been involved in PPP projects in other countries such as Canada, Australia, Saudi Arabia and Malaysia. This is illustrated in the below table:

Number	Other (please specify)
1	Canada
2	Australia
3	Saudi Arabia
4	Malaysia (Conference)
5	Regional

Table 17: Other countries in which the respondents have worked in the domain of PPP

4.2 Risk Factors Analysis

In this section of the Questionnaire, there are 12 risk factors with various risks under each title. The respondents were asked to determine, based on their past experience in the domain of PPP projects, the probability (the likelihood of occurrence) as well as the impact (the effect) of each risk on a scale from 1 to 5 where 1 represents the least probability and the smallest impact and 5 represents the highest probability and the largest impact. Also, the respondent had to determine which party will bear this specific risk: whether the private party, the public party or whether this risk will be borne equally by both the private and the public party. In the next pages, each risk factor group is presented along with the subsidiary risk factors under each group with a summary for the 25 responses for each risk. For each risk, the number and percentage of respondents who assigned the probability, the impact and the risk allocation of each risk factor is presented.

4.2.1 Factor 1: Macroeconomic and Financial Risks

1- Interest Rate Fluctuation
2- Inflation
3- Foreign Exchange Fluctuation
4- Price Change
5- Operation Cost Overrun
6- Revenue Risk
7- Inability of Concessionaire
8- Subjective Project Evaluation method
9- Insufficient Project Finance Supervision

4.2.1.1 Probability

Probability						
Answer Options	**1**	**2**	**3**	**4**	**5**	**Response Count**
Interest Rate Fluctuation	0	7	9	9	0	25
Inflation	0	2	5	12	6	25
Foreign Exchange Fluctuation	0	4	2	8	11	25
Price Change	1	2	9	10	3	25
Operation Cost Overrun	2	5	10	7	1	25
Revenue Risk	5	3	9	7	1	25
Inability of Concessionaire	8	7	7	2	1	25
Subjective Project Evaluation Method	8	3	13	1	0	25
Insufficient project finance supervision	9	5	6	2	3	25

Table 18: Risk Factor 1: Probability

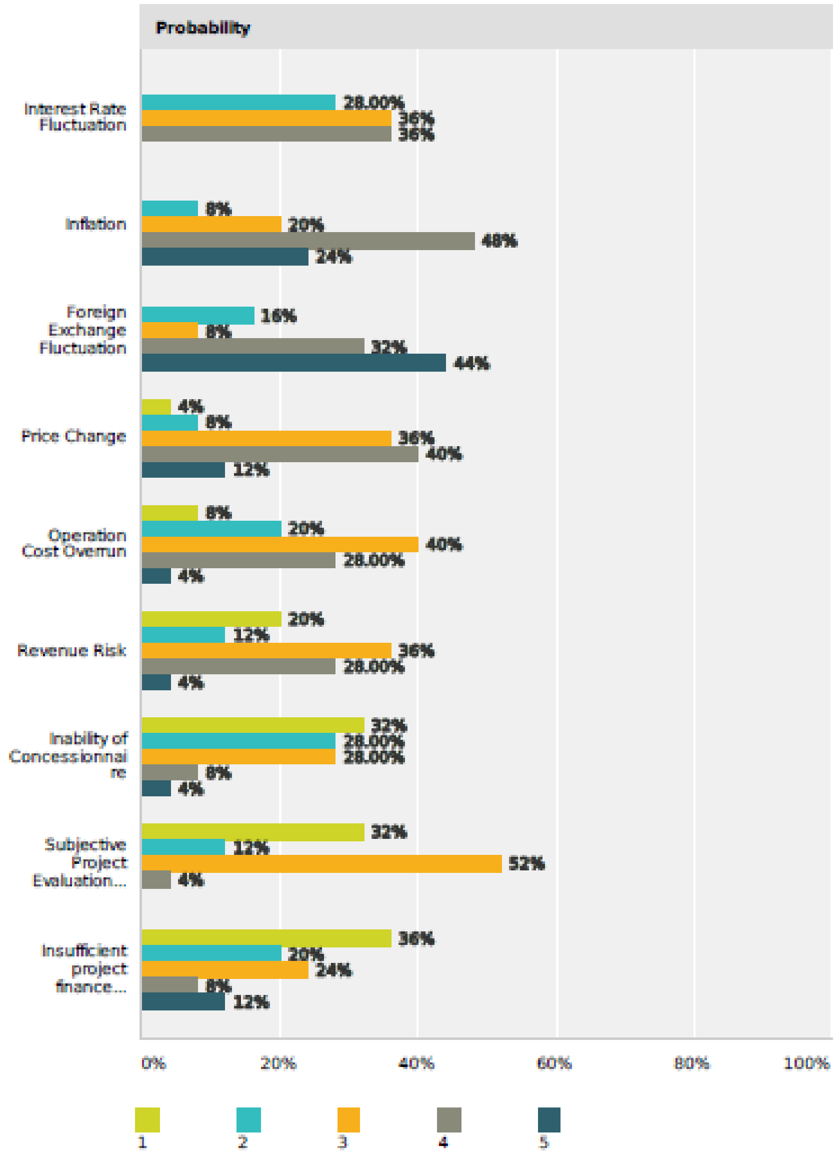


Figure 20: Risk Factor 1: Probability

From the above table and the above figure, it is noticed that most of the respondents (around 72 %) determined that the interest rate fluctuation has a high probability of occurrence. The same applies for the probability of inflation. In the light of the actual conditions that are prevailing in the country, 44 % of the respondents chose that the foreign exchange fluctuation has a high likelihood of occurrence. Concerning the Operation Cost overrun risk, the revenue risk and the inability of concessionaire, the majority of the respondents chose that they are likely to occur but not with a high probability. This is due to the fact that the Private Partner chosen is usually a competent one. The same applies for the subjective project evaluation method. While for the insufficient project finance supervision, 36% of the respondents assessed a very low probability of occurrence to it.

4.2.1.2 Impact

Impact						
Answer Options	**1**	**2**	**3**	**4**	**5**	**Response Count**
Interest Rate Fluctuation	0	7	5	12	1	25
Inflation	0	4	5	8	8	25
Foreign Exchange Fluctuation	1	2	3	8	11	25
Price Change	1	7	7	7	3	25
Operation Cost Overrun	2	4	9	9	1	25
Revenue Risk	1	3	6	9	6	25
Inability of Concessionaire	2	4	5	7	7	25
Subjective Project Evaluation Method	7	5	7	5	1	25
Insufficient project finance supervision	4	3	9	2	7	25

Table 19: Risk Factor 1: Impact

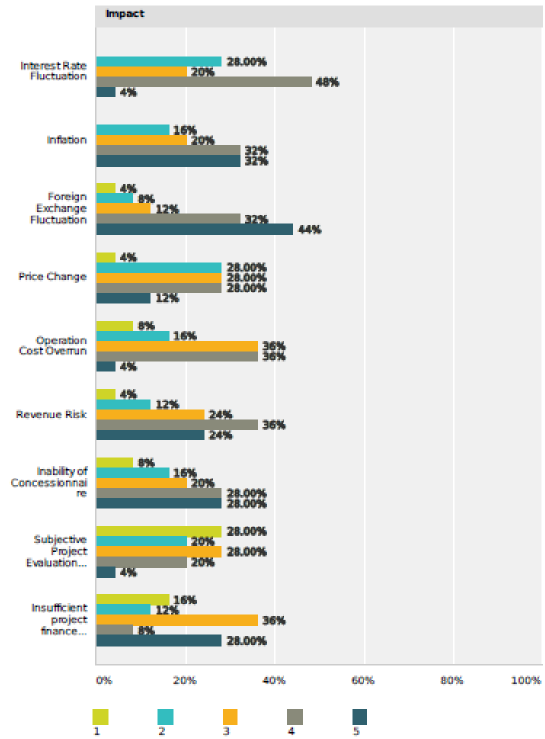


Figure 21: Risk Factor 1: Impact

Concerning the Impact of the above mentioned risk factors from the point of view of the respondents, the respondents' answers were that the Interest rate fluctuation and the foreign exchange fluctuation will have a significant or catastrophic impact on the project. This is normal and true in light of the actual conditions in the country. The same applies for the inflation risk where 64 % of the respondents chose that it will have a great effect on the PPP project. Also, 56 % of the respondents mentioned that the financial inability of the concessionaire can seriously affect the project. 60 % of the respondents' choices were that the risk that the project does not realize the necessary revenue can drastically have an impact on the project. The insufficient project finance supervision in addition to the subjective project evaluation method both have a moderate impact on the project. Concerning the Operations cost overrun risk, it has moderate to significant effect on the project.

4.2.1.3 Risk Allocation

Party's risk				
Answer Options	Private's Risk	Public's Risk	Both	Response Count
Interest Rate Fluctuation	8	3	14	25
Inflation	6	5	14	25
Foreign Exchange Fluctuation	9	4	12	25
Price Change	10	2	13	25
Operation Cost Overrun	19	0	6	25
Revenue Risk	9	6	10	25
Inability of Concessionaire	9	2	14	25
Subjective Project Evaluation Method	6	3	16	25
Insufficient project finance supervision	11	1	13	25

Table 20: Risk Factor 1: Risk Allocation

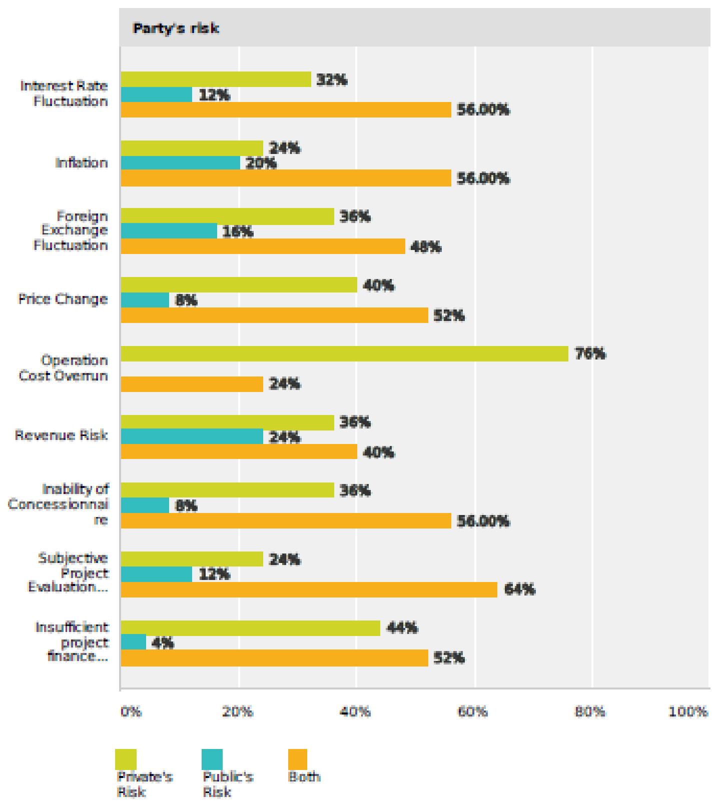


Figure 22: Risk Factor 1: Risk Allocation

The survey respondents allocated the interest rate fluctuation risk, the inflation risk, price change risk, inability of concessionaire risk, subjective project evaluation method and the insufficient project finance supervision risks to both the private and public parties. 76 % of the respondents chose that the Operations cost overrun risk will be allocated to the private party while for foreign exchange fluctuation and the revenue risk, neither choices (private, public or both) exceeded 50 % of the respondents and accordingly, it is assumed that in this case, the allocation of this specific risk will be dependent on the project.

4.2.2 Factor 2: Commercial and Market Environmental Risks

10- Market Competition
11- Supply and Demand
12- Change in Market Demand
13- Public Credit

4.2.2.1 Probability

Probability						
Answer Options	1	2	3	4	5	Response Count
Market Competition	4	9	8	3	1	25
Supply and demand	2	7	9	6	1	25
Change in market demand	5	9	6	3	2	25
Public credit	2	4	9	6	4	25

Table 21: Risk Factor 2: Probability

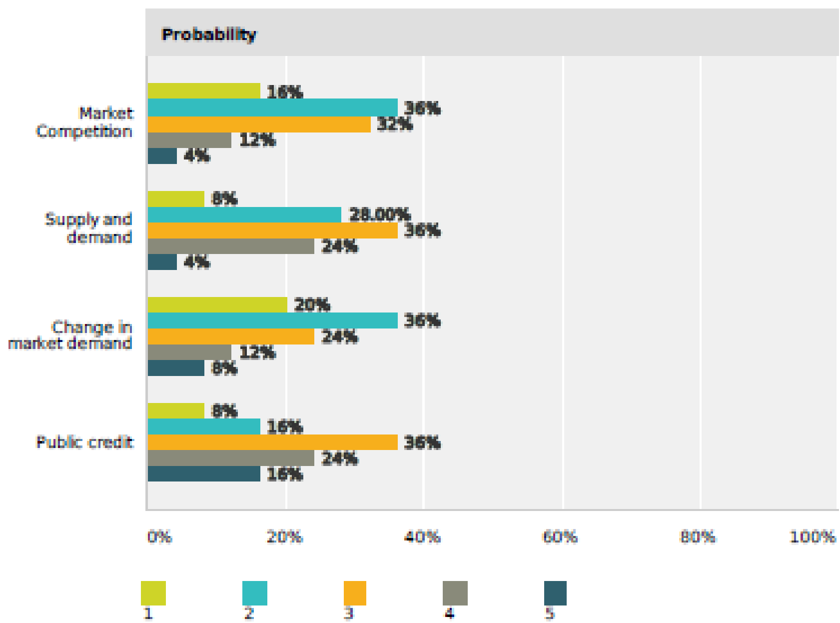


Figure 23: Risk Factor 2: Probability

As illustrated in the above table and figure, the supply and demand risks as well as the public credit risk are likely to occur with a percentage of 36 % each. The market competition and the change in market demand are less likely to occur with the same percentage (36 %) each.

4.2.2.2 Impact

Impact						
Answer Options	1	2	3	4	5	Response Count
Market Competition	1	9	7	7	1	25
Supply and demand	1	8	5	8	3	25
Change in market demand	1	6	6	8	4	25
Public credit	1	2	9	6	7	25

Table 22: Risk Factor 2: Impact

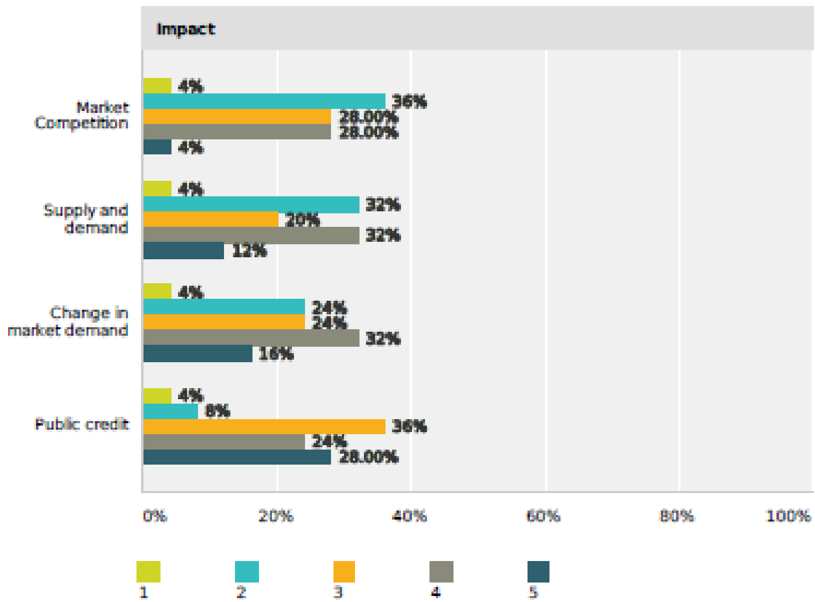


Figure 24: Risk Factor 2: Impact

From the above table and figure, it is found that 52% of the respondents chose that the public credit risk has a high impact on the project. Also, 48 % of the respondents assessed a significant to catastrophic impact on the project due the change in market demand. While for the market competition and the supply and demand risks, they will have a slight to moderate impact on the project.

4.2.2.3 Risk Allocation

Party's Risk				
Answer Options	Private's Risk	Public's Risk	Both	Response Count
Market Competition	9	3	13	25
Supply and demand	6	4	15	25
Change in market demand	3	6	16	25
Public credit	5	7	13	25

Table 23: Risk Factor 2: Risk Allocation

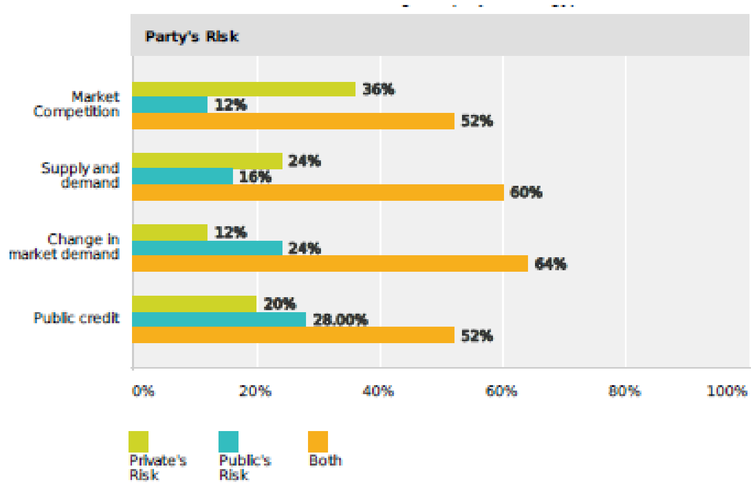


Figure 25: Risk Factor 2: Risk Allocation

Concerning the Risk Allocation, all risks included under this risk factor, i.e. Market competition risks, supply and demand risks, change in market demand risks and public credit risks were allocated to both the private and the public parties.

4.2.3 Factor 3: Legal Risks

14- Performance Security Risk
15- Permits Risk
16- Delay in Project Approvals/Permits
17- Legislation Changes
18- Dispute Resolution
19- Change in Tax Regulation
20- Government Policy

4.2.3.1 Probability

Probability						
Answer Options	**1**	**2**	**3**	**4**	**5**	**Response Count**
Performance Security Risk	4	13	3	2	3	25
Permits Risks	4	5	10	4	2	25
Delay in Project approvals/permits	5	4	7	9	0	25
Legislation changes	1	4	9	8	3	25
Dispute resolution	0	3	13	8	1	25
Change in tax regulation	1	3	9	10	2	25
Government policy	1	1	10	8	5	25

Table 24: Risk Factor 3: Probability

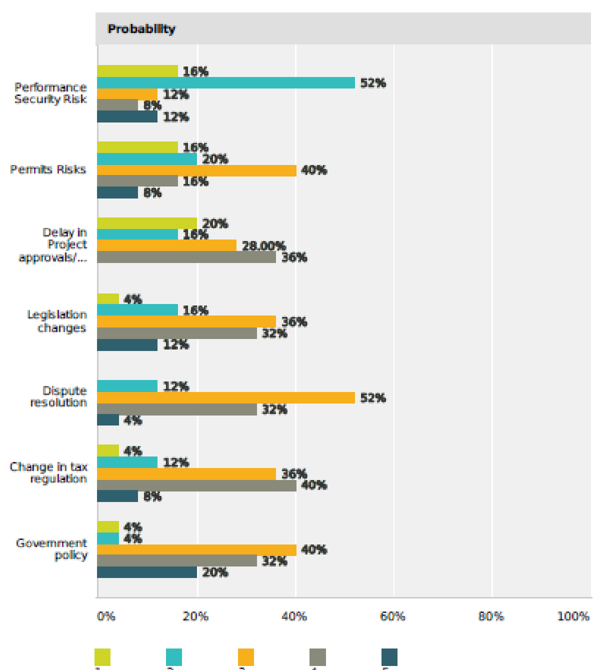


Figure 26: Risk Factor 3: Probability

According to the survey responses, 52 % of the respondents chose that the dispute resolution risk is likely to occur. 52 % of the respondents think that the government policy risk is very likely or almost certain to occur. Concerning the change in tax regulation risk, the percentage of respondents who think that this risk is likely to occur or very likely to occur are 36 % and 40 % respectively. The majority of the respondents (64 %) chose that the permits risk has a high probability of occurrence. Also, the delays in project approvals risk and legislation changes risk have a considerably high probability of occurrence which in the researcher's opinion is logical as the delays in the project's approval and the changes in laws can happen frequently during the project's lifetime. On the other hand, 52 % of the respondents allocated a low likelihood of occurrence to performance security risks.

4.2.3.2 Impact

Impact						
Answer Options	**1**	**2**	**3**	**4**	**5**	**Response Count**
Performance Security Risk	1	9	5	4	6	25
Permits Risks	2	1	9	9	4	25
Delay in Project approvals/permits	2	3	7	9	4	25
Legislation changes	2	1	5	10	7	25
Dispute resolution	0	1	6	15	3	25
Change in tax regulation	0	2	6	9	8	25
Government policy	0	2	5	11	7	25

Table 25: Risk Factor 3: Impact

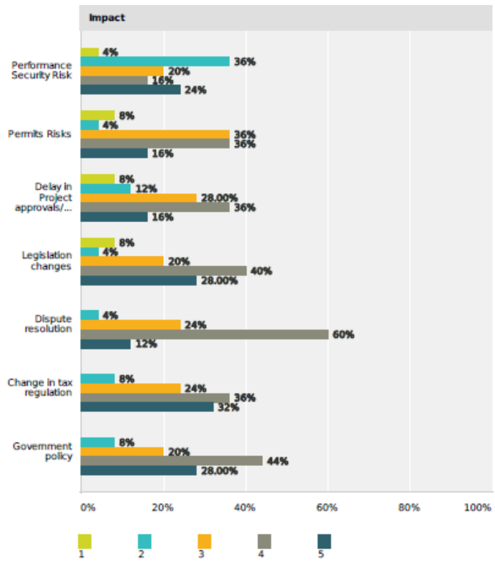


Figure 27: Risk Factor 3: Impact

Among all the risks under risk factor 3, 60 % of the experts determined that the dispute resolution risk can significantly affect the project's performance which in the researcher's opinion is perfectly logical. Also, 36 % of the respondents chose that there will be a considerable impact on the project due to the permits risks, the delay in project approvals and permits and the change in tax regulation risks. 68 % of the respondents think that the legislation changes can have a great effect on the project while 72 % of them think that the project will be greatly affected by the government policy risk. On the other hand, 40 % of the respondents think that the performance security risk will be slightly affecting the project's performance.

4.2.3.3 Risk Allocation

Party's risk				
Answer Options	**Private's Risk**	**Public's Risk**	**Both**	**Response Count**
Performance Security Risk	14	1	10	25
Permits Risks	5	2	18	25
Delay in Project approvals/permits	5	4	16	25
Legislation changes	8	5	12	25
Dispute resolution	7	0	18	25
Change in tax regulation	9	5	11	25
Government policy	6	4	15	25

Table 26: Risk Factor 3: Risk Allocation

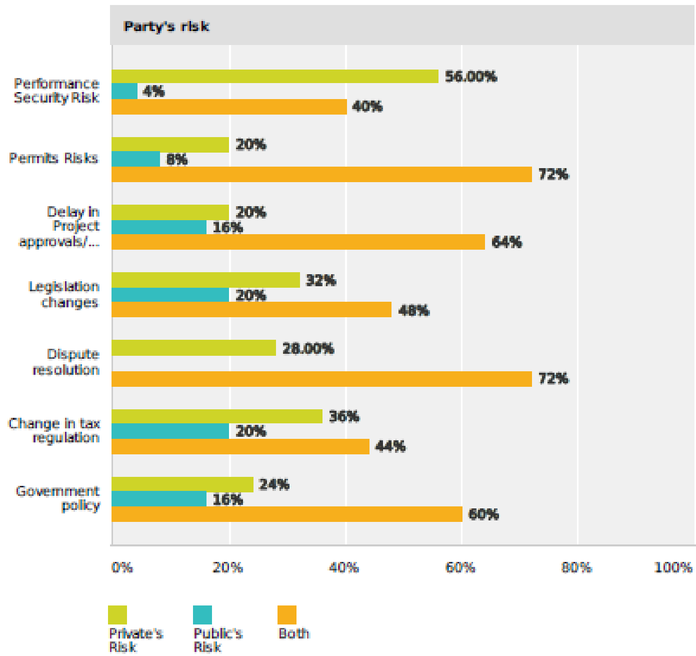


Figure 28: Risk Factor 3: Risk Allocation

The respondents chose that the permits risk, the delay in project's approvals and permits, the dispute resolution risks and the government policy risks should be allocated to both parties. 56 % of the respondents think that the performance security risk should be borne by the private party. Concerning the legislation changes and the change in tax regulation, they should be dependent on the project and should be allocated on individual project cases.

4.2.4 Factor 4: Political Risks

21- Political/Public Opposition
22- Swings in Public Opinion
23- Political Risk
24- Nationalization/Expropriation

4.2.4.1 Probability

Probability						
Answer Options	1	2	3	4	5	Response Count
Political/Public Opposition	3	3	7	5	7	25
Swings in public opinion	5	3	5	8	4	25
Political Risk	1	1	5	11	7	25
Nationalization/expropriation	5	5	6	5	4	25

Table 27: Risk Factor 4: Probability

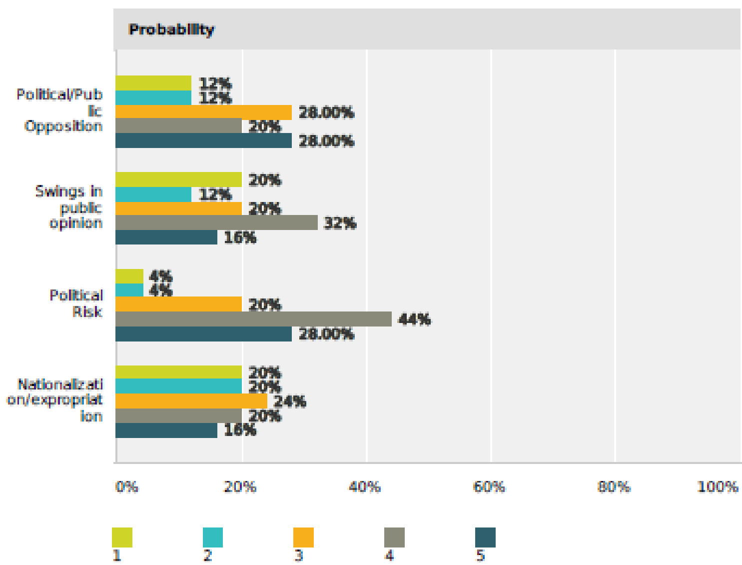


Figure 29: Risk Factor 4: Probability

Due to the actual political conditions in the country, 72 % of the survey respondents think that political risks are either very likely or almost certain to occur. 48 % of the respondents think that political and public opposition risks and swings in public opinion risks have a high likelihood of occurrence. 40 % of the respondents assigned a low probability to nationalization/expropriation risks.

4.2.4.2 Impact

Impact						
Answer Options	1	2	3	4	5	Response Count
Political/Public Opposition	1	1	7	5	11	25
Swings in public opinion	3	1	6	6	9	25
Political Risk	0	0	6	12	7	25
Nationalization/expropriation	0	4	4	5	12	25

Table 28: Risk Factor 4: Impact

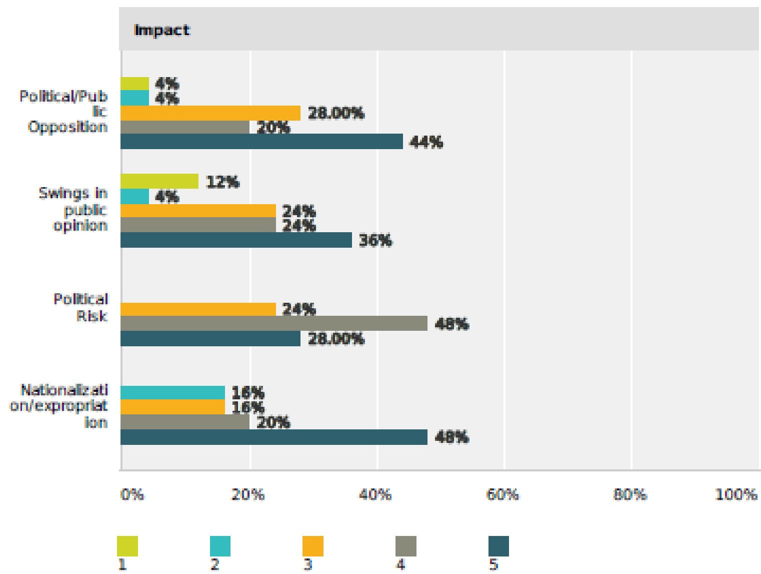


Figure 30: Risk Factor 4: Impact

Among the above mentioned risks, and according to the above table and the above figure, a large portion of the respondents (48%) determined that the nationalization/expropriation risks will have a catastrophic effect on the project. Also, the same percentage (48 %) chose that the political risks currently occurring in the country can significantly affect PPP projects in Egypt. Also, 64 % of the respondents think that the political/public opposition will have a huge impact on the project and 60 % of the respondents think of the same huge impact due to the swings in public opinion risk.

4.2.4.3 Risk Allocation

Party's Risk				
Answer Options	Private's risk	Public's risk	Both	Response Count
Political/Public Opposition	3	6	16	25
Swings in public opinion	5	4	16	25
Political Risk	7	2	16	25
Nationalization/expropriation	14	4	7	25

Table 29: Risk Factor 4: Risk Allocation

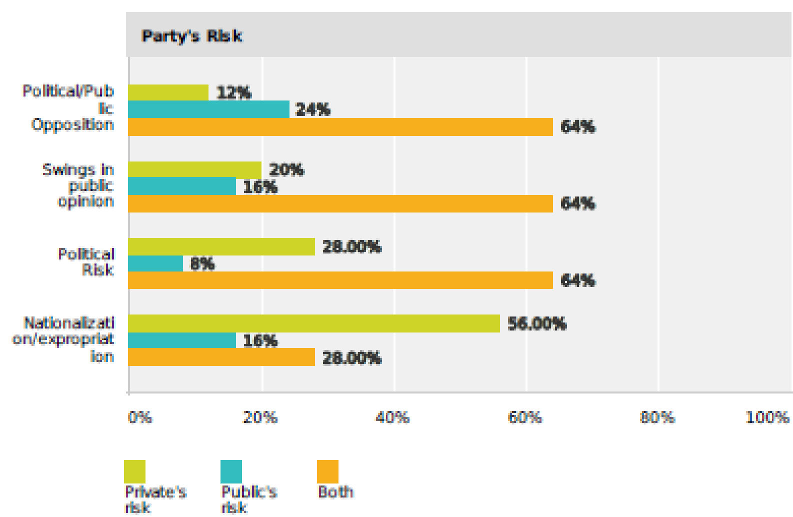


Figure 31: Risk Factor 4: Risk Allocation

The respondents chose that the political/public opposition risks, swings in public opinion risks and political risks should be borne by both the private and public partners in the PPP projects. On the other hand, 56 % of the respondents allocated the nationalization/expropriation risk to the private partner.

4.2.5 Factor 5: Regulatory Risks

25- Regulatory/Contractual Risk
26- Government Intervention

4.2.5.1 Probability

Probability						
Answer Options	1	2	3	4	5	Response Count
Regulatory/Contractual Risk	1	4	13	5	2	25
Government Intervention	2	1	15	5	2	25

Table 30: Factor 5: Probability

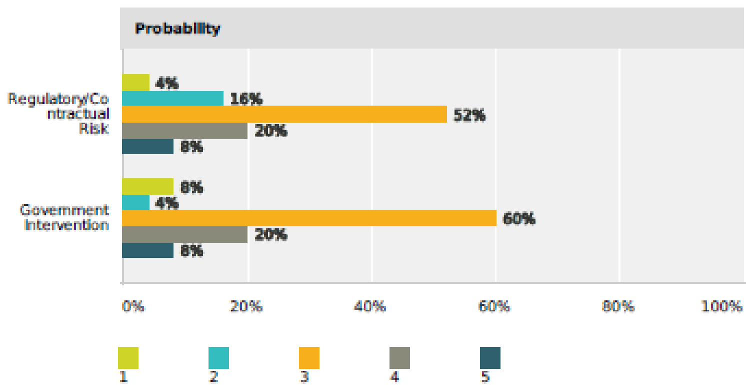


Figure 32: Risk Factor 5: Probability

Concerning the regulatory and Contractual risks and the government intervention risks, the respondents think that they are likely to occur with a percentage of 52 % and 60 % of the respondents respectively. For both risks, 28 % of the respondents only think that they are very likely or almost certain to occur.

4.2.5.2 Impact

Impact						
Answer Options	1	2	3	4	5	Response Count
Regulatory/Contractual Risk	1	4	8	6	6	25
Government Intervention	0	6	9	7	3	25

Table 31: Risk Factor 5: Impact

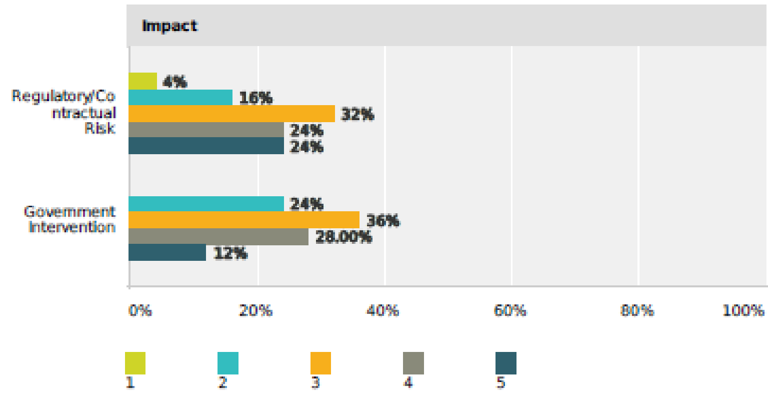


Figure 33: Risk Factor 5: Impact

Concerning the impact assigned by the survey respondents, for the regulatory/contractual risks, 32 % of the respondents think that it has a moderate impact, while 24 % think that it has a significant impact on the PPP project and 24 % think that it has a great impact on the project. The Government Intervention risk was chosen to have a moderate impact on the project by 36 % of the respondents, 24 % of the respondents chose this risk to be slightly affecting the project while no respondent mentioned that it has no serious influence on the project.

4.2.5.3 Risk Allocation

Party's risk				
Answer Options	Private's risk	Public's risk	Both	Response Count
Regulatory/Contractual Risk	11	2	12	25
Government Intervention	10	4	11	25

Table 32: Risk Factor 5: Risk Allocation

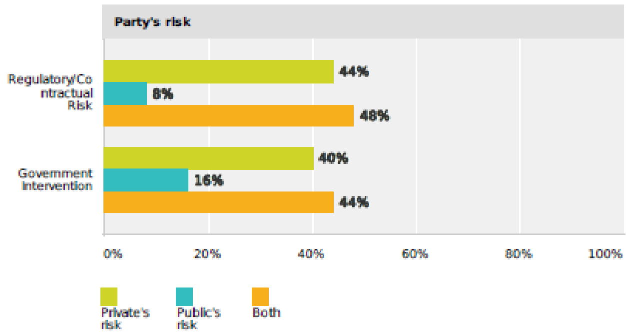


Figure 34: Risk Factor 5: Risk Allocation

Concerning the risk allocation for the above 2 risks, the percentage of respondents allocating the risk to either party never exceeded 50 % and accordingly, both risks will be allocated based on the specific project type.

4.2.6 Factor 6: Government Maturity Risks

27- Poor Public Decision Making Process
28- Government Corruption
29- Inadequate Law and Supervision System

4.2.6.1 Probability

Probability						
Answer Options	1	2	3	4	5	Response Count
Poor public decision making process	0	6	4	7	8	25
Government corruption	4	5	2	6	8	25
Inadequate law and supervision system	6	6	4	5	4	25

Table 33: Risk Factor 6: Probability

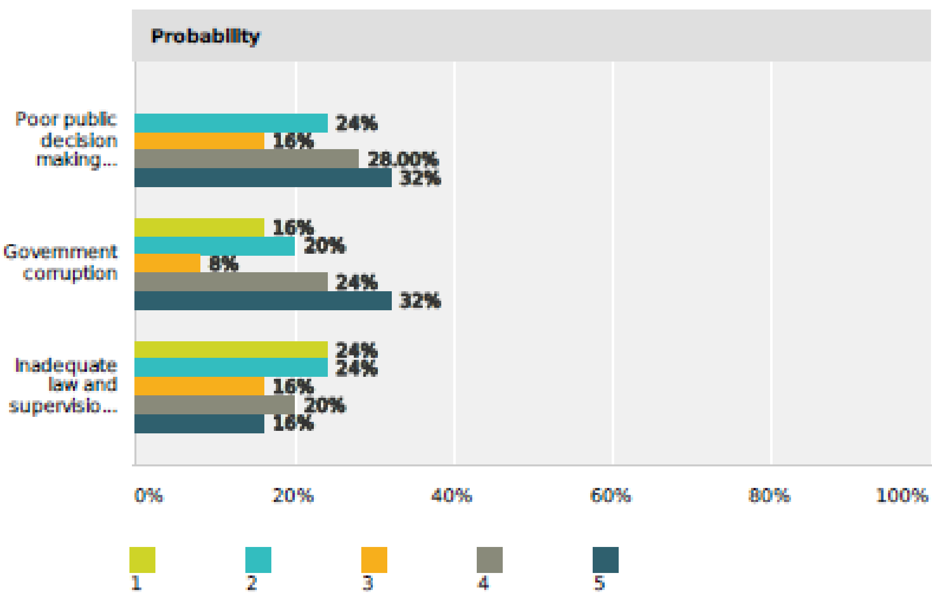


Figure 35: Risk Factor 6: Probability

Concerning the Government maturity risks, 60 % of the respondents assigned a high likelihood of occurrence to poor public decision making process and to government corruption risks. On the other hand, 48 % of the respondents' opinion was that the inadequate law and supervision system risks have a low probability of occurrence.

4.2.6.2 Impact

Impact						
Answer Options	1	2	3	4	5	Response Count
Poor public decision making process	0	3	4	10	8	25
Government corruption	1	2	8	6	8	25
Inadequate law and supervision system	1	5	5	9	5	25

Table 34: Risk Factor 6: Impact

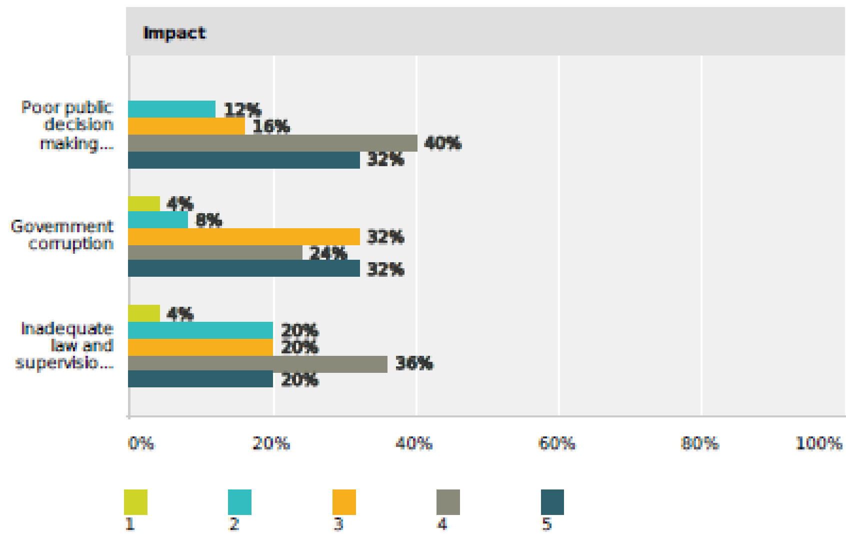


Figure 36: Risk Factor 6: Impact

Concerning the impact of the Government maturity risks, 72 % of the respondents chose to assign a high impact associated with poor public decision making process which, in their opinion, will have a tremendous impact on the PPP project. Also, the government corruption had a great negative impact on the PPP project as per 59 % of the respondents while for 56 % of the respondents, the inadequate law and supervision system could have drastic impacts on the project.

4.2.6.3 Risk Allocation

Party's risk				
Answer Options	Private's risk	Public's risk	Both	Response Count
Poor public decision making process	9	6	10	25
Government corruption	15	3	7	25
Inadequate law and supervision system	9	8	8	25

Table 35: Risk Factor 6: Risk Allocation

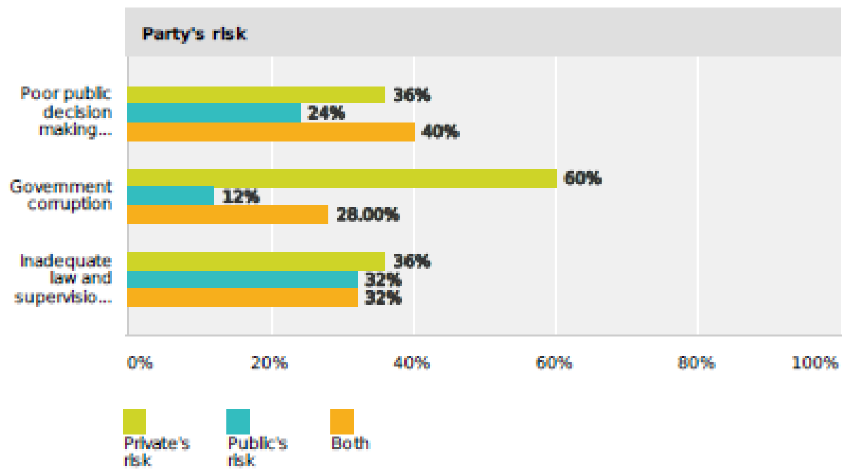


Figure 37: Risk Factor 6: Risk Allocation

In the risk allocation section for this particular risk factor, and according to the opinion of 60 % of the respondents, the government corruption risks will be borne by the private party. Meanwhile, the poor public decision making process and the inadequate law and supervision system risks will be allocated according to the project and therefore will be project dependent.

4.2.7 Factor 7: Technical Risks

30- Imperfect Contract Documents
31- Deficiency of Design
32- Quality Assurance
33- Quality Control
34- Latent Defect Risk
35- Lack of Supporting Infrastructure

4.2.7.1 Probability

Probability						
Answer Options	1	2	3	4	5	Response Count
Imperfect contract documents	6	8	7	2	2	25
Deficiency of design	8	8	5	4	0	25
Quality Assurance	3	13	5	4	0	25
Quality Control	2	11	8	4	0	25
Latent Defect Risk	2	14	7	1	1	25
Lack of supporting infrastructure	2	5	5	10	3	25

Table 36: Risk Factor 7: Probability

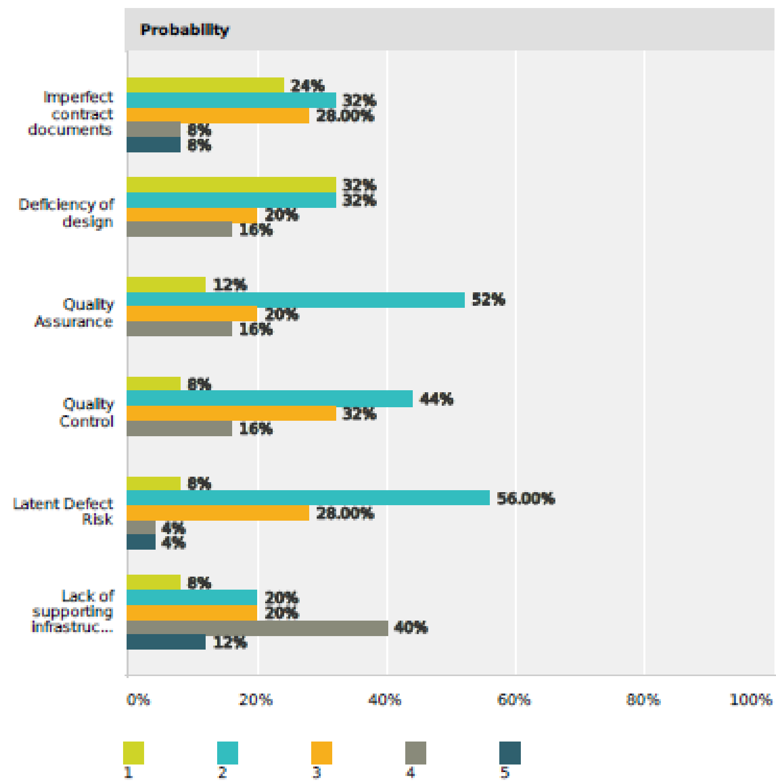


Figure 38: Risk Factor 7: Probability

There are several technical risks that can be associated with PPP projects and based on the survey responses, 40 % of the respondents chose that the risk of lack of supporting infrastructure is very likely to occur for PPP projects in Egypt. On the other hand, some risks, in the opinion of the majority of the respondents do not have a high probability such as the imperfect contract documents, deficiency of design, quality assurance, quality control and latent defect risks.

4.2.7.2 Impact

Impact						
Answer Options	**1**	**2**	**3**	**4**	**5**	**Response Count**
Imperfect contract documents	0	4	8	9	4	25
Deficiency of design	2	1	3	11	8	25
Quality Assurance	1	2	7	12	3	25
Quality Control	1	3	5	13	3	25
Latent Defect Risk	2	1	7	9	6	25
Lack of supporting infrastructure	1	0	3	11	10	25

Table 37: Risk Factor 7: Impact

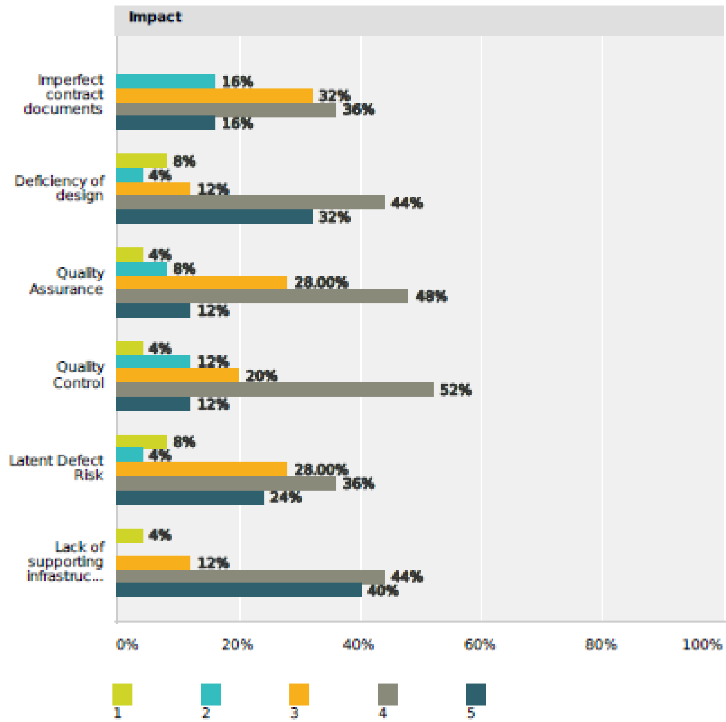


Figure 39: Risk Factor 7: Impact

In spite of previously assigning low probability to the risk of imperfect contract documents, deficiency of design, quality assurance, quality control and latent defect risks, in case of their occurrence, these risks will have significant impact on the PPP project. The lack of supporting infrastructure risk will have a great impact on the project in the opinion of 84 % of the respondents.

4.2.7.3 Risk Allocation

Party's risk				
Answer Options	Private's risk	Public's risk	Both	Response Count
Imperfect contract documents	5	4	16	25
Deficiency of design	8	3	14	25
Quality Assurance	9	2	14	25
Quality Control	8	2	15	25
Latent Defect Risk	13	0	12	25
Lack of supporting infrastructure	3	5	17	25

Table 38: Risk Factor 7: Risk Allocation

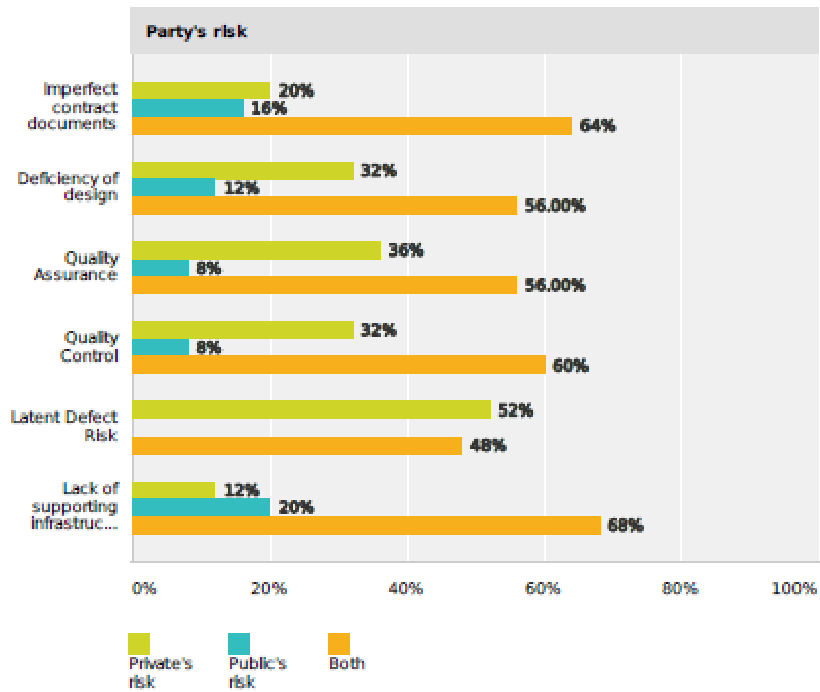


Figure 40: Risk Factor 7: Risk Allocation

The respondents allocated all the above mentioned risks to both parties together except one risk which is the latent defect risk which is borne by the private party in their opinion.

4.2.8 Factor 8: Construction and Operational Risks

36- Project/Operations Changes
37- Inability of Concessionaire
38- Provision of Transformers, Substations or backup power
39- Construction risk
40- Organization risk
41- Coordination risk
42- Land acquisition
43- Physical Obstacles that cannot be avoided
44- Maintenance risks
45- Access and Delivery of site
46- Connection of Public Utilities to boundaries of site
47- Connection to boundary of site of telephone lines and natural gas provision

4.2.8.1 Probability

Probability						
Answer Options	**1**	**2**	**3**	**4**	**5**	**Response Count**
Project/Operation changes	3	8	6	8	0	25
Inability of concessionaire	9	7	6	3	0	25
Provision of transformers, substations or backup power	4	12	6	3	0	25
Construction risk	2	11	9	2	1	25
Organization risk	6	6	10	3	0	25
Coordination risks	3	8	9	4	1	25
Land acquisition	9	6	9	1	0	25
Physical obstacles that cannot be avoided	6	11	7	0	1	25
Maintenance risks	3	6	10	4	2	25
Access and delivery of site	4	13	6	2	0	25
Connection of public utilities to boundaries of site	5	6	9	3	2	25
Connection to boundary of site of telephone lines and natural gas provision	5	8	6	4	2	25

Table 39: Risk Factor 8: Probability

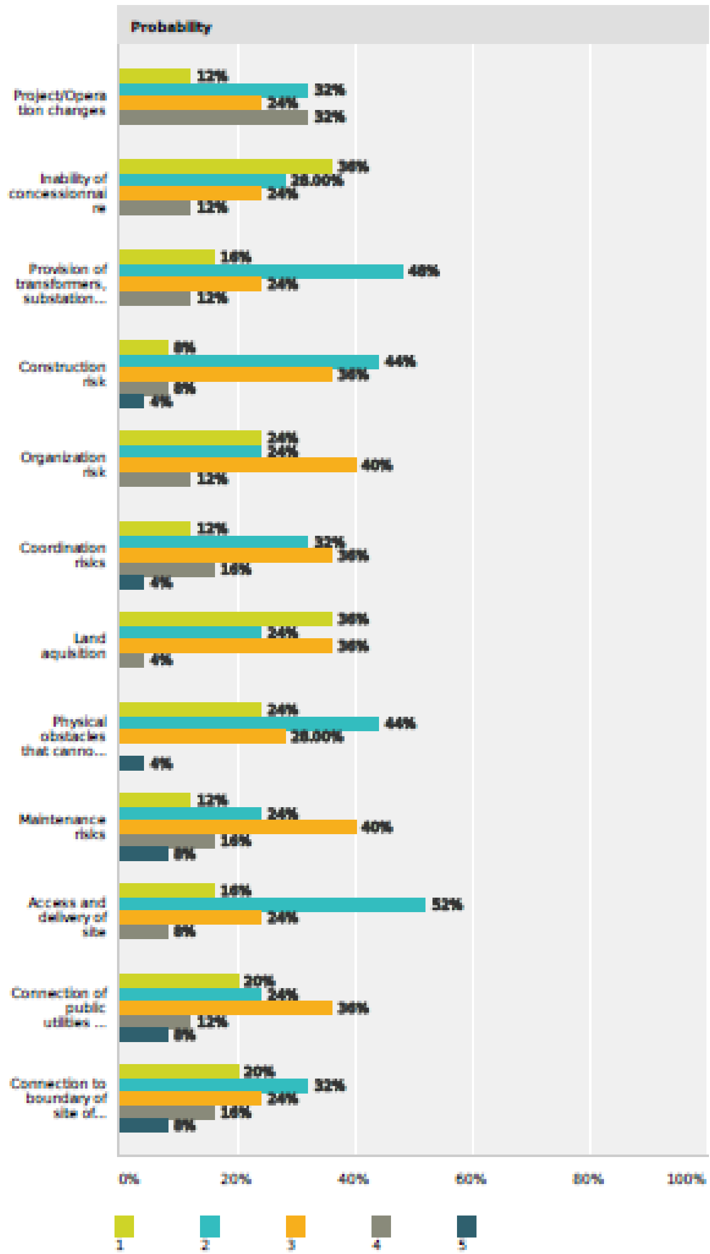


Figure 41: Risk Facto 8: Probability

Concerning the Construction and Operational risks, most of the respondents assigned a low likelihood of occurrence to Project/operations changes risks, the technical inability of the concessionaire, the risk of providing transformers, substations or backup power, any construction risk, land acquisition risks, the risks of the presence of physical obstacles that cannot be avoided, the risks associated with the access and delivery of site and the risks of connecting the telephone lines and natural gas to the boundaries of site. On the other hand, other risks have, in the opinion of the respondents a higher probability of occurrence such as the organization risks, coordination risks, maintenance risks and connections of public utilities to boundaries of the site.

4.2.8.2 Impact

Impact						
Answer Options	**1**	**2**	**3**	**4**	**5**	**Response Count**
Project/Operation changes	2	8	6	8	1	25
Inability of concessionaire	2	2	5	13	3	25
Provision of transformers, substations or backup power	1	5	6	8	5	25
Construction risk	2	3	9	7	4	25
Organization risk	2	3	13	5	2	25
Coordination risks	1	5	13	4	2	25
Land acquisition	2	0	8	9	6	25
Physical obstacles that cannot be avoided	1	3	8	7	6	25
Maintenance risks	2	7	8	5	3	25
Access and delivery of site	4	6	7	7	1	25
Connection of public utilities to boundaries of site	1	4	5	7	8	25
Connection to boundary of site of telephone lines and natural gas provision	3	3	7	8	4	25

Table 40: Risk Factor 8: Impact

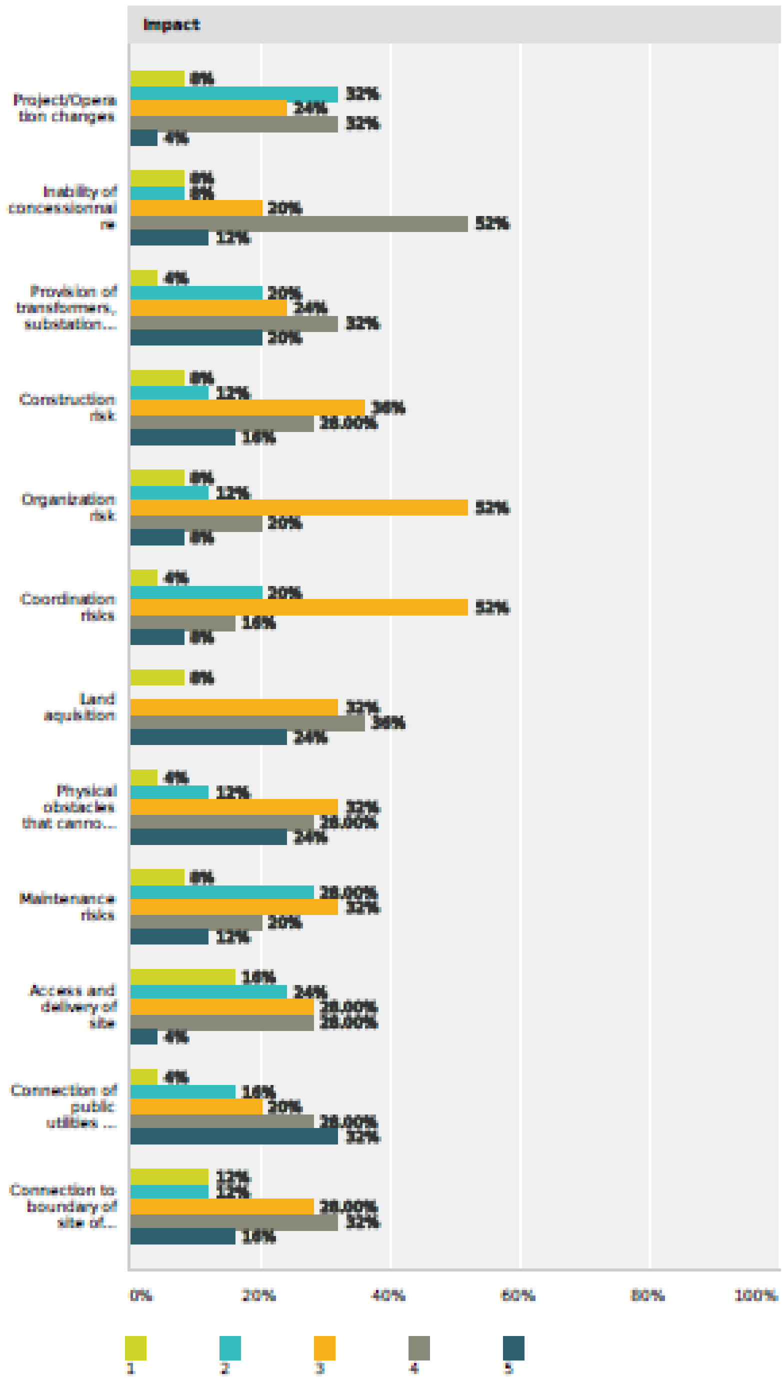


Figure 42: Risk Factor 8: Impact

According to the respondents' opinion, 52 % of the respondents think that the technical inability of the private party can lead to significant effects on the project. Also, the majority of the respondents chose that moderate impacts can affect the project due to organization risks, coordination risks, risks of providing transformers and backup power as well as construction risks.

4.2.8.3 Risk Allocation

Party's risk				
Answer Options	Private's risk	Public's risk	Both	Response Count
Project/Operation changes	13	2	10	25
Inability of concessionaire	8	2	15	25
Provision of transformers, substations or backup power	9	2	14	25
Construction risk	19	0	6	25
Organization risk	16	0	9	25
Coordination risks	11	1	13	25
Land acquisition	3	8	14	25
Physical obstacles that cannot be avoided	7	5	13	25
Maintenance risks	15	3	7	25
Access and delivery of site	8	5	12	25
Connection of public utilities to boundaries of site	5	9	11	25
Connection to boundary of site of telephone lines and natural gas provision	6	11	8	25

Table 41: Risk Factor 8: Risk Allocation

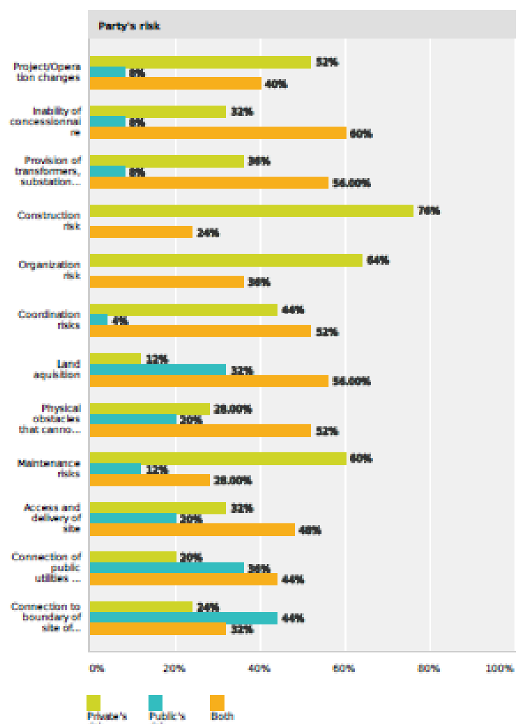


Figure 43: Risk Factor 8: Risk Allocation

In this risk factor group, the respondents allocated four risks to the private sector which are project/ operations changes risks, construction risks, organization risks and maintenance risks. On the other hand, the risks associated with the access and delivery of site, the connection of public utilities, telephone lines and natural gas to the boundaries of site will be allocated according to the project. Meanwhile, the technical inability of the private party, the provision of backup power risks, the coordination risks, land acquisition risks and the risks of the presence of physical obstacles that cannot be avoided will be borne by both parties in the opinion of the majority of the respondents.

4.2.9 Factor 9: Resources Risks

48- Labor unavailability
49- Material Shortage

4.2.9.1 Probability

Probability						
Answer Options	1	2	3	4	5	Response Count
Labor unavailability	8	8	6	2	1	25
Material shortage	1	13	7	4	0	25

Table 42: Risk Factor 9: Probability

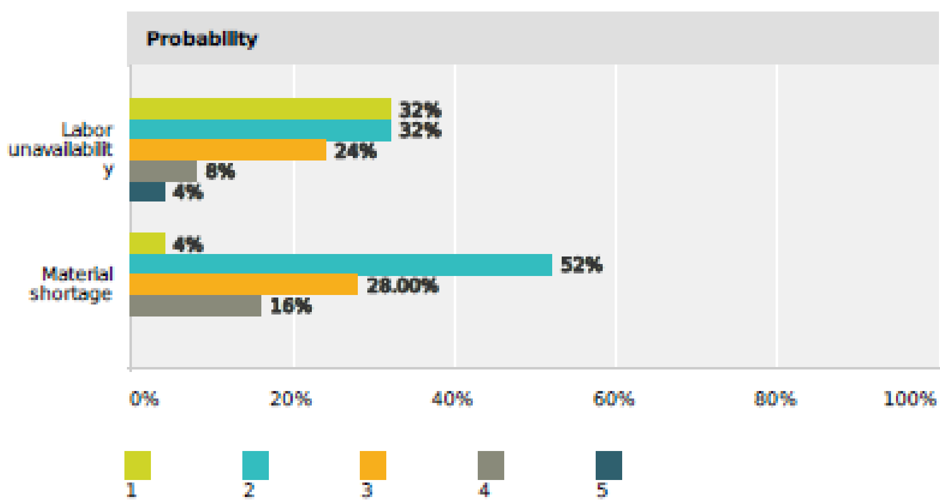


Figure 44: Risk Factor 9: Probability

The labor unavailability risk has a low probability of occurrence in the opinion of 64 % of the respondents. The same applies for the probability of the materials shortage risk which is unlikely to occur in the opinion of 52 % of the respondents.

4.2.9.2 Impact

Impact						
Answer Options	1	2	3	4	5	Response Count
Labor unavailability	3	1	13	7	1	25
Material shortage	2	3	8	11	1	25

Table 43: Risk Factor 9: Impact

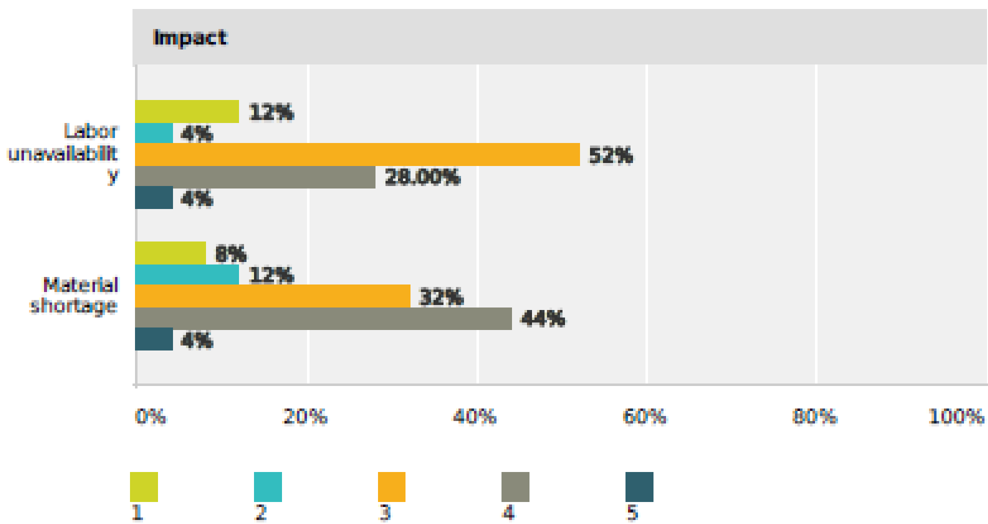


Figure 45: Risk Factor 9: Impact

The labor unavailability risk can moderately affect the project in the opinion of 52 % of the respondents while the material shortage can moderately affect the project in the opinion of only 32 % of the respondents. On the other hand, 48 % of the respondents think that the material shortage can significantly affect the PPP project.

4.2.9.3 Risk Allocation

Party's risk				
Answer Options	Private's risk	Public's risk	Both	Response Count
Labor unavailability	18	1	6	25
Material shortage	18	1	6	25

Table 44: Risk Factor 9: Risk Allocation

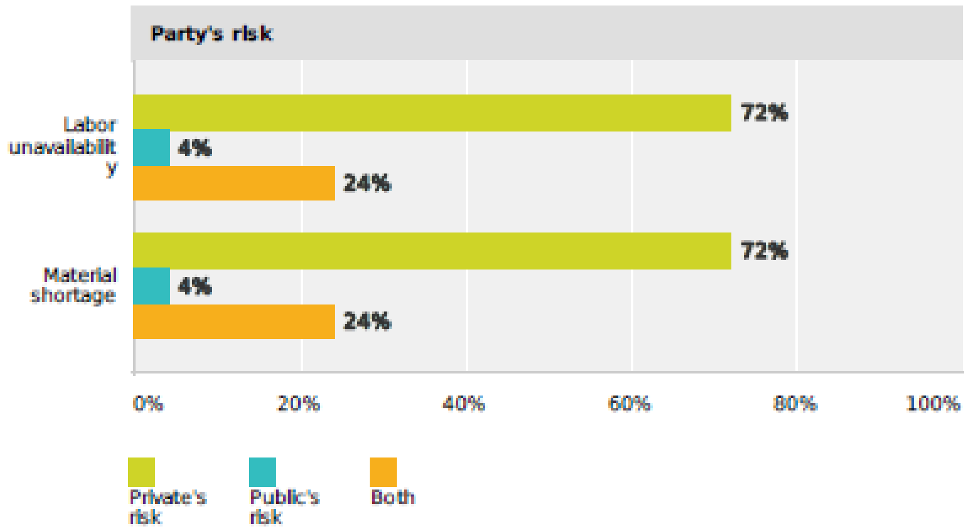


Figure 46: Risk Factor 9: Risk Allocation

72 % of the respondents assigned the risks of labor unavailability and the materials shortage to the private party.

4.2.10 Factor 10: Production Risks

50- Third Party Delay/Violation
51- Planning Risks
52- Supervision, Organization and Control for inspection of Construction works
53- Technological Risks
54- Completion Risks

4.2.10.1 Probability

Probability						
Answer Options	**1**	**2**	**3**	**4**	**5**	**Response Count**
Third Party delay/violation	2	6	12	4	1	25
Planning risks	3	6	11	4	1	25
Supervision, organization and control for inspection of construction works	2	10	11	1	1	25
Technological risks	3	12	7	3	0	25
Completion risks	2	8	5	7	3	25

Table 45: Risk Factor 10: Probability

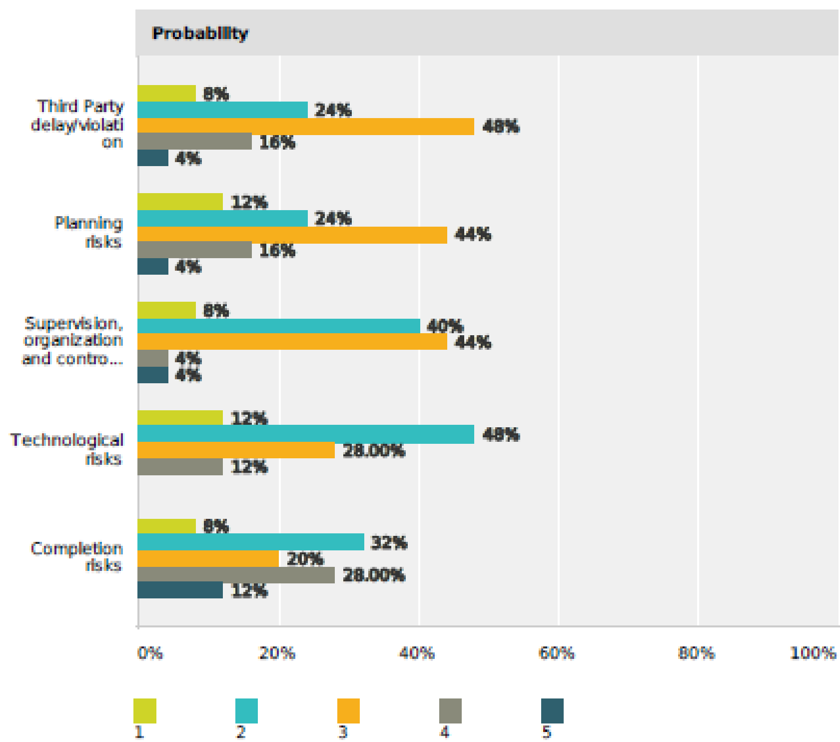


Figure 47: Risk Factor 10: Probability

According to the survey responses, third party delay/violation risks, planning risks, supervision, organization and control for inspection of construction works are likely to occur. Technological risks are less likely to occur in PPP projects while completion risks can occur with a high probability according to 40 % of the survey respondents.

4.2.10.2 Impact

Impact						
Answer Options	1	2	3	4	5	Response Count
Third Party delay/violation	0	7	11	5	2	25
Planning risks	0	6	11	6	2	25
Supervision, organization and control for inspection of construction works	0	4	14	5	2	25
Technological risks	2	6	10	5	2	25
Completion risks	0	3	6	9	7	25

Table 46: Risk Factor 10: Impact

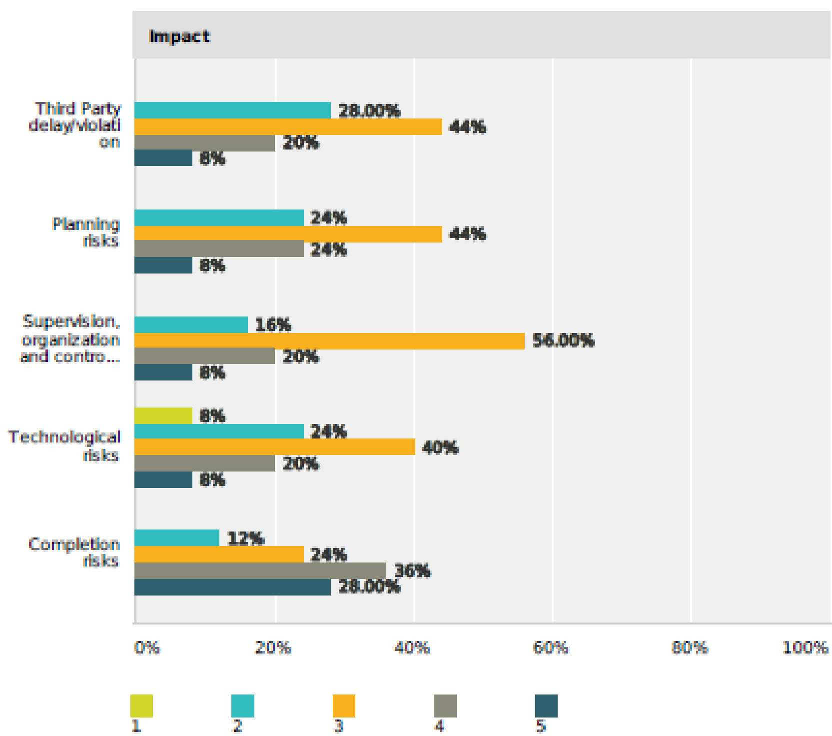


Figure 48: Risk Factor 10: Impact

According to 64 % of the survey respondents, completion risks can have significant effects on the PPP project. Supervision, organization and control for inspection of construction works risks, planning risks and third party violation risks have moderate effects on the PPP project.

4.2.10.3 Risk Allocation

Party's risk				
Answer Options	Private's risk	Public's risk	Both	Response Count
Third Party delay/violation	14	0	11	25
Planning risks	13	3	9	25
Supervision, organization and control for inspection of construction works	17	1	7	25
Technological risks	15	3	7	25
Completion risks	12	1	12	25

Table 47: Risk Factor 10: Risk Allocation

Figure 49: Risk Factor 10: Risk Allocation

According to the responses to the survey, the risks associated with third party delay/violation, planning risks, supervision, organization and control for inspection of construction works and technological risks will be borne by the private partner. The Completion risks will be allocated based on the project.

4.2.11 Factor 11: Environmental Risks

55- Sustainability Risk
56- Antiquities Risk

4.2.11.1 Probability

Probability						
Answer Options	1	2	3	4	5	Response Count
Sustainability risk	6	8	7	3	1	25
Antiquities risk	9	7	7	1	1	25

Table 48 : Risk Factor 11: Probability

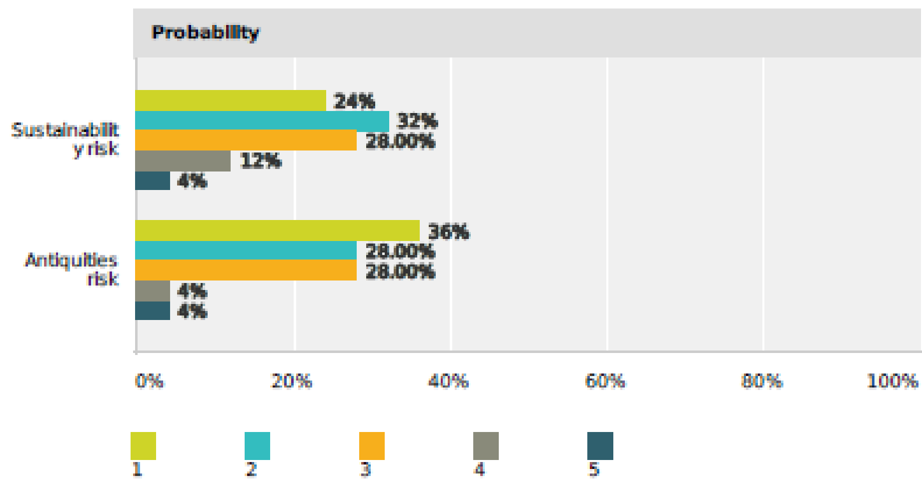


Figure 50: Risk Factor 11: Probability

Sustainability risks and antiquities risks are less likely to occur according to the majority of the survey respondents with a percentage of 56 % and 64 % respectively.

4.2.11.2 Impact

Impact						
Answer Options	1	2	3	4	5	Response Count
Sustainability risk	3	3	10	6	3	25
Antiquities risk	2	8	5	5	5	25

Table 49: Risk Factor 11: Impact

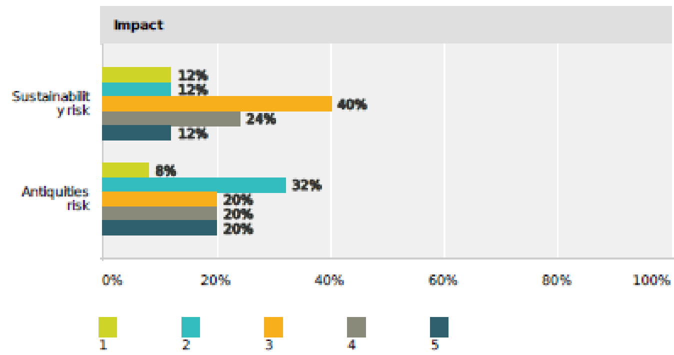


Figure 51: Risk Factor 11: Impact

Concerning the impact of the above mentioned risks, according to the opinion of the majority of the survey respondents, sustainability risks and antiquities risks will have slight to moderate effects on the project in case they occur.

4.2.11.3 Risk Allocation

Party's risk				
Answer Options	Private's risk	Public's risk	Both	Response Count
Sustainability risk	6	8	11	25
Antiquities risk	5	9	11	25

Table 50: Risk Factor 11: Risk Allocation

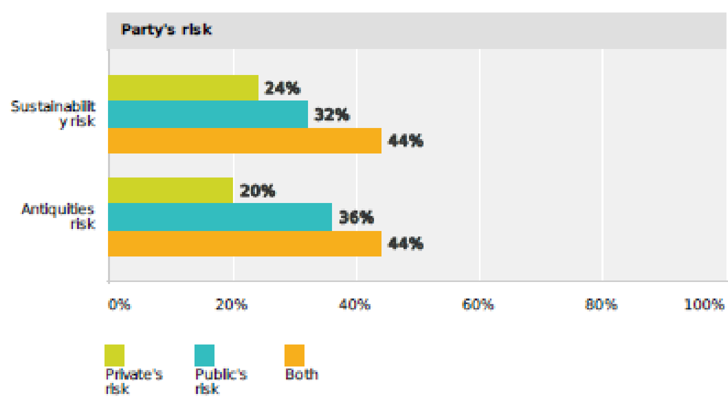


Figure 52: Risk Factor 11: Risk Allocation

According to the opinions of the respondents, the allocation of the sustainability risks and the antiquities risks will be dependent on the project.

4.2.12 Factor 12: Unforeseen Risks

57- Unforeseen Weather Conditions
58- Unforeseen Geotechnical Conditions
59- Force Majeure

4.2.12.1 Probability

Probability						
Answer Options	1	2	3	4	5	Response Count
unforeseen Weather conditions	13	5	6	1	0	25
unforeseen Geotechnical conditions	5	10	9	1	0	25
Force Majeure	2	7	8	7	1	25

Table 51: Risk Factor 12: Probability

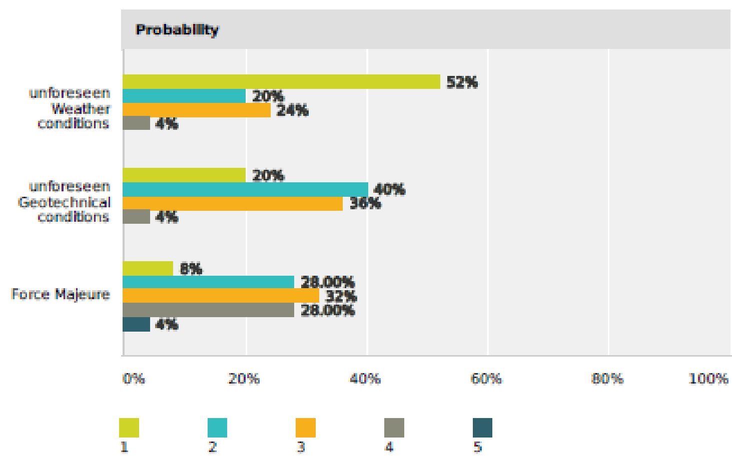


Figure 53: Risk Factor 12: Probability

According to the Egyptian climate, 52 % of the respondents assigned an almost impossible probability of occurrence to the unforeseen weather conditions. 60 % of the respondents assigned a low probability to unforeseen geotechnical conditions. On the other hand, 32 % of the respondents assigned a moderate probability to Force Majeure and 32 % of the respondents assigned a high probability to the same risk factor.

4.2.12.2 Impact

Impact						
Answer Options	1	2	3	4	5	Response Count
unforeseen Weather conditions	7	7	7	4	0	25
unforeseen Geotechnical conditions	1	5	8	9	2	25
Force Majeure	0	3	5	9	8	25

Table 52: Risk Factor 12: Impact

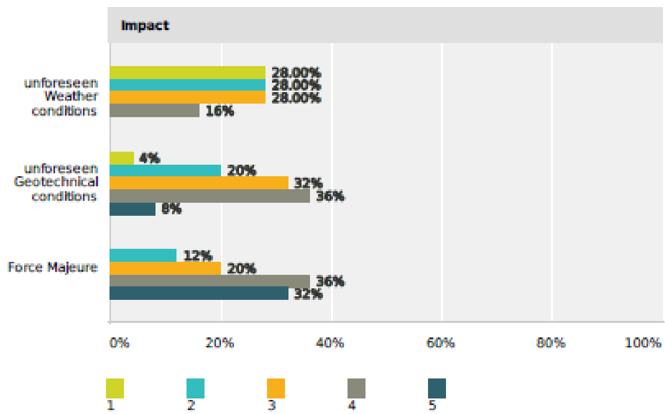


Figure 54: Risk Factor 12: Impact

68 % of the respondents determined that the Force Majeure risk will have a significant effect on the PPP project. 36 % of the respondents assigned a significant impact due to the risk of unforeseen geotechnical conditions while 56 % of the respondents assigned a slight impact on the project in case unforeseen weather conditions occur.

4.2.12.3 Risk Allocation

Party's risk				
Answer Options	Private's risk	Public's risk	Both	Response Count
unforeseen Weather conditions	14	1	10	25
unforeseen Geotechnical conditions	13	2	10	25
Force Majeure	5	0	20	25

Table 53: Risk Factor 12: Risk Allocation

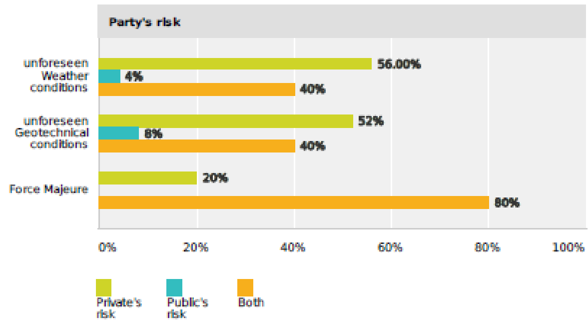


Figure 55: Risk Factor 12: Risk Allocation

The survey respondents determined that the unforeseen weather conditions and the unforeseen geotechnical conditions risks will both be borne by the private sector. On the other hand, the Force Majeure will be allocated to both parties.

4.2.13 Factor 13: Other Risks

60- Death or Bodily Injury
61- Safety Breaches

4.2.13.1 Probability

Probability						
Answer Options	1	2	3	4	5	Response Count
Death or Bodily Injury	0	0	1	0	0	1
Safety Breaches	0	0	0	1	0	1

Table 54: Risk Factor 13: Probability

Two new risk factors were added by one of the respondents. The first one being the death or bodily injury that can occur in the project with a moderate probability and the other one is safety breaches that can occur onsite with a high probability.

4.2.13.2 Impact

Impact						
Answer Options	1	2	3	4	5	Response Count
Death or Bodily Injury	0	0	0	0	1	1
Safety Breaches	0	0	0	1	0	1

Table 55: Risk Factor 13: Impact

According to the respondent's opinion, the risk of death or bodily injury on site has a catastrophic effect on the project while safety breaches can have serious effects on the project.

4.2.13.3 Risk Allocation

The respondent's opinion was that both risks should be borne by the private and public parties.

Chapter 5: Study of Actual PPP contracts

5.1 Risk Allocation according to the survey responses

Concerning the risk allocation analysis, as it is previously mentioned, it is calculated based on the “Majority Opinion”. In other words, if more than 50% of the survey respondents allocated a certain risk to the public party, then this risk will be allocated to the public party. The same applies if the majority of the respondents (more than 50 % of the respondents) choose to allocate a certain risk to the private party or whether they choose that this risk will be borne by both the private and public sector (Shared risk). In the case that for a certain risk, neither choice exceeds 50 %, then, in this case, it will be assumed that this specific risk will be allocated separately based on the project (“Project Dependent”) (Hwang et al., 2012).

Below is a summary for the risk allocation based on this concept applied on the survey results:

#	Risk Factor	Risk Allocation	Private (%)	Public (%)	Both (%)
Factor 1: Macroeconomic and Financial Risks					
1	Interest Rate Fluctuation	Both	32	12	56
2	Inflation	Both	24	20	56
3	Foreign exchange fluctuation	Project Dependent	36	16	48
4	Price Change	Both	40	8	52
5	Operation cost overrun	Private's risk	76	0	24
6	Revenue Risk	Project Dependent	36	24	40
7	Inability of concessionaire	Both	36	8	56
8	Subjective Project evaluation method	Both	24	12	64

9	Insufficient project finance supervision	Both	44	4	52
Factor 2: Commercial and Market Environmental Risks					
10	Market competition	Both	36	12	52
11	Supply and demand	Both	24	16	60
12	Change in Market demand	Both	12	24	64
13	Public Credit	Both	20	28	52
Factor 3: Legal Risks					
14	Performance Security Risk	Private	56	4	40
15	Permits Risks	Both	20	8	72
16	Delay in project approvals/permits	Both	20	16	64
17	Legislation changes	Project Dependent	32	20	48
18	Dispute resolution	Both	28	0	72
19	Change in tax regulation	Project Dependent	36	20	44
20	Government policy	Both	24	16	60
Factor 4: Political Risks					
21	Political/Public opposition	Both	12	24	64
22	Swings in Public Opinion	Both	20	16	64
23	Political Risk	Both	28	8	64
24	Nationalization/expropriation	Private	56	16	28
Factor 5: Regulatory Risks					
25	Regulatory/Contractual Risk	Project Dependent	44	8	48
26	Government Intervention	Project Dependent	40	16	44
Factor 6: Government Maturity Risks					
27	Poor public decision making process	Project Dependent	36	24	40
28	Government corruption	Private	60	12	28
29	Inadequate law and supervision system	Project Dependent	36	32	32
Factor 7: Technical Risks					
30	Imperfect contract documents	Both	20	16	64
31	Deficiency of design	Both	32	12	56
32	Quality Assurance	Both	36	8	56
33	Quality Control	Both	32	8	60
34	Latent Defect Risk	Private	52	0	48
35	Lack of supporting infrastructure	Both	12	20	68
Factor 8: Construction and Operational Risks					
36	Project/operation changes	Private	52	8	40
37	Inability of concessionaire	Both	32	8	60

38	Provision of transformers, substations or backup power	Both	38	8	56
39	Construction Risk	Private	76	0	24
40	Organization risk	Private	64	0	36
41	Coordination risks	Both	44	4	52
42	Land acquisition	Both	22	32	56
43	Physical Obstacles that cannot be avoided	Both	28	20	52
44	Maintenance Risks	Private	60	12	28
45	Access and delivery of site	Project Dependent	32	20	48
46	Connection of Public utilities to boundaries of site	Project Dependent	20	36	44
47	Connection to boundary of Site of telephone lines and natural gas provision	Project Dependent	24	44	32
Factor 9: Resources Risks					
48	Labor unavailability	Private	72	4	24
49	Material shortage	Private	72	4	24
Factor 10: Production Risks					
50	Third party delay/violation	Private	56	0	44
51	Planning risks	Private	52	12	36
52	Supervision, organization and control for inspection of Construction works	Private	68	4	28
53	Technological Risks	Private	60	12	28
54	Completion risk	Project Dependent	48	4	48
Factor 11: Environmental Risks					
55	Sustainability Risk	Project Dependent	24	32	44
56	Antiquities Risks	Project Dependent	20	36	44
Factor 12: Unforeseen Risks					
57	Unforeseen Weather conditions	Private	56	4	40
58	Unforeseen geotechnical conditions	Private	52	8	40
59	Force majeure	Both	20	0	80

Table 56: Risk Allocation based on survey analysis

5.2 Mapping Risk Factors with real case Contract Clauses

In order to make sure that the risk factors which are included in the questionnaire are applied and taken into account in actual PPP contracts, a mapping is performed between the risk factors included in the questionnaire and actual PPP contract clauses. The aim of this process is to determine how the risk factors included in the questionnaire are addressed in actual PPP contracts.

Also, the risk allocation obtained from the survey responses and which were presented in the previous section are compared to the allocation of the same risks to the parties in the actual contract(s) and accordingly, an interpretation is developed concerning which risk allocation is more beneficial according to each risk factor. The aim of this section is to compare between the views of the PPP risk allocation of the respondents and the actual allocation of risks in real contracts. In case of contradiction between the two views a wording is recommended to make sure that the clause is interpreted clearly to address the risk allocation.

The two contracts that are used for this study are:

1- New Cairo Wastewater treatment Plant
2- Alexandria University New Hospital Project

5.2.1 New Cairo Wastewater treatment Plant

Location: New Cairo

Contracting Authority: The New Urban Communities Authority (NUCA).

Project Status: Construction ended in 2012

Work description: Design, finance, construct, operate, maintain and transfer the waste water treatment plant whose capacity is 250, 000 m^3/day.

The Public entities in this project were:

- the Ministry of Housing (MHUUD),
- the Ministry of Investment (MoI) and
- The Ministry of Finance (MoF) and more specifically the PPP Central Unit.

The main consultant for the PPP Central unit was the International Finance Corporation (IFC).

The private partner was a joint venture between Orascom and Aqualia, a Spanish water company named "Orasqualia".

5.2.2 Alexandria University New Hospital Project

Location: Alexandria.

Contracting Authority: Alexandria University

Project Status: Construction will start on April 30th 2013

Work description: Design, Finance, Construct and Operate the hospital. (230 beds)

In the following table, the risk factors that are covered in the contracts are presented with an interpretation for each risk covered. The structure of the table is as follows: the first and second columns are for the sub-clause number corresponding to the risk factor in both PPP contracts. The third column contains the exact wording of the clauses in both contracts in addition to the risk allocation in case it is clearly stated in the contract. The interpretation section is to analyze the clause in both contracts and in order to compare the risk allocation of the contracts to the risk allocation obtained from the survey results.

Details	#	Risk Factor	Risk Allocation
Factor 1: Macroeconomic and Financial Risks			
1- Interest Rate Fluctuation			
Sub-Clause # in New Cairo Waste Water Treatment Plant Project	34.2	***Revision Request by NUCA:*** *NUCA may issue a Revision Request if any of the following Re-Equilibrium events occur: 1- Change in Law giving rise to an increase in the return on equity indicated in the financial model submitted by the Service Provider 2- Change in adopted international standards that giving rise to an increase in the return on equity indicated in the financial model submitted by the Service Provider.*	**-**
Sub-Clause # in Alexandria University New Hospital Project	-	-	-
Interpretation		In New Cairo Waste Water Treatment Plant Project, if there is a change in law or in international standards, then, a revision can be done to the Contract. However, this matter is not addressed in Alexandria University New Hospital Project. In the opinion of the survey respondents, the Interest Rate Fluctuation risk shall be borne by both parties. Although the Interest Rate Fluctuation is not stated explicitly in either contract, this risk can be covered by including it under the change in the adopted international standards.	**Both (based on Survey Results)**
2- Inflation			
Interpretation		There are no clauses in the contract clearly covering the inflation. In the light of the actual case in the country, the inflation risks should be covered under the contract. According to the survey results, this risk was allocated to both parties.	**Both (based on Survey Results)**
3- Foreign exchange fluctuation			

Sub-Clause # in New Cairo Waste Water Treatment Plant Project	34.1	***Revision Request by the Service Provider:*** *The Service Provider may issue a Revision Request if any of the following Re-Equilibrium events occur: Change in adopted international standards giving rise to a Material Adverse Effect, subject to approval by NUCA.*	**-**
Sub-Clause # in Alexandria University New Hospital Project	-	-	-
Interpretation		Similar to the Interest Rate Fluctuation Risk, the Foreign Exchange Fluctuation risk is not explicitly addressed in the Contracts. Moreover, according to the questionnaire results, the allocation of this risk will be dependent on the project conditions. As the PPP project is sometimes financed by foreign lenders, there may be different currencies. The Foreign Exchange Fluctuation can sometimes be dramatic which can increase the cost of the debt. Also, if the revenues of the project will be in a currency which is different from the currency of the debt, the lender will want to be compensated for any change in the exchange rate of the devalued currency. ("World Bank" 2013)	**Project Dependent (based on Survey Results)**
4- Price Change			
Interpretation		There were no specific clauses addressing the issue of price change in the contracts. This risk was allocated to both parties according to the survey results.	**Both (based on Survey Results)**
5- Operation cost overrun			
Interpretation		Both PPP contracts did not cover the operation cost overrun. This is considered as a deficiency in both contracts as there should be a clause in the contract concerning the Operation Cost Overrun in the project. For instance, in the case of power generation project, the increase of the cost of fuel can expose the project to the risk of Operation Cost overrun. Similarly, in the case of water treatment plant, any increase in the cost of power can expose the project to the same risk. Also, there may be increases in the costs attributed to wages due to inflation that may occur in workers' wages which can also seriously affect the project ("World Bank", 2013). Based on the Survey Results, this risk shall be borne by the Private Party.	**Private (Based on the Survey Results)**
6- Revenue Risk			
Sub-Clause # in New Cairo Waste Water	25.2 & 34	***25.2 Quarterly Payment Order*** *In the Event that the Plant is not capable of producing Effluent at its full capacity for reasons attributed to the Service Provider, NUCA shall issue a notice to the Service Provider within 2 Business Days from its knowledge of such*	**Private**

Treatment Plant Project		*event and shall give the Service Provider 60 days as cure period. In case the Service Provider does not remedy the event within such period, the Capacity Charge and Fixed Operating Charge components of STC paid to the Service Provider by NUCA starting from the date of issuance of NUCA's notice to the Service Provider in this concern shall be prorated to the volume of Effluent effectively produced by the Plant for a period not to exceed 3 month. After this period, if the capacity of the Plant is not restored to its full capacity, it shall be deemed as a Service Provider Event of Default.**34 Contract Re-Equilibrium** The Service Provider may issue a Revision Request if the Minimum Volumes and Strength have not been reached and/or the Maximum Volumes and Strength have been exceeded based on the average volume of Influent for a period of 3 consecutive months previous to the issuance of a Revision Request by the Service Provider. The basis for computation of compensation to either Party shall be to restore the Service Provider's return on equity to the same economic position as per the financial model submitted by the Service Provider.*	
Sub-Clause # in Alexandria University New Hospital Project	-	-	-
Interpretation		In the hospital project, the revenue risk was not addressed. The revenue risk is dependent on the type of the project. Therefore, the allocation of such risk should be dependent on the project. However, in New Cairo Waste Water Treatment Plant, the revenue risk was allocated to the Private Party since it is the Party responsible for the operation of the Plant and hence, responsible for generating its revenues.	**Project Dependent (based on Survey Results)**
7- Inability of concessionaire			
Sub-Clause # in New Cairo Waste Water Treatment Plant Project	27.3.1	***27.3.1 Service Provider Events of default:** the occurrence of a Service Provider Bankruptcy Event which does not result from either a NUCA Event of Default or a Force Majeure Event, if such breaches reach 26 weeks consecutively or 52 weeks interrupted, NUCA shall immediately send an Early Termination Notice for a Service Provider Event of Default.*	**Private**
Sub-Clause # in Alexandria University New Hospital	32.2 & 35.6	***32.2 Service Provider Events of default:** the occurrence of a Service Provider Bankruptcy Event which does not result from either a NUCA Event of Default or a Force Majeure Event, a notice shall be sent specifying the Event of Default. **35.6 Variations:** If the Service Provider fails to obtain financing for a Variation where Service Provider has used all reasonable endeavors to obtain such financing,*	**Private**

Project		*AU may choose to finance such Variation.*	
Interpretation		The financial inability of the private party should be borne only by the private party who is unable to finance the construction of the project. However, a sub-clause was added in the hospital project concerning financing the works resulting from a variation order. In case the private partner is unable to finance them, then the public partner shall bear such responsibility which is a notable point to take into consideration. However, this does not totally conform to the survey results which mentioned that this risk shall be always borne by both parties.	**Both (based on Survey Results)**
8- Subjective Project evaluation method			
Interpretation		This risk was not covered under the PPP contract. However, according to the survey results, the subjective project evaluation method should be borne by both parties. The Project shall be properly evaluated and studied in order to have the optimum risk allocation between parties.	**Both (based on Survey Results)**
9- Insufficient project finance supervision			
Interpretation		This risk was not covered under the PPP contracts as the proper and adequate finance supervision from the government's side is always assumed in the project. However, according to the survey results, this risk should be allocated to both parties.	**Both (based on Survey Results)**
Factor 2: Commercial and Market Environmental Risks			
10- Market competition			
Interpretation		There are no clauses in the contract related to the Market Competition risks because since the private partner has been awarded the project, it is assumed that there is not market competition. However, according to the survey results, this risk should be allocated to both parties.	**Both (based on Survey Results)**
11- Supply and demand			
Interpretation		The Supply and demand is usually not taken into account when drafting the PPP contract. However, according to the survey results, this risk should be allocated to both parties.	**Both (based on Survey Results)**
12- Change in Market demand			
Interpretation		The Change in Market demand is usually not taken into account when drafting the PPP contract. However, according to the survey results, this risk should be allocated to both parties.	**Both (based on Survey Results)**
13- Public Credit			

Interpretation		The public credit is usually not taken into account when drafting the PPP contract. However, according to the survey results, this risk should be allocated to both parties.	**Both (based on Survey Results)**
Factor 3: Legal Risks			
14- Performance Security Risk			
Sub-Clause # in New Cairo Waste Water Treatment Plant Project	20.3	*The Performance Security issued in the favor of NUCA from the Service Provider in the form of an unconditional and irrevocable bank guarantee issued by an Egyptian bank or a branch of an international bank registered with the Central Bank of Egypt guaranteeing the Service Provider's performance of its obligations under the Contract.* ***Performance Security Risk:*** *For the avoidance of doubt, if the Service Provider fails to deliver any subsequent Performance Security for the Operations Period and a Service Provider Event of Default shall be deemed to have occurred. In any event, NUCA shall only be entitled to liquidate the Performance Security, whether for the Construction Period or the Operations Period, upon the written approval of MoF.*	**Private**
Sub-Clause # in Alexandria University New Hospital Project	22	***Performance Security Risk:*** *For the avoidance of doubt, if the Service Provider fails to deliver any subsequent Performance Security to AU on time, AU shall be entitled to liquidate the current Performance Security and a Service Provider Event of Default shall be deemed to have occurred. AU shall also be entitled to draw on the full amount of the then valid Performance Security in the event that a Service Provider Event of Default has occurred. In any event, AU shall only be entitled to liquidate the Performance Security upon the written approval of MoF.*	**Private**
Interpretation		The risk allocation of the performance security to the private partner perfectly matches the survey results as the risk of the performance security should be solely borne by the private partner.	**Private (based on Survey Results)**
15- Permits Risks			
Sub-Clause # in New Cairo Waste Water Treatment Plant Project	9.2.2 & 15	***9.2.2 Conditions Precedent under NUCA's responsibility:*** *NUCA shall provide the Service Provider with approvals reflecting the rights of way for pipelines and roads between the Plant and the Waste Stabilization Ponds.* ***15 Building Approvals:*** *The Service Provider shall be responsible for obtaining the Building Approvals at its own expense and for providing all the necessary documents for the acquisition of such Building Approvals. NUCA shall not be responsible for any delay in the Service Provider acquisition of Building Approvals except for NUCA Building Approval unless the delay resulted from a default by the Service Provider.*	**Both**

Sub-Clause # in Alexandria University New Hospital Project	15	***Approvals and Building Permit:*** *1-AU shall obtain and maintain, at its own expense the AU Approvals. AU shall provide reasonable assistance to the Service Provider in obtaining the Building Permit. 2- The Service Provider shall obtain and maintain, at its own expense, all approvals necessary to perform the Construction Works and otherwise perform its obligations under this Contract. 3-The Service Provider shall, at its own expense, be responsible for preparing an application for a Building Permit (based upon the approved Working Drawings pursuant to Article 20) and for furnishing all necessary supporting documentation and approvals(except for the AU Approvals) including any environmental impact assessment that may berequired. AU shall not be responsible for any delay in acquiring any Building Permit if the delay is due to the incompleteness or inaccuracy of any Building Permit application or any supportingdocumentation furnished by the Service Provider. 4- If the Building Permit has not been issued within thirty (30) Days after a complete and accurate Building Permit application (together with all supporting documentation) was submitted by the Service Provider and for reasons notattributable to the Service Provider or any of its Related Parties, then AU shall be responsible for obtaining the Building Permit. In case of such failure by the Service Provider to obtain a Building Permit for the Site within such period of thirty (30) Days which prevents the Construction Works from proceeding, AU shall grant the Service Provider an equivalent period of extension for suchdelay and the Capital Value of SAP will be paid on time unless further extension of ScheduledServices Availability Date is attributed to the Service Provider.*	**Both**
Interpretation		The risk allocation obtained out of both Contracts is conforming to the survey results. In fact, the risk of obtaining the permits should be borne by both the Private and the Public partners. The Public partner in both cases will obtain the necessary approvals while the Private Partner will obtain the approvals necessary for the Construction and Building permits.	**Both (based on Survey Results)**
16- Delay in project approvals/permits			
Sub-Clause # in New Cairo Waste Water Treatment Plant Project	9.2.2, 9.2.4 & 15	***Conditions Precedent under NUCA's responsibility: 9.2.2*** *NUCA shall provide the Service Provider with approvals reflecting the rights of way for pipelines and roads between the Plant and the Waste Stabilization Ponds.**9.2.4*** *NUCA shall provide its approval or comments on the Final Design and the Sludge Strategy submitted by the Service Provider within 30 days of its receipt. In case of requested amendments, NUCA shall further review the Service Provider's proposed amendments to the Final Design and/or Sludge Strategy. Following the approval of the Final Design, NUCA shall issue NUCA Building Approval. NUCA's approval shall not be unreasonably withheld or delayed.**15 Building Approvals:*** *The Service Provider shall be responsible for obtaining the Building*	**Both**

		Approvals at its own expense and for providing all the necessary documents for the acquisition of such Building Approvals. NUCA shall not be responsible for any delay in the Service Provider acquisition of Building Approvals except for NUCA Building Approval unless the delay resulted from a default by the Service Provider.	
Sub-Clause # in Alexandria University New Hospital Project	15	***Approvals and Building Permit:*** *1-AU shall obtain and maintain, at its own expense the AU Approvals. AU shall provide reasonable assistance to the Service Provider in obtaining the Building Permit. 2- The Service Provider shall obtain and maintain, at its own expense, all approvals necessary to perform the Construction Works and otherwise perform its obligations under this Contract. 3-The Service Provider shall, at its own expense, be responsible for preparing an application for a Building Permit (based upon the approved Working Drawings pursuant to Article 20) and for furnishing all necessary supporting documentation and approvals(except for the AU Approvals) including any environmental impact assessment that may berequired. AU shall not be responsible for any delay in acquiring any Building Permit if the delay is due to the incompleteness or inaccuracy of any Building Permit application or any supportingdocumentation furnished by the Service Provider. 4- If the Building Permit has not been issued within thirty (30) Days after a complete and accurate Building Permit application (together with all supporting documentation) was submitted by the Service Provider and for reasons notattributable to the Service Provider or any of its Related Parties, then AU shall be responsible for obtaining the Building Permit. In case of such failure by the Service Provider to obtain a Building Permit for the Site within such period of thirty (30) Days which prevents the Construction Works from proceeding, AU shall grant the Service Provider an equivalent period of extension for suchdelay and the Capital Value of SAP will be paid on time unless further extension of ScheduledServices Availability Date is attributed to the Service Provider.*	**Both**
Interpretation		The risk allocation obtained out of both Contracts is conforming to the survey results. In fact, the risk of obtaining the permits should be borne by both the Private and the Public partners. The Public partner in both cases will obtain the necessary approvals while the Private Partner will obtain the approvals necessary for the Construction and Building permits. This is similar to the Permits risk.	**Both (based on Survey Results)**
17- Legislation changes			
Sub-Clause # in New Cairo Waste Water Treatment Plant	29	***Changes in Law:*** *1- The Service Provider shall notify NUCA of a Change in Law which has a Material Adverse Effect within 180 Business Days as from such change in Law. The Change in Law shall be deemed to have occurred, on the date of enactment of the executive regulations, in the case that such regulations are required to fully assess the effect of such Change in Law. In the event that the*	**Public**

Project		*Service Provider incurs any Losses due to such duly notified Change in Law, it shall be entitled to claim compensation for Losses as determined by the Parties within ten (10) Business Days from receipt of notification by NUCA of occurrence of such Change in Law. In case the Parties fail to reach a solution in relation thereof, the Service Provider shall refer the matter to the Partnership Committee. 2- In case it is established that the Losses incurred by the Service Provider were due to the Change in Law, NUCA shall compensate the Service Provider as determined by the Partnership Committee within 60 days from the date of the Partnership Committee's decision.*	
Sub-Clause # in Alexandria University New Hospital Project	34	***Changes in Law:*** *1- Either Party may issue a Revision Request to the other Party if a Change in Law occurs, which directly gives rise to an increase or decrease in the return on equity indicated in the financial model submitted by the Service Provider as per Article 5.1.7 exceeding half a percent (0.5%) of the Services Availability Payments for the relevant year after indexation in accordance with Annex 11. 2- The Parties shall meet within ten (10) Days of the date of such Revision Request and seek to agree the effect of the Change in Law. The basis for computation of any change to the Services Availability Payment shall be to restore the Service Provider's return on equity to the same economic position as per the financial model submitted by Service Provider pursuant to Article 5.1.7. If the Parties are unable to agree on the effects of the Change in Law within thirty (30) Days of their meeting, the Independent Financial Expert shall determine the required value and form of compensation as per Article 34.3. In the event of any Dispute as to the determination of the applicable compensation, value and form, the Dispute shall be referred to the Partnership Committee. 3- The form, amount and timing of compensation shall depend on the type and extent of the Loss suffered or saving incurred as a result of the Change in Law and may take the form of: adjustment to the Services Availability Payments; payment of a lump sum amount; any combination of the above; or any other measures, including changes to the Services. 4- Upon determining the compensation as provided above, AU and the Service Provider shall proceed diligently with the implementation of the compensation arrangements including but not limited to (i) obtaining any necessary approvals (including as the case may be approval from MoF as to the revised Services Availability Payment) and (ii) executing any amendments to the Contract or other legal documents as may be required or useful to reflect such amendments.*	**Public**
Interpretation		In the case of New Cairo Waste water treatment plant project, the private party has to be compensated by the public party. The public party will be the one to bear such risk. This is the case in Alexandria University new hospital project. The Change in Law is one of the risks that may have a huge impact on the project. According to the	**Project Dependent (based on Survey Results)**

		World Bank Guidelines, the Change in Law should be taken into account by the Private sector which conforms neither to the Survey results nor to the risk allocation of this risk in both contracts.	
18- Dispute resolution			
Sub-Clause # in New Cairo Waste Water Treatment Plant Project	37	***Dispute Settlement:*** *1- In the event that the Parties fail to reach an amicable solution to any Dispute within seven (7) Business Days from the notice of any party to the other of the occurrence of such Dispute, any of the Parties may refer the matter to the Partnership Committee which shall review and examine the Dispute and the proposed means of settlement. The Partnership Committee shall issue its decision within a period of 30 days from the date of the referral of the Dispute to it. 2- In the event the Partnership Committee fails to issue its decision, the Dispute shall be referred to the Chairman of NUCA and the Chairman of the Service Provider in order to settle the Dispute amicably. In the event that they are unable to settle the Dispute within 15 Business Days from the date of its referral, either Party may submit the Dispute to arbitration in accordance with the Cairo Regional Centre for International Commercial Arbitration (CRCICA).*	**Both**
Sub-Clause # in Alexandria University New Hospital Project	42	***Dispute Settlement:*** *1- In the event that the Parties fail to reach an amicable solution to any Dispute within ten (10) Days from the notice of any party to the other of the occurrence of such Dispute, any of the Parties may refer the matter to the Partnership Committee which shall review and examine the Dispute and the proposed means of settlement. The Partnership Committee shall issue its decision within a period of 30 days from the date of the referral of the Dispute to it. 2- In the event the Partnership Committee fails to issue its decision, the Dispute shall be referred to the Chairman of the Service Provider in order to settle the Dispute amicably. In the event that they are unable to settle the Dispute within 20 Business Days from the date of its referral, either Party may submit the Dispute to arbitration in accordance with the Cairo Regional Centre for International Commercial Arbitration (CRCICA).*	**Both**
Interpretation		Concerning the Dispute Settlement risk, according to both contracts and based on the survey results, this risk shall be borne by both parties which is realistic. When a dispute arises, both parties will be affected and hence, both parties shall bear such risk. This conforms to the survey results.	**Both (based on Survey Results)**
19- Change in tax regulation			
Sub-Clause # in New Cairo Waste Water	29	***Changes in Law:*** *1- The Service Provider shall notify NUCA of a Change in Law which has a Material Adverse Effect within 180 Business Days as from such change in Law. The Change in Law shall be deemed to have occurred, on the date of enactment of the*	**Public**

Treatment Plant Project		*executive regulations, in the case that such regulations are required to fully assess the effect of such Change in Law. In the event that the Service Provider incurs any Losses due to such duly notified Change in Law, it shall be entitled to claim compensation for Losses as determined by the Parties within ten (10) Business Days from receipt of notification by NUCA of occurrence of such Change in Law. In case theParties fail to reach a solution in relation thereof, the Service Provider shall refer the matter to the Partnership Committee. 2- In case it is established that the Losses incurred by the Service Provider were due to the Change in Law, NUCA shall compensate the Service Provider as determined by the Partnership Committee within 60 days from the date of the Partnership Committee's decision.*	
Sub-Clause # in Alexandria University New Hospital Project	34	***Changes in Law:*** *1- Either Party may issue Revision Request to the other Party if a Change in Law occurs, which directly gives rise to an increase or decrease in the return on equity indicated in the financial model submittedby the Service Provider as per Article 5.1.7 exceeding half a percent (0.5%) of the Services Availability Payments for the relevant year after indexation in accordance with Annex 11. 2- The Parties shall meet within ten (10) Days of the date of such Revision Request and seek to agree the effect of the Change in Law. The basis for computation of any change to the Services Availability Payment shall be to restore the Service Provider's return on equity to the same economic position as per the financial model submitted by Service Provider pursuant to Article 5.1.7. If the Parties are unable to agree on the effects of the Change in Law within thirty (30) Days of their meeting, the Independent Financial Expert shall determine the required value and form of compensation as per Article 34.3. In the event of anyDispute as to the determination of the applicable compensation, value and form, the Dispute shall be referred to thePartnership Committee. 3- The form, amount and timing of compensation shall depend on the type and extent of the Loss suffered or saving incurred as a result of the Change in Law and may take the form of: (a) adjustment to the Services Availability Payments; payment of a lump sum amount; any combination of the above; or any other measures, including changes to the Services. 4- Upon determining the compensation as provided above, AU and the Service Provider shall proceed diligently with the implementation of the compensation arrangements including but not limited to (i) obtaining any necessary approvals (including as the case may be approval from MoF as to the revised Services Availability Payment) and (ii) executing any amendments to the Contract or other legal documents as may be required or useful to reflect such amendments.*	**Both**
Interpretation		In the case of New Cairo Waste water treatment plant project, the private party has to be compensated by the public party. The public party will be the one to bear such risk. However, in the case of Alexandria University new hospital project, both parties will bear	**Project Dependent (based on Survey Results)**

		such risk and both parties shall collaborate in order to amend the contract due to any change in law that may happen. In fact, according to the opinion of the respondents in the survey, the allocation of this risk should be based on the project and should be taken individually (case by case).	
20- Government policy			
Interpretation		The Government policy and laws are not covered under the PPP contract. However, the poor government policy, as per the survey results should be allocated to both parties.	**Both (based on Survey Results)**
Factor 4: Political Risks			
21- Political/Public opposition			
Interpretation		The risks included under the political and public opposition are not covered under the contracts except if included under "Force Majeure" risks. According to the experts' opinions in the survey, the majority allocated this risk to both parties. This risk can be covered through private insurances. However, there should be a clause concerning the events of riots, civil disturbances, wars, etc.	**Both (based on Survey Results)**
22- Swings in Public Opinion			
Interpretation		The swings in public opinion risks are not included in the contract. According to the experts' opinions in the survey, the majority allocated this risk to both parties.	**Both (based on Survey Results)**
23- Political Risk			
Interpretation		The political risk is not covered under the contracts.	**Both (based on Survey Results)**
24- Nationalization/expropriation			
Sub-Clause # in New Cairo Waste Water Treatment Plant Project	27.2	***27.2 NUCA events of default:*** *Expropriation, requisition, confiscation or nationalization of the Plant or outstanding share capital of the Service Provider and/or the Service Provider Essential Rights, NUCA shall remedy the relevant Event of Default within 45 days following the day of the notice; otherwise, the Service Provider shall be entitled to send to NUCA and Early Termination Notice.*	**Public**
Sub-Clause # in Alexandria University New Hospital Project	32.1	***27.2 AU events of default:*** *Expropriation, requisition, confiscation or nationalization of the Hospital or any part of the Hospital or outstanding share capital of the Service Provider and/or the Service Provider Essential Rights, AU shall remedy the relevant Event of Default within 45 days following the day of the notice; otherwise, the Service Provider shall be entitled to send to NUCA and Early Termination Notice.*	**Public**
Interpretation		This risk is an instance where the survey results do not conform to the contracts' risk allocation where the nationalization and expropriation risk should be totally borne by the public partner and	**Private**

		the private partner should be properly compensated accordingly. According to the World Bank, in case of unilateral termination or in the case of expropriation, the Private Partner should be compensated by the Public Partner.	
Factor 5: Regulatory Risks			
25- Regulatory/Contractual Risk			
Sub-Clause # in New Cairo Waste Water Treatment Plant Project	13	***Relief from Responsibility:*** *The Service Provider shall not request to be relieved from any of its obligations under the Contract for reasons of the invalidity, inadequacy or inaccuracy of the Disclosed Data. However, the Service Provider is not denied the opportunity to present a suggestion to carry out the obligation affected by the invalidity, inadequacy or inaccuracy of the Disclosed Data subject to NUCA's approval.*	**Private**
Sub-Clause # in Alexandria University New Hospital Project	13.2	***Relief from Responsibility:*** *The Service Provider may not request to be relieved from any of its obligations under the Contract for reasons of the invalidity, inadequacy or inaccuracy of the Disclosed Data.*	**Private**
Interpretation		In both contracts, the private partner should bear the contractual risks present in the contract and should not be relieved of his responsibilities due to the inaccuracy of the data in the contract. However, the survey results did not deliver the same results as some respondents allocated this risk to the private partner, other to the public partner while a third portion allocated this risk to both parties.	**Project Dependent (based on Survey Results)**
26- Government Intervention			
Interpretation		The Government Intervention risk is not included in the contracts. According to the survey results, some respondents allocated this risk to the private partner, other to the public partner while a third portion allocated this risk to both parties	**Project Dependent (based on Survey Results)**
Factor 6: Government Maturity Risks			
27- Poor public decision making process			
Interpretation		The risks related to the government decisions are not usually covered under the PPP contracts. According to the survey results, some respondents allocated this risk to the private partner, other to the public partner while a third portion allocated this risk to both parties	**Project Dependent (based on Survey Results)**
28- Government corruption			
Interpretation		The risks related to the government decisions are not usually covered under the PPP contracts. The survey results determined that this risk will be allocated to the private party. However, there should be clauses in the Contract to cover events of government corruption	**Private (based on Survey Results)**

		such as bribery, etc.	
29- Inadequate law and supervision system			
Interpretation		The risks related to the government decisions are not usually covered under the PPP contracts. According to the survey results, some respondents allocated this risk to the private partner, other to the public partner while a third portion allocated this risk to both parties	**Project Dependent (based on Survey Results)**
Factor 7: Technical Risks			
30- Imperfect contract documents			
Sub-Clause # in New Cairo Waste Water Treatment Plant Project	13 & 14	***13- Relief from Responsibility:*** *The Service Provider shall not request to be relieved from any of its obligations under the Contract for reasons of the invalidity, inadequacy or inaccuracy of the Disclosed Data. However, the Service Provider is not denied the opportunity to present a suggestion to carry out the obligation affected by the invalidity, inadequacy or inaccuracy of the Disclosed Data subject to NUCA's approval.* ***14- Project Documents:*** *The Service Provider shall perform its obligation as provided for in the Project Documents and shall not terminate any of the Project Documents, or introduce any amendment to any part of it which may adversely affect the performance by the Service Provider of its obligations under the Contract, without the prior written consent of NUCA, which shall not be reasonably withheld or delayed.* **Private**	**Private**
Sub-Clause # in Alexandria University New Hospital Project	13.2 & 14	***13.2- Relief from Responsibility:*** *The Service Provider may not request to be relieved from any of its obligations under the Contract for reasons of the invalidity, inadequacy or inaccuracy of the Disclosed Data.* ***14 - Project Documents:*** *The Service Provider shall perform its obligation as provided for in the Project Documents and shall not terminate any of the Project Documents, or introduce any amendment to any part of it which may adversely affect the performance by the Service Provider of its obligations under the Contract, without the prior written consent of AU, which shall not be reasonably withheld or delayed.*	**Private**
Interpretation		In both contracts, the private partner should bear the contractual risks present in the contract and should not be relieved of his responsibilities due to the inaccuracy of the data in the contract. However, the survey results did not deliver the same results as some respondents allocated this risk to the private partner, other to the public partner while a third portion allocated this risk to both parties.	**Both (based on Survey Results)**
31- Deficiency of design			
Sub-Clause # in New Cairo Waste Water Treatment	20.2.2	***Responsibilities of the Service Provider:*** *The Service Provider shall be solely responsible for any deficiency in the design of the Plant (including the Final Design). The failure of NUCA to object to any design, drawing or specification (including the Final Design), or any change thereto, shall not be construed as a waiver by NUCA of any*	**Private**

Plant Project		*of its rights under this Contract or in any way relieve the Service Provider of its obligations hereunder. Further to the a foregoing, the Service Provider shall: a- accept no review conducted by NUCA with respect to the design of the Plant (including the Final Design) will relieve the Service Provider of any of its obligations under the Contract, and that NUCA undertakes no responsibility as to the quality of engineering or construction of the design of the Plant (including the Final Design), the Plant or any component thereof; b- in no way represent or imply to any third party that, as a result of any review by NUCA, NUCA is responsible for the engineering or construction soundness of the design of the Plant (including the Final Design), or any component thereof, and c- be solely responsible for the technical feasibility, operational capability and reliability of the design of the Plant (including the Final Design), and each component thereof.*	
Sub-Clause # in Alexandria University New Hospital Project	20.6.1	***Responsibilities of the Service Provider:*** *The Service Provider shall be solely responsible for any deficiency in the design of the Hospital (including the Design Documents). The failure of AU to object to any design, drawing or specification (including the Design Documents), or any change thereto, shall not be construed as a waiver by AU of any of its rights under this Contract or in any way relieve the Service Provider of its obligations hereunder.*	**Private**
Interpretation		In both contracts, it is clearly stated that the deficiency of design is the complete responsibility of the Private Partner and that the public partner is not responsible for any problem that may arise in the design. Since the private partner is contractually responsible for the design, therefore, any risk related to the design deficiency should be allocated and borne by him. However, according to the survey results, this risk shall be borne by both the public and the private partner. Accordingly, this risk is better allocated in both contracts and should not be borne by the private partner since it is the private partner's responsibility to perform the design and submit all the project's drawings based on the Good Industry Practice, Egyptian Law and relevant codes.	**Both (based on Survey Results)**
32- Quality Assurance			
Sub-Clause # in New Cairo Waste Water Treatment Plant Project	20.2.4 & 21.4	***20.2.4 Quality Assurance and Quality Control:*** *Prior to the commencement of any activities related to the Construction Works, the Service Provider shall establish the Quality Assurance System to cover construction, operation and Plant Laboratory testing, which shall be provided to NUCA.* ***21.4 Service Quality Assurance:*** *1- The Service Provider shall implement a Quality Assurance System in accordance with Good industry Practice. 2- The Service Provider shall comply with the Quality Assurance System from the date of its submission to NUCA. 3- The Service Provider shall deliver the last updated O & M Manual to NUCA.*	**Private**

Sub-Clause # in Alexandria University New Hospital Project	21.4	***Quality Assurance System:*** *1- Prior to the commencement of any activities related to the Construction Works, the Service Provider shall establish a Quality Assurance System to cover construction, operation and testing, a copy of which shall be provided to AU. 2- AU shall have the right upon a three (3) Days' notice to examine the Quality Assurance System to confirm that any item of the Construction Works complies with the requirements of the Contract, without interfering or hindering Construction Works. 3- If the Construction Works or any item thereof fails to conform in any material respect with the requirements of the Contract (including the Quality Assurance System), AU may give notice to the Service Provider of such failure. The Service Provider shall correct or start correcting the noncompliance as soon as possible but in any case within fifteen (15) Days of receipt of AU's notice.*	**Private**
Interpretation		In both contracts, the establishment of the Quality Assurance system is the sole responsibility of the private partner. However, the involvement of competent personnel from the public partner's side is important in order to ensure a good supervision system for the project. Accordingly, based on the survey results, the majority of the respondents allocated this risk to both the private and the public partners.	**Both (based on Survey Results)**
33- Quality Control			
Sub-Clause # in New Cairo Waste Water Treatment Plant Project	20.2.4	***Quality Assurance and Quality Control:*** *If the Construction Works or any item thereof fails to conform in any material respect with the requirements of the Contract (including the quality or safety requirements), NUCA, based on EWRA's recommendations, may give notice to the Service Provider of such failure. The Service Provider shall correct or materially start correcting the noncompliance as soon as possible but in any case within 15 days of receipt of NUCA's notice.*	**Private**
Sub-Clause # in Alexandria University New Hospital Project	25.2	***Performance monitoring system:*** *The Service Provider shall be responsible for monitoring its performance of this Contract during the Contract Duration, in the manner and at the frequencies required by this Contract and the Service Level specifications. The Service Provider shall establish a Performance Monitoring System which shall continuously monitor the delivery and quality of the Services and compliance with the Service Level Specifications and the other terms of the Contract. The Service Provider shall provide to AU relevant particulars of any aspects of its performance which fail to meet the requirements of this Contract. AU may at all reasonable times observe, inspect as to the adequacy of the monitoring procedures (including without limitation carrying out spot checks and appointing and independent third party to carry out*	**Both**

		monitoring). The Service Provider shall undertake a comparison between its inspection and audit results and that of AU or other monitoring parties to reduce discrepancies and differences in the evaluation of criteria and standard.	
Interpretation		In the New Cairo waste water treatment plant, the quality control is the sole responsibility of the Service Provider. However, in the hospital project, it is clearly stated that the Service Provider should monitor his own performance in the presence of a monitoring system by a third party appointed by the public partner. This complies with the survey results which allocated this risk to both parties.	**Both (based on Survey Results)**
34- Latent Defect Risk			
Sub-Clause # in New Cairo Waste Water Treatment Plant Project	20.2.2 & 20.2.9 (b)	***20.2.2 Responsibilities of the Service Provider:*** *The Service Provider shall be solely responsible for any deficiency in the design of the Plant (including the Final Design). The failure of NUCA to object to any design, drawing or specification (including the Final Design), or any change thereto, shall not be construed as a waiver by NUCA of any of its rights under this Contract or in any way relieve the Service Provider of its obligations hereunder. Further to the foregoing, the Service Provider shall: a- accept no review conducted by NUCA with respect to the design of the Plant (including the Final Design) will relieve the Service Provider of any of its obligations under the Contract, and that NUCA undertakes no responsibility as to the quality of engineering or construction of the design of the Plant (including the Final Design), the Plant or any component thereof; b- in no way represent or imply to any third party that, as a result of any review by NUCA, NUCA is responsible for the engineering or construction soundness of the design of the Plant (including the Final Design), or any component thereof, and c- be solely responsible for the technical feasibility, operational capability and reliability of the design of the Plant (including the Final Design), and each component thereof.* ***20.2.9 (b)*** *The Service Provider shall not be relieved from any of its obligations or liabilities relating to any defects or delays in the design or the Construction Works*	**Private**
Sub-Clause # in Alexandria University New Hospital Project	20.6.1	***Responsibilities of the Service Provider:*** *The Service Provider shall be solely responsible for any deficiency in the design of the Hospital (including the Design Documents). The failure of AU to object to any design, drawing or specification (including the Design Documents), or any change thereto, shall not be construed as a waiver by AU of any of its rights under this Contract or in any way relieve the Service Provider of its obligations hereunder.*	**Private**
Interpretation		In this particular risk, the majority of the survey respondents allocated the latent defect risk to the private party which applies to both contracts discussed as the private partner is the one responsible for the design.	**Private (based on Survey Results)**
35- Lack of supporting infrastructure			

Sub-Clause # in New Cairo Waste Water Treatment Plant Project	11.2.3 & 31.1	***NUCA Warranties:*** *NUCA warrants that the cables, piping and conduits located on the Site on the Date of Signature are in a status allowing the Service Provider to perform its obligations under the Contract. In case the above representation is found to be incorrect, NUCA shall compensate the Service Provider for all the properly justified costs incurred by the Service Provider to fix such cables, piping or conduits and time extension if so required, as shall be determined by the Performance Monitoring Committee.* ***31.1 Compensation Events*** *During the Construction period, in case of an electricity cut-off affecting the Plant Operation and resulting in cost of fuel for electric generator and in case of any failure of the Influent Pipeline System having a Material Adverse Effect, NUCA shall compensate the Service Provider.*	**Public**
Sub-Clause # in Alexandria University New Hospital Project	**-**	**-**	**-**
Interpretation		In the hospital project, the lack of supporting infrastructure risk was not mentioned although this is an important risk to take into account. In fact, allocating this risk to both risks is better than allocating it to the public partner as the private partner may have optimized design solutions for the project to have the least impact on the project due to the deficiency of the existing infrastructure.	**Both (based on Survey Results)**
Factor 8: Construction and Operational Risks			
36- Project/operation changes			
Sub-Clause # in New Cairo Waste Water Treatment Plant Project	9.1.11 & 30.2	***9.1.11 Conditions precedent under the Service Provider's responsibility:*** *The Service Provider shall provide a repair and replacement plan in which the Service Provider shall outline its overall approach and responsibilities in performing repairs and replacements, including major repairs and refurbishments for the Plant.****30.2 Changes at the request of NUCA:*** *NUCA shall be entitled to request the Service Provider to undertake any changes, which the Service Provider shall undertake at NUCA's expense.*	**Both**
Sub-Clause # in Alexandria University New Hospital Project	35	***35 Variations:*** *If the Service Provider fails to obtain financing for a Variation where Service Provider has used all reasonable endeavors to obtain such financing, AU may choose to finance such Variation.*	**Both**
Interpretation		It is more reasonable to allocate the variations to both partners because the changes can be initiated by the private partner who is the project designer or by the public partner. Also, in the hospital project,	**Private (based on Survey Results)**

		it is mentioned that the public partner can finance the variation if the Service Provider fails in obtaining finance to it which is a reasonable point to take into consideration.	
37- Inability of concessionaire			
Interpretation		In spite of the fact that this risk is not addressed in the contracts discussed, the Civil code discussed this risk in article 650, mentioning that: *"If during the performance of the work it is established that the contractor is performing the work in a faulty manner or contrary to the contract, the employer may call on him to rectify the manner of performance within a reasonable period he fixes for him. If the period expires and the contractor fails to adopt the proper manner of work, the employer may either request rescission of the contract or handing over the work to another contractor for its completion at the first contractor's expense. The employer may request immediate rescission of the contract without granting a period (for rectification) if rectification of the faulty manner of performance is impossible."* Accordingly, the technical inability of the private party shall be borne by them. This is different from the survey responses which allocated this risk to both parties. However, this risk should be borne by the private party only as this is the party responsible for construction works.	**Both (based on Survey Results)**
38- Provision of transformers, substations or backup power			
Sub-Clause # in New Cairo Waste Water Treatment Plant Project	20.4	***20.4.1 Obligations of NUCA*** *NUCA shall 3 months prior to the Scheduled Plant operation Date supply one electrical power source and 12 months prior to the Scheduled Plant Operation Date supply potable water to the Plant at the boundary of the Site at its sole risk and expenses and shall pay on a quarterly basis on the same date of payment of the STC a Pass-Through Charge to the Service Provider to reimburse the Service Provider for the full cost of electricity consumption, up to the Maximum Electricity Consumption.* ***20.4.2 Obligations of the Service Provider*** *The Service Provider shall be responsible, at its sole risks and expenses, for the connection charges and the construction, operation and maintenance of any required electrical transformers, electrical substations or backup power. The Service Provider shall install its transformers at least 3 months before the Scheduled Plant Operation Date.*	**Both**
Sub-Clause # in Alexandria University New Hospital Project	23.2.5	***Public Utilities:*** *The Service Provider shall be responsible at its sole risk and expense for the connection charges and construction operation and maintenance of any required electrical transformers, electrical substations or backup power;*	**Private**
Interpretation		This risk was conforming to the survey results in the New Cairo Waste water treatment plant project where the risk of providing transformers was shred between the private and public parties.	**Both (based on Survey Results)**

		However, in the hospital project, the provision of transformers as well as their operation and maintenance.	
39- Construction Risk			
Sub-Clause # in New Cairo Waste Water Treatment Plant Project	20.2.1 & 20.2.9 (b)	***Design and Construction:*** *The Service Provider shall, at his own cost and expense, design and construct the Plant in accordance with: 1- The Final Design approved by NUCA 2- The Technical Specifications and requirements 3- All relevant Egyptian design codes and standards and 4- Good Industry Practice.* ***20.2.9 (b)*** *The Service Provider shall not be relieved from any of its obligations or liabilities relating to any defects or delays in the design or the Construction Works*	**Private**
Sub-Clause # in Alexandria University New Hospital Project	21.3	***Implementation Requirements:*** *1- The Service Provider shall provide all the Implementation Requirements necessary to complete the Construction Works, to provide and install the Equipment and to perform the Services. As between the Parties, the ownership or possession of the Implementation Requirements shall remain with the Service Provider. 2- The Service Provider shall be liable for and shall bear all expenses related to any damage or loss that may arisefrom the use or presence of any Implementation Requirements on the Site. AU shall have the right to be reimbursed by the Service Provider for any Loss incurred by AU or any of its Representatives or Related Parties resulting from such use or presence of any Implementation Requirements on the Site. 3- The Service Provider guarantees that allImplementation Requirements used in the Construction Works to provide and install the Equipment and to perform the Services shall be in conformity with all Egyptian laws, or any relevant codes in force at the relevant time and, in particular, those relating to the environment, construction and installation and Good Industry Practice.*	**Private**
Interpretation		This risk allocation in both contracts applies perfectly to the survey results. Since the private partner is the one responsible for the construction works on site, then it is reasonable that he bears all the risks related to the construction works that are taking place on site.	**Private (based on Survey Results)**
40- Organization risk			
Interpretation		There are no clauses in the contract referring to the organization risks and their allocation. As per the survey results, the private party is the best party to bear such risk.	**Private (based on Survey Results)**
41- Coordination risks			
Sub-Clause # in New Cairo Waste Water Treatment Plant Project	11.2.3	***NUCA Warranties:*** *NUCA warrants that the cables, piping and conduits located on the Site on the Date of Signature are in a status allowing the Service Provider to perform its obligations under the Contract. In case the above representation is found to be incorrect, NUCA shall compensate the Service Provider for all the properly justified costs incurred by the Service Provider to fix such cables, piping or conduits and time extension if so required, as shall be*	**Public**

		determined by the Performance Monitoring Committee.	
Sub-Clause # in Alexandria University New Hospital Project		-	-
Interpretation		The coordination risk was not addressed in the hospital project. In fact, allocating this risk to both parties is better as the private party will seek optimized coordination between the various parties and during construction while some coordination deficiencies may be caused by the public partner. Sometimes, the public partner is better in managing some coordination issues such as dealing with other governmental agencies for some services.	**Both (based on Survey Results)**
42- Land acquisition			
Sub-Clause # in New Cairo Waste Water Treatment Plant Project	19.1	***Ownership and Use of the Site:*** *Ownership of the Site shall at no time be transferred to the Service Provider. Any agreement or procedure to the contrary shall be considered null and void. The Service Provider shall not use or occupy or permit the use of the Site for any purpose other than as contemplated under the Contract.*	**Public**
Sub-Clause # in Alexandria University New Hospital Project	19.1	***Access and Delivery of Site:*** *As of the Date of Signature, AU shall allow the Service Provider to access the Site for the purpose of preparing the necessary Design Documents and carrying out Due Diligence.*	**Public**
Interpretation		The risk of the land acquisition should be attributed to the public partner as this is the responsible party for acquiring the land. Allocating this risk to the private partner is better than allocating this risk to both parties.	**Both (based on Survey Results)**
43- Physical Obstacles that cannot be avoided			
Sub-Clause # in New Cairo Waste Water Treatment Plant Project	11.3.2 & 12	***11.3.2 NUCA undertakings*** *NUCA shall guarantee that, on the Effective Date, the Site shall be delivered to the Service Provider free from legal or physical obstacles except for any fence that may run around all or part of the perimeter of the Site.* ***12 Service Provider's due diligence:*** *By signing the Contract, the Service Provider confirms that it has performed and completed Due Diligence of the Site and that it has reviewed all necessary documents and information relating thereto. Such Due Diligence shall include a soil analysis, including geotechnical studies performed by the Service Provider at its own expense. The Service Provider shall bear all risks and responsibilities related to its Due Diligence.*	**Both**

Sub-Clause # in Alexandria University New Hospital Project	2, 5.2.4 & 19.1.7	***2 Service Provider's due diligence:*** *The Service Provider's signature to the Contract shall be deemed as a declaration that it has completed the Due Diligence of the Site and the Project, and has reviewed the Disclosed Data, as well as any other documents concerning the Project. Such Due Diligence shall include a soil analysis, including geotechnical studies performed by the Service Provider at its own expense. The Service Provider shall bear all risks and responsibilities related to its Due Diligence.* ***5.2.4 Conditions Precedent under the AU's responsibility:*** *AU shall remove any existing physical obstacles on the Site to surface level.* ***19.1.7 Access and Delivery of the Site:*** *If the obstacle discovered on Site is physical in nature and if the Hospital Buildings cannot be positioned so as to avoid such physical obstacle, AU shall remove such obstacle or may request the Service Provider to do so at AU's cost. In the event that the obstacle prevents or delays the Construction Works, this shall constitute a Compensation Event.*	**Both**
Interpretation		In spite of the fact that the Service Provider in both contracts should have completed the Due Diligence of the Site, at his own costs and shall bear all its related risks, the Public Partner should deliver the Site to the Private Partner free from any physical obstacles and in case a physical obstacle is found and it cannot be avoided, in the case of the hospital project, then this shall form a Compensation event to the Service Provider. Therefore, in this case, the risk of physical obstacles is partially borne by the public partner and partially borne by the private partner which is similar to the survey results where the respondents allocated this risk to both parties.	**Both (based on Survey Results)**
44- Maintenance Risks			
Sub-Clause # in New Cairo Waste Water Treatment Plant Project	21.1	***Operations and Maintenance:*** *21.1.1 The Service Provider shall operate, maintain, repair and renew the Plant and Equipment in accordance with the Technical Specifications and Requirements of the Plant at its own cost and risk, and in accordance with the provisions of the Contract and Egyptian Law (including health, safety and Environmental Law).*	**Private**
Sub-Clause # in Alexandria University New Hospital Project	21.8.7 , 24.1.1 & 44	***21.8.7 Equipping the Hospital:*** *The Service Provider shall supply at its cost, install, commission, maintain and replace (as applicable) all Equipment together with all Durables, Maintenance Consumables, materials, stock, spare parts and other consumables (except for Operational consumables) required pursuant to the terms of this Contract to enable the proper and satisfactory provision of the Services and/or comply with all relevant statutory requirements and/or health and safety regulations.* ***24.1.1 Obligations of the Service Provider:*** *The Service Provider shall operate, maintain, repair and renew the Hospital and Equipment at his own cost and risk, and in accordance with the provisions of this Contract, Egyptian law, Good Industry Practice, relevant codes and standards referred*	**Private**

		to in the Contact and Annexes ***44 Indemnities*** *For the avoidance of doubt, the Service Provider shall be responsible for the Maintenance and repair of all damage occurring to the Hospital during the Contract Duration and will be reimbursed for the cost and Availability Failure Deductions when the Performance Monitoring Committee determines that such damage occurred as a direct result of the deliberate act or negligence of AU or an AU Related Party.*	
Interpretation		In this case, the risk allocation of the maintenance to the private party perfectly matches the survey output as this risk shall be borne by the private party who shall be responsible for the operations and maintenance in PPP projects.	**Private (based on Survey Results)**
45- Access and delivery of site			
Sub-Clause # in New Cairo Waste Water Treatment Plant Project	8.2, 11.3.2 & 19.1	**8.2 Service Provider Essential Rights:** *As of the Date of Signature, NUCA shall grant the Service Provider access to the Site for the purpose of preparing the Final Design and commencing preparation works on the Site under the Service Provider's own responsibility.* ***11.3.2 NUCA undertakings*** *NUCA shall guarantee that, on the Effective Date, the Site shall be delivered to the Service Provider free from legal or physical obstacles except for any fence that may run around all or part of the perimeter of the Site.***19.1** ***Ownership and Use of the Site:*** *Ownership of the Site shall at no time be transferred to the Service Provider. Any agreement or procedure to the contrary shall be considered null and void. The Service Provider shall not use or occupy or permit the use of the Site for any purpose other than as contemplated under the Contract.*	**Public**
Sub-Clause # in Alexandria University New Hospital Project	7.2, 11.4.2 ,19.1.1 & 19.1.7	***7.2 Essential Rights:*** *As of the Date of Signature, AU shall grant the Service Provider access to the Site for the purpose of preparing the Final Design and Working Drawings.****11.4.2 AU undertakings*** *AU shall deliver the Site to the Service Provider free from any surface physical and legal obstacles.* ***19.1.1 Access and Delivery of Site:*** *As of the Date of Signature, AU shall allow the Service Provider to access the Site for the purpose of preparing the necessary Design Documents and carrying out Due Diligence.* ***19.1.7 Access and Delivery of the Site:*** *If the obstacle discovered on Site is physical in nature and if the Hospital Buildings cannot be positioned so as to avoid such physical obstacle, AU shall remove such obstacle or may request the Service Provider to do so at AU's cost. In the event that the obstacle prevents or delays the Construction Works, this shall constitute a Compensation Event.*	**Public**
Interpretation		The Access and delivery of site risk shall be borne by the Public Partner as it should be his responsibility to deliver the site to the Service Provider free from any obstacles in order for the Service	**Project Dependent (based on Survey**

		Provider to start working and preparing the necessary documents. On the other hand, this risk should not be project dependent and should always be allocated to the public partner. Based on the survey results, this risk is dependent on the project.	**Results)**
46- Connection of Public utilities to boundaries of site			
Sub-Clause # in New Cairo Waste Water Treatment Plant Project	21.1.2	***21.1.2 Obligations of NUCA:*** *NUCA shall supply influent to the Reception Point at no cost to the Service Provider 180 days prior to Scheduled Plant Operation Date; operate and maintain the Influent Pipeline System in a Good Industry Practice manner not causing any Material Adverse Effect. In the event that the operation and maintenance of the Influent Pipeline System by NUCA shall have a Material Adverse Effect, the Service Provider shall be compensated.*	**Public**
Sub-Clause # in Alexandria University New Hospital Project	23.1	***Public Utilities:*** *AU shall 1- connect all necessary Public Utilities (except the telephone lines and any natural gasconnections) to the boundaries of the Site as indicated in Annex 3 and shall bear all the costs thereof. AU shall informthe Service Provider when such Public Utilities are connected to the boundaries of the Site which must occur no later than one hundred and eighty (180) Days prior to the Scheduled Services Availability Date; 2- acquire all necessaryapprovals for connecting the Public Utilities inside the Site and pay all invoices and connection fees pertaining tothe usage of Public Utilities during the Services Availability Period, except the cost of use of Public Utilities related toAdditional Facilities; and 3- on or before the Services Availability Date, procure the connection of any necessarytelephone lines and natural gas pipelines (if applicable).*	**Public**
Interpretation		This risk is allocated in both cases to the public partner as it is his sole responsibility to connect the utilities to the boundaries of the site. Since this risk is not concerned with the actual construction operations taking place on site, then, it is reasonable to allocate this risk to the public partner who will be better in managing this risk since it needs permits and governmental procedures and steps. The allocation of such risk to the public partner is more reasonable than letting the allocation of such risk be dependent on the project type.	**Project Dependent (based on Survey Results)**
47- Connection to boundary of Site of telephone lines and natural gas provision			
Sub-Clause # in New Cairo Waste Water Treatment Plant Project	-	-	-

Sub-Clause # in Alexandria University New Hospital Project	23.1	***Public Utilities:*** *AU shall 1- connect all necessary Public Utilities (except the telephone lines and any natural gas connections) to the boundaries of the Site as indicated in Annex 3 and shall bear all the costs thereof. AU shall inform the Service Provider when such Public Utilities are connected to the boundaries of the Site which must occur no later than one hundred and eighty (180) Days prior to the Scheduled Services Availability Date; 2- acquire all necessary approvals for connecting the Public Utilities inside the Site and pay all invoices and connection fees pertaining to the usage of Public Utilities during the Services Availability Period, except the cost of use of Public Utilities related to Additional Facilities; and 3- on or before the Services Availability Date, procure the connection of any necessary telephone lines and natural gas pipelines (if applicable).*	**Private**
Interpretation		Concerning this specific risk, it was not mentioned in New Cairo waste water treatment Plant project. However, it is clearly stated in Alexandria University New Hospital project that all the public utilities should be connected to the boundaries of site. Concerning the natural gas and the telephone line, they will also be provided either on or before the Service Availability Date. According to the survey results, the allocation of this risk will be based on the project type which is reasonable.	**Project Dependent (based on Survey Results)**
Factor 9: Resources Risks			
48- Labor unavailability			
Interpretation		There are no clauses in the contract referring to the labor unavailability. Such risk factors are not covered in the contract. According to the survey results, this risk will be allocated to the private party as this party is the one responsible for labor delivery.	**Private (based on Survey Results)**
49- Material shortage			
Interpretation		There are no clauses in the contracts referring to the material shortage. According to the survey results, this risk will be allocated to the private party as this party is the one responsible for material delivery.	**Private (based on Survey Results)**
Factor 10: Production Risks			
50- Third party delay/violation			
Sub-Clause # in New Cairo Waste Water Treatment Plant Project	41	***Indemnities:*** *The Service Provider shall indemnify AU and the AU Related Parties against any Loss incurred by AU or any AU Related Party, including any Loss suffered by any third party whom AU is legally or contractually responsible to indemnify against such Loss, as a result of any of the following: the gross negligence or willful misconduct of the Service Provider or any Service Provider Related Party; or any material breach by the Service Provider of any of its obligations under the Contract; provided that, in all cases, such*	

		indemnity shall not apply to the extent that the Loss has been caused by the gross negligence or misconduct of AU or any AU Related Party.	
Sub-Clause # in Alexandria University New Hospital Project	10	***Responsibility for related parties:*** *Each Party shall be responsible for the behavior or acts committed by its related Parties in relation to the performance of the Contract.*	**Both**
Interpretation		In this particular risk factor, the third party delay/violation risk was not addressed in New Cairo Waste Water Treatment Plant Project. However, in Alexandria University New Hospital Project, this risk was addressed by mentioning that each party should be responsible for its related parties in the Contract. Therefore, this risk should be allocated to both parties which do not conform to the survey results where the majority of the respondents allocated this risk to the private partner only.	**Private**
51- Planning risks			
Sub-Clause # in New Cairo Waste Water Treatment Plant Project	20.2.3 & 20.2.9 (b)	***20.2.3 Construction Program and Scheduled Plant operation Date:*** *No more than 30 days after the Effective Date, the Service Provider shall provide NUCA with a detailed monthly construction schedule showing in detail the activities, their sequence and the duration planned to achieve the Scheduled Plant Operation Date.* ***20.2.9 (b)*** *The Service Provider shall not be relieved from any of its obligations or liabilities relating to any defects or delays in the design or the Construction Works.*	**Private**
Sub-Clause # in Alexandria University New Hospital Project	21.1	***21.2 Construction Programme:*** *No more than 30 days after the Effective Date, the Service Provider shall provide AU with a detailed monthly construction schedule (based on and consistent with the Scheduled Services availability Date and draft construction schedule included in the Technical Offer) showing in detail the activities, their sequence and the duration planned to achieve the Scheduled Services availability Date. The Service Provider shall complete all of the Construction Works in accordance with its proposals in its Technical Offer.*	**Private**
Interpretation		In both contracts and according to the survey results, the private partner is responsible for his planning and for his time schedule to perform the works. This risk allocation makes sense as the private partner should be the best party to bear such risk since the private partner is the one responsible for the construction works on site. Therefore, it will be the best party to manage such risk.	**Private (based on Survey Results)**
52- Supervision, organization and control for inspection of Construction works			

Sub-Clause # in New Cairo Waste Water Treatment Plant Project	20.2.4 & 20.2.7	***20.2.4 Quality Assurance and Quality Control:*** *NUCA, represented by EWRA shall have the right upon 3 Business Days' notice to attend or examine the quality control inspections and methods to confirm that any item of the Construction Works complies with the requirements of the Contract, without interfering or hindering Construction Works.* ***20.2.7 Monitoring and Inspection of the Construction of the Plant*** *In addition to any monitoring and inspection by the relevant Governmental authorities in accordance with Egyptian law or by the Performance Monitoring Committee in accordance with the Contract, NUCA and any NUCA related party may monitor and inspect the construction at NUCA's cost during the Construction Period in the presence of either the Service Provider or any Service Provider related party upon 3 Business Days' notice to the Service Provider and should comply with the Site's health and safety regulations. Such monitoring and inspection shall not cause any material impediment or interfere with the construction progress or disrupt construction. Otherwise, the matter shall be referred to the Performance Monitoring Committee to determine the required time extension equivalent. Monitoring and inspection results shall be summarized in a written report and shall be forwarded to the Service Provider no later than 15 Business Days form the inspection date to allow the Service Provider to remedy potential issues raised in such report.*	**Public**
Sub-Clause # in Alexandria University New Hospital Project	21.6	***21.6 Monitoring, Inspection and access*** *In addition to any monitoring and inspection by the relevant Governmental authorities in accordance with Egyptian law or by the Performance Monitoring Committee ,AU and any AU related party may monitor and inspect the construction at AU's cost during the Construction Period in the presence of either the Service Provider or any Service Provider related party upon 3 Business Days' notice to the Service Provider and should comply with the Site's health and safety regulations. Such monitoring and inspection shall not cause any material impediment or interfere with the construction progress or disrupt construction. Otherwise, the matter shall be referred to the Performance Monitoring Committee to determine the required time extension equivalent. Monitoring and inspection results shall be summarized in a written report and shall be forwarded to the Service Provider no later than 15 Business Days form the inspection date to allow the Service Provider to remedy potential issues raised in such report.*	**Public**
Interpretation		According to both contracts, the monitoring operations for quality assurance should be performed by the public partner. This does not match the survey results which mentioned that such risk should be borne by the private partner. On the other hand, the public partner will be better able to bear and manage such risk on the condition that competent personnel and technical experts are hired in this process in order not to cause any disruption of the work.	**Private (based on Survey Results)**

<table>
<tr><td colspan="4">53- Technological Risks</td></tr>
<tr><td colspan="2">Interpretation</td><td>The technological risks are not covered under the contract as usually in the projects performed in Egypt, there are rarely technological challenges in any project.</td><td>Private (based on Survey results)</td></tr>
<tr><td colspan="4">54- Completion risk</td></tr>
<tr><td colspan="2">Interpretation</td><td>According to the definitions provided for the risks, the completion risks are not covered under the contracts. The contracts do not provide any provision for the risks associated with the Completion of the project.</td><td>Project Dependent(based on Survey results)</td></tr>
<tr><td colspan="4">Factor 11: Environmental Risks</td></tr>
<tr><td colspan="4">55- Sustainability Risk</td></tr>
<tr><td>Sub-Clause # in New Cairo Waste Water Treatment Plant Project</td><td>9.1.2, 9.1.10 ,19.3 & 20.2.8</td><td>Conditions precedent under the Service Provider's responsibility: 9.1.2 The Service Provider shall submit a comprehensive Environmental Impact Assessment in conformity with Environmental Law to the Egyptian Environmental Affairs Agency and obtain approval from the Egyptian Environmental Affairs Agency. 9.1.10 The Service Provider should specify the location of a landfill site for off-specification sludge and letter(s) of confirmation from the landfill operators thereof that they are licensed to accept such sludge. Sludge stockpiling site, sale and disposal of sludge, carbon credits: 19.3.1 All sludge related risks should be borne by the Service Provider. The Service Provider shall be entitled to treat and sell sludge for agricultural reuse and/or energy production. The Service Provider shall be responsible for applying for any approvals required at his cost. 19.3.4 If the Service Provider at any time elects not to treat and sell sludge for agricultural reuse and/or energy production, after having identified an appropriate landfill site and having obtained (at his cost) any approvals required for the transport and / or disposal of sludge, the Service Provider shall transport and dispose of such sludge at a landfill site in accordance with Egyptian law and Good Industry Practice. 19.3.7 The Service Provider shall be the beneficiary of the revenues generated from the sale of sludge. 19.3.8 The Service Provider shall be the beneficiary of any Carbon Credits obtained for the operation of the Plant. 20.2.8 (c) Other Duties The Service Provider shall prevent and control any environmental contamination caused by any Construction Works. (e) Dispose of construction waste and Project debris in accordance with Egyptian Law and Good Industry Practice.</td><td>Private</td></tr>
</table>

Sub-Clause # in Alexandria University New Hospital Project	19.1.4, 21.11.2 & 21.11.3	***19.1.4 Access and delivery of site:*** *AU shall bear the responsibility for all the environmental risks arising in or existing at the Site before the Site Delivery Date. In the event that such an environmental condition is discovered at the Site at a later date the Service Provider shall immediately notify AU. In the event that remedial action is required pursuant to Egyptian law, AU shall either request the Service Provider to undertake such remedial measures at AU's cost or otherwise take action to remedy the condition itself or through third parties. In the event that the environmental condition prevents or delays the Construction Works this shall constitute a Compensation Event to be administered in accordance with Article 21.7.* ***21.11 Other Duties*** *The Service Provider shall prevent and control any environmental pollution caused by any Construction Works and Dispose of construction waste and Project debris in accordance with Egyptian Law and Good Industry Practice.*	**Both**
Interpretation		Concerning the Sustainability risk, in the case of New Cairo Waste Water treatment Plant, it is clearly mentioned that all sustainability and environment related risks should be borne by the Service Provider. On the other hand, in Alexandria University New Hospital Project, all the environmental risks shall be borne by the public partner who shall also compensate the Service Provider in case of the presence of any remedial measures related to the environment until the Site Delivery Date. On the other hand, the private partner shall be responsible for preventing pollution related to his construction works on site after the Site Delivery Date. This conforms to the survey results which mentioned that the allocation of this risk should be dependent on the project and this is the cause of the difference of risk allocation in both projects. In the first project, as it is a waste water treatment plant and as the Service Provider is responsible for the operation of the plant, then, the environmental risks should be borne by him. On the other hand, in the case of the hospital, the same risk was allocated to the public partner as the project type is different.	**Project Dependent (based on Survey Results)**
56- Antiquities Risks			

Sub-Clause # in New Cairo Waste Water Treatment Plant Project	16	***Fossils and Antiquities:*** *1- Without prejudice to the Service Provider's rights to any extension of the Scheduled Plant Operation Date and to any compensation in accordance with Article 21.7, the Service Provider shall, upondiscovery of any fossils or antiquities, immediately notify NUCA and the Supreme Council of Antiquities and cease Construction Works on the Site. 2- Upon receipt of the Service Provider's notification, NUCA shall notify the Supreme Council of Antiquities within five (5) Business Days to coordinate with NUCA and determine the existence or not of the fossils or antiquities. 3-In the event that the written report of the Supreme Council for Antiquities concludes the existence of antiquities or fossils at the Site or the issuance of the report was delayed for 6 months from the date of issuance of the Service Provider notice to NUCA, NUCA shall provide the Service Provider with another geographically comparable site of similar surface area within New Cairo City (the "Replacement Site"), this shall give the Service Provider an extension as determined by the Independent Technical Expert, if so required and shall pay the costs of transferring the Plant to the Replacement Site as well as the costs and expenses that the Service Provider incurred in performing its obligations herein on, or in relation to, the initial Site as determined by the independent Financial Expert. 4- The Service Provider acknowledges and agrees that it shall have no ownership or financial interest in any fossils or antiquities discovered at the Site.*	**Public**
Sub-Clause # in Alexandria University New Hospital Project	16	***Fossils and Antiquities:*** *1- Without prejudice to the Service Provider's rights to any extension of the Scheduled Services Availability Date and to any compensation in accordance with Article 21.7, the Service Provider shall, upon discovery of any fossils or antiquities, immediately notify AU and the Supreme Council of Antiquities and ceaseConstruction Works on the Site. 2- Upon receipt of the Service Provider's notification, AU shall notify the Supreme Council of Antiquities within five (5) Business Days to inspect the Site and determine the existence or not of the fossils or antiquities. All fees of the Supreme Council shall be borne by AU. 3-In the event that the written report of the Supreme Council for Antiquities concludes the existence of antiquities or fossils at the Site, this shall constitute a Compensation Event. If the Supreme Council determines that it is possible to remove the antiquities or fossils discovered at the Site the Service Provider shall coordinate with the Supreme Council for Antiquities before commencing any excavation works. 4- In the event that: (i) the written report of the Egyptian Supreme Council of Antiquities prohibits further Construction Works at the Site, or (ii) the issuance of the report was delayed for, orthe antiquities or fossils are not removed within, six (6) months from the date of issuance of the Service Provider notice to AU, AU shall have the option to provide the Service Provider with a Replacement Site within six (6)*	**Public**

		months from the date of issuance of the Service Provider notice to AU or otherwise in case on nonexistence of a ReplacementSite, either Party may issue an Early Termination Notice to the other Party and AU shall compensate the ServiceProvider for all direct expenses associated from Date of Signature until Calculation Date as computed and verified bythe Independent Financial Expert. If the reports do not conclude presence of Fossils/Antiques, the ServiceProvider will be entitled to an extension equivalent to the inspection period. 5- In the event that AU provides aReplacement Site, the Service Provider shall, as soon as possible, take the necessary measures to commence theConstruction Works at the Replacement Site. The Service Provider shall be entitled to a time extension as determinedby the Independent Technical Expert and AU shall pay any additional costs related to transferring the Hospital to theReplacement Site as well as the direct costs and expenses that the Service Provider reasonably incurred in performing its obligations herein on, or in relation to, the initial Site as determined by the Independent Financial Expert and without double recovery. 6- The Service Provider acknowledges and agrees that it shall have no ownership or financial interest in any fossils or antiquities discovered at the Site.	
Interpretation		According to both contracts, the public partner bears the responsibility in case any fossils or antiquities are found on site. In Alexandria University New Hospital Project, it is clearly mentioned that the Public partner even bears the fees of the Supreme Council for Antiquities. In both cases, the Public Partner is responsible for providing a replacement site for the Service Provider in case construction works are stopped in the original site. The Service Provided will be compensated in terms of time and cost. However, according to the survey results, this risk will be dependent on the project as none of the results were chosen by more than 50 % of the respondents. However, allocating the fossils and antiquities risks to the public partner makes more sense as the Private Partner should be properly compensated in case of such event.	**Project Dependent (based on Survey Results)**
Factor 12: Unforeseen Risks			
57- Unforeseen Weather conditions			
Interpretation		The unforeseen weather condition is not covered in the contracts as usually; Egypt is not exposed to unforeseen weather conditions. At the beginning of each project the parties should have a report from the meteorological authorities that state the weather in the area of the project. Any exception from this report is a force majeure.	**Private (based on Survey Results)**
58- Unforeseen geotechnical conditions			

Sub-Clause # in New Cairo Waste Water Treatment Plant Project	12	***Service Provider's Due Diligence:*** *By signing the Contract, the Service Provider confirms that it has performed and completed Due Diligence of the Site and that it has reviewed all necessary documents and information relating thereto. Such Due Diligence shall include a soil analysis, including geotechnical studies performed by the Service Provider at his own expense. The Service Provider shall bear all risks and responsibilities related to its Due Diligence.*	**Private**
Sub-Clause # in Alexandria University New Hospital Project	2	***Service Provider's Due Diligence:*** *The Service Provider's signature to the Contract shall be deemed as a declaration that it has completed the Due Diligence of the Site and the Project, and has reviewed the Disclosed Data, as well as any other documents concerning the Project. Such Due Diligence shall include soil analysis, including geotechnical studies performed by the Service Provider at its own expense. The Service Provider shall bear all risks related to such Due Diligence.*	**Private**
Interpretation		In both contracts, the private partner should have performed his Due Diligence of the Site at his own cost and at his own risk. It is the sole responsibility of the private partner to perform his geotechnical studies and no claims shall be raised by him due to such cause. This was the same choice of the survey respondents as they chose to allocate such risk to the Private Partner as he should have already done his own inspection to the site at his own cost regarding the geotechnical and soil conditions.	**Private (based on Survey Results)**
59- Force majeure			

Sub-Clause # in New Cairo Waste Water Treatment Plant Project	28	*1- Except as expressly provided otherwise in the Contract, no Party shall be entitled to claim any Losses from the other Party for any Event of Default if such Event of Default results from Force Majeure. Each Party shall be relieved from performance and shall not be deemed to be in breach of any of its obligations as long as, and to the extent that, it is due to Force Majeure. 2- Upon the occurrence of an event of Force Majeure, the affected Party shall notify the other Party within fifteen (15)Days of the occurrence of such event. The notification shall include details of the Force Majeure, including its anticipated or actual effect on the obligations of the affected Party and any action proposed to mitigate the same. In all cases, both NUCA and the Service Provider shall use their best efforts to mitigate the consequences of the Force Majeure. 3- In case of a Prolonged Force Majeure Event, either Partymay give an Early Termination Notice to the other Party. 4- As from the occurrence of a Force Majeure (and following the Services Availability Date), NUCA shall continue to pay the Capital Value of any Services Availability Payments due to the Service Provider, provided however, that NUCA shall have the right to deduct from such payments any insurance proceeds being paid under business interruption insurance policies taken out by the Service Provider in relation to the Project. In the event that part of the Plant is still available, NUCA shall also pay the pro-rata portion of the Operation and Maintenance Value of the Services Availability Payment. The obligation to pay such Services Availability Payments shall continue for as long as theevent of Force Majeure continues, subject to a maximum of one hundred and eighty (180) consecutive Days. 5- In the event that the Force Majeure ceases, the affected Party shall notify the other Party thereof and resume performance of any obligation previously made impossible by the relevant Force Majeure within seven (7) Days or such other period, as both Parties agree, is necessary to restore Services. 6- In the event that an event of Force Majeure shall lead to the complete or partial destruction of the Plant, the Service Provider shall rebuild the portion destroyed and restore it to its condition prior to the occurrence of the Force Majeure, but only to the extent it receives insurance proceeds following such destruction (provided that the Service Provider has complied with all its insurance obligations and policies under the Contract). In the event that the Service Provider does not receive sufficient proceeds from insurance providers as aforesaid, NUCA may choose to bear the additional cost required to restore the Plant to its condition prior to theoccurrence of the Force Majeure, otherwise the Service Provider shall be entitled to give an Early Termination Notice and this shall be treated in the same manner as aProlonged Force Majeure Event. In such circumstances NUCA shall be entitled to receivethe insurance proceeds.*	**Both**

Sub-Clause # in Alexandria University New Hospital Project	33	*1- Except as expressly provided otherwise in the Contract, no Party shall be entitled to claim any Losses from the other Party for any Event of Default if such Event of Default results from Force Majeure. Each Party shall be relieved from performance and shall not be deemed to be in breach of any of its obligations as long as, and to the extent that, it is due to Force Majeure. 2- Upon the occurrence of an event of Force Majeure, the affected Party shall notify the other Party within fifteen (15)Days of the occurrence of such event. The notification shall include details of the Force Majeure, including its anticipated or actual effect on the obligations of the affected Party and any action proposed to mitigate the same. In all cases, both AU and the Service Provider shall use their best efforts to mitigate the consequences of the Force Majeure. 3- In case of a Prolonged Force Majeure Event, either Partymay give an Early Termination Notice to the other Party. 4- As from the occurrence of a Force Majeure (and following the Services Availability Date), AU shall continue to pay the Capital Value of any Services Availability Payments due to the Service Provider, provided however, that AU shall have the right to deduct from suchpayments any insurance proceeds being paid under business interruption insurancepolicies taken out by the Service Provider in relation to the Project. In the event thatpart of the Hospital is still available, AU shall also pay the pro-rata portion of theOperation and Maintenance Value of the Services Availability Payment. Theobligation to pay such Services Availability Payments shall continue for as long as theevent of Force Majeure continues, subject to a maximum of one hundred andeighty (180) consecutive Days. 5- In the event that the Force Majeure ceases, the affected Party shall notify the other Party thereof and resume performance of any obligation previously made impossible by the relevant Force Majeure within seven (7) Days or such other period, as both Parties agree, is necessary to restore Services. 6- In the event that an event of Force Majeure shall lead to the complete or partial destruction of the Hospital, the Service Provider shall rebuild the portion destroyed and restore it to its condition prior to the occurrence of the Force Majeure, but only to the extent it receives insurance proceeds following such destruction (provided that the Service Provider has complied with all its insurance obligations and policies under the Contract). In the event that the Service Provider does not receive sufficient proceeds from insurance providers as aforesaid, AU may choose tobear the additional cost required to restore the Hospital to its condition prior to theoccurrence of the Force Majeure, otherwise the Service Provider shall be entitled togive an Early Termination Notice and this shall be treated in the same manner as aProlonged Force Majeure Event. In such circumstances AU shall be entitled to receivethe insurance proceeds.*	**Both**
Interpretation		This complies with the survey results as in the case of Force Majeure,	**Both (based on**

		both parties will be affected.	**Survey Results)**
Factor 12: Other Risks			
60-Death or bodily injury			
Sub-Clause # in New Cairo Waste Water Treatment Plant Project	21.1.1	***21.1.1 Obligations of the Service Provider:*** *The Service Provider shall ensure the safe operation of the Plant, take all precautions and provide all such protection as may be necessary or appropriate to safeguard persons and property.*	**Private**
Sub-Clause # in Alexandria University New Hospital Project	21.1.2	***21.1 Construction Works Conditions:*** *The Service Provider shall take the necessary measures to ensure the safety of all occupants of the Site, AU related Parties and all residents of the neighborhood of the Site in accordance with applicable law, relevant codes and Good Industry Practice. The Service Provider shall indemnify AU against any third party claims arising from the Construction Works.*	**Private**
Interpretation		In both contracts, the private partner is the one responsible for the safety of all personnel on site. In the hospital project, the Service Provider shall be responsible for the safety of the neighborhood as well. Since, the Service Provider is the Party responsible for construction works taking place on site, then it should be responsible for the safety. However, the safety precautions should be a shared responsibility between both the private and public partners in order to ensure the implementation of safety measures on site. This conforms to the survey results. This risk factor was chosen by one respondent who allocated this risk to both parties.	**Both (based on Survey Results)**
61- Safety Breaches			
Sub-Clause # in New Cairo Waste Water Treatment Plant Project	20.2.4, 20.2.8 & 21.1.1	***20.2.4 Quality Assurance and Quality Control:*** *If the Construction Works or any item thereof fails to conform in any material respect with the requirements of the Contract (including the quality or safety requirements), NUCA, based on EWRA's recommendations, may give notice to the Service Provider of such failure. The Service Provider shall correct or materially start correcting the noncompliance as soon as possible but in any case within 15 days of receipt of NUCA's notice.* ***20.2.8 Other Duties*** *The Service Provider shall take all required safety measures with respect to the Site.* ***21.1.1 Obligations of the Service Provider:*** *The Service Provider shall ensure the safe operation of the Plant, take all precautions and provide all such protection as may be necessary or appropriate to safeguard persons and property.*	**Private**
Sub-Clause # in Alexandria University	21.1.2	***21.1 Construction Works Conditions:*** *The Service Provider shall take the necessary measures to ensure the safety of all occupants of the Site, AU related Parties and all residents of the neighborhood of the Site in accordance with applicable law, relevant codes and Good*	**Private**

New Hospital Project		*Industry Practice. The Service Provider shall indemnify AU against any third party claims arising from the Construction Works.*	
Interpretation		In both contracts, the private partner is the one responsible for the safety of all personnel on site. In the hospital project, the Service Provider shall be responsible for the safety of the neighborhood as well. Since, the Service Provider is the Party responsible for construction works taking place on site, then it should be responsible for the safety. However, the safety precautions should be a shared responsibility between both the private and public partners in order to ensure the implementation of safety measures on site. This conforms to the survey results. This risk factor was chosen by one respondent who allocated this risk to both parties.	**Both (based on Survey Results)**

5.3 Major Outcomes of Contract Risk Mapping

According to the above study, it is concluded that most of the risks have been mapped. In other words, the majority of the risks factors obtained and included in the Survey are covered under the Contract. For instance, the Performance Security risk, the Permits risk, the Changes in Law risk, the Dispute Resolution risk, the Deficiency of Design are all explicitly covered and addressed in both Contracts.

However, there are some exceptions. For instance, the Interest Rate Fluctuation Risk is not explicitly covered in New Cairo Waste Water Treatment Plant contract while it is not covered at all in Alexandria University New Hospital Project Contract. In the light of the current conditions prevailing in the country, such risk should be covered in the Contract and allocated to the party able to manage such risk. For instance, fixing the interest rate throughout the project can be a way to minimize such risk. The same applies for the Inflation risk which is not covered in the Contract conditions of both projects. One of the risks that should also be covered in the PPP contracts is the Price Change Risk. In order to cover such risk, a suggestion is added from the Egyptian Civil Code which allows the Contractor to notify the Employer in case any increase occurs in the price. Other risk factors were not covered in the PPP contracts such as the Supply and Demand risks, the Change in Market Demand, the Public Credit risks, the public opposition risk and the swings in public opinion.

Concerning the comparison between the allocation of the risks under the actual case contracts and their allocation according to the survey results, it is noticed that for some risks, the allocation of the risks in both contracts perfectly matches its allocation according to the survey results. For instance, in the case of the Performance Security risks, both contracts and the majority of the respondents to the survey allocated this risk to the Private Party which makes perfect sense as the Private Party is the one responsible for the Performance Security. Also, the same case applies for the Permits risk. The risk allocation in both contracts perfectly matches the survey results as it is allocated to both parties. This is due to the fact that in some cases, the Private Party is required to acquire some permits and the Public Party may be required to get other permits for the project. The same applies for the risk of delay in project approvals and permits. Also, the Construction risk is allocated in all cases to the Private Partner which conforms to the reality and to the nature of PPP where the Private Partner in general is the party bearing the responsibility of the Construction. The same applies for Maintenance risk, for Planning risks and unforeseen geotechnical conditions risk.

In other cases, the risk allocation for both contracts is slightly different from the survey results. For instance, in the case of the Legislation Changes risk, it is covered and allocated under both contracts to the Public Party while according to the survey results; the allocation of this risk should be dependent on the project and should be determined individually. However, the allocation of this risk under the actual contracts is better as such risk can be better borne by the Public Party and not the Private Party in case the Change in Law that occurs was not accounted for and caused a dramatic impact on the project. This risk is properly addressed under the World Bank suggestions. The Dispute Resolution risk allocation under both contracts also matches the survey results as it is allocated to both parties. This risk also is properly addressed according to the World Bank suggestions for the drafting of PPP contracts. The researcher suggests that for the latent defect risk, the article from the Egyptian Civil Code can apply as it conforms to the long term nature of PPP projects.

On the other hand, the allocation of Nationalization/expropriation risk is to the Public Party according to both contracts as it is considered as an Employer's event of default. However, according to the survey results, this risk was allocated to the Private Party. It can be concluded that this risk definition may be misunderstood by the majority of the Survey respondents as this risk shall not be borne by the Private Party. Also, concerning the Government Corruption risk, it was not covered under the real case contracts. However, this risk shall be allocated to the Public Party rather than to the Private Party which does not conform to the survey results.

Chapter 6: Model Development, Verification and Validation

6.1 Risk Severity Calculation

After the probability and impact of each risk was determined through the survey results, the severity of each risk is calculated by multiplying the probability of the risk by the risk impact.

$$Risk\ Severity = Risk\ Probability\ \times Risk\ Impact$$

Afterwards, for each risk, the mean (μ), standard deviation (σ) and median are determined.

Then, the Minimum severity value and Maximum severity value are obtained.

Also, the minimum set value is obtained through the following formula:

$$Minimum\ Set\ Value = Mean - (2\ \times Standard\ Deviation)$$

The maximum set value is obtained through the following formula:

$$Maximum\ Set\ Value = Mean\ + (2\ \times Standard\ Deviation)$$

If the minimum severity is smaller than the minimum set value or if the maximum severity is larger than the maximum set value, then, the data contains outliers that should be removed. After the outliers' removal, the mean (μ), standard deviation (σ) and median are calculated again. (This process is illustrated and shown in Appendix 1).

Finally, after the outlier removal, an average severity and standard deviation are obtained for each risk factor. These results are the ones which will be used in the future calculations of this study.

6.2 Risk Ranking

In order to rank the risks, the average severities that were obtained in the previous step are normalized using the following rule:

$$Normalized\ Value = \frac{(Average\ Actual\ Value - Average\ Minimum\ Value)}{(Average\ Mximum\ Value - Average\ Minimum\ Value)}$$

The objective of the normalization procedure is to unify and adjust the data to a common scale so it can be better interpreted and analyzed. According to Xu et al. (2012), only the risk factors with a normalized value equal or greater than 0.5 are included. However, since the researcher found that there were risk factors with a value close to 0.5, such as values equal to 0.48 and 0.47, then, the researcher widened the range and took into account the risk factors with a normalized value equal to or greater than 0.4.

Accordingly, only the risks with a normalized value equal to or greater than 0.4 will be taken into consideration for future analysis as they are considered as "critical risk factors". The below table shows the average severity of each risk as well the average normalized severity after being calculated. The risks with normalized values equal to or greater than 0.4 are highlighted in their descending order:

#	Risk Factor	Average Severity	Normalized Value
1	Foreign exchange fluctuation	16.92	1.00
2	Political Risk	16.71	0.98
3	Inflation	15.24	0.87
4	Poor public decision making process	15.16	0.86
5	Government policy	14.72	0.83
6	Political/Public opposition	14.28	0.79
7	Lack of supporting infrastructure	14.24	0.79

8	Change in tax regulation	13.4	0.73
9	Government corruption	13.16	0.71
10	Legislation changes	12.88	0.69
11	Public Credit	12.48	0.65
12	Swings in Public Opinion	12.44	0.65
13	Dispute resolution	12.17	0.63
14	Nationalization/expropriation	11.88	0.61
15	Force majeure	10.92	0.53
16	Inadequate law and supervision system	10.6	0.51
17	Interest Rate Fluctuation	10.4	0.49
18	Regulatory/Contractual Risk	10.26	0.48
19	Delay in project approvals/permits	10.16	0.47
20	Price Change	10.04	0.46
21	Revenue Risk	10	0.46
22	Completion risk	9.95	0.46
23	Government Intervention	9.74	0.44
24	Permits Risks	9.63	0.43
25	Operation cost overrun	9.58	0.43
26	Supply and demand	9.17	0.40
27	Quality Control	8.88	0.37
28	Quality Assurance	8.76	0.36
29	Insufficient project finance supervision	8.72	0.36
30	Project/operation changes	8.68	0.36
31	Third party delay/violation	8.67	0.36
32	Planning risks	8.5	0.34
33	Connection of Public utilities to boundaries of site	8.48	0.34
34	Construction Risk	8.38	0.33
35	Material shortage	8.32	0.33
36	Latent Defect Risk	8.13	0.32
37	Deficiency of design	8.08	0.31
38	Provision of transformers, substations or backup power	8.08	0.31
39	Connection to boundary of Site of telephone lines and natural gas provision	8.08	0.31
40	Maintenance Risks	7.83	0.29
41	Imperfect contract documents	7.57	0.27
42	Land acquisition	7.52	0.27

43	Supervision, organization and control for inspection of Construction works	7.43	0.26
44	Inability of concessionaire	7.36	0.26
45	Coordination risks	7.35	0.25
46	Organization risk	7.3	0.25
47	Change in Market demand	7.22	0.24
48	Unforeseen geotechnical conditions	7.17	0.24
49	Market competition	7.08	0.23
50	Inability of concessionaire	6.96	0.22
51	Technological Risks	6.74	0.21
52	Sustainability Risk	6.74	0.21
53	Performance Security Risk	6.73	0.21
54	Physical Obstacles that cannot be avoided	6.71	0.20
55	Labor unavailability	6.54	0.19
56	Access and delivery of site	5.96	0.15
57	Subjective Project evaluation method	5.83	0.14
58	Antiquities Risks	5.75	0.13
59	Unforeseen Weather conditions	4.08	0.00

Minimum Value	4.08
Maximum Value	16.92

Table 57: Risk Ranking

The top 26 risks having a severity of 0.4 or more were identified and selected for the quantitative risk analysis presented in the next section. After performing the contract mapping step, it was found that some different risks are covered by the same clause under the contracts such as the following pairs of risks which are: the permits risk and the delay in project approvals/permits risk, the Legislation Changes risk and the change in tax regulation risk, the Contractual risk and the Imperfect Contract documents risk, the deficiency of design risk and the latent defect risk, the provision of transformers, substations or backup power risk and the connection of public utilities to boundaries of site risk. Accordingly, grouping the risks which can be covered by the same contract clause can be done in future research.

On the other hand, the following table shows the number of risks that will be taken into consideration if only the risks with a normalized severity equal to or greater than 0.5 are taken into account. If only the risks with a normalized value equal to or greater than 0.5 are taken into account, then the risks that will be taken into consideration for the Risk Decision Support System will be equal to 16 risks only (around 27%) of the risks. Accordingly, it is more representative to include the risks with a normalized value equal to or greater than 0.4 in the calculations in order to wider the range of the top ranked risks.

#	Risk Factor	Average Severity	Normalized Value
1	Foreign exchange fluctuation	16.92	1.00
2	Political Risk	16.71	0.98
3	Inflation	15.24	0.87
4	Poor public decision making process	15.16	0.86
5	Government policy	14.72	0.83
6	Political/Public opposition	14.28	0.79
7	Lack of supporting infrastructure	14.24	0.79
8	Change in tax regulation	13.4	0.73
9	Government corruption	13.16	0.71
10	Legislation changes	12.88	0.69
11	Public Credit	12.48	0.65
12	Swings in Public Opinion	12.44	0.65
13	Dispute resolution	12.17	0.63
14	Nationalization/expropriation	11.88	0.61
15	Force majeure	10.92	0.53
16	Inadequate law and supervision system	10.6	0.51

17	Interest Rate Fluctuation	10.4	0.49
18	Regulatory/Contractual Risk	10.26	0.48
19	Delay in project approvals/permits	10.16	0.47
20	Price Change	10.04	0.46
21	Revenue Risk	10	0.46
22	Completion risk	9.95	0.46
23	Government Intervention	9.74	0.44
24	Permits Risks	9.63	0.43
25	Operation cost overrun	9.58	0.43
26	Supply and demand	9.17	0.40
27	Quality Control	8.88	0.37
28	Quality Assurance	8.76	0.36
29	Insufficient project finance supervision	8.72	0.36
30	Project/operation changes	8.68	0.36
31	Third party delay/violation	8.67	0.36
32	Planning risks	8.5	0.34
33	Connection of Public utilities to boundaries of site	8.48	0.34
34	Construction Risk	8.38	0.33
35	Material shortage	8.32	0.33
36	Latent Defect Risk	8.13	0.32
37	Deficiency of design	8.08	0.31
38	Provision of transformers, substations or backup power	8.08	0.31
39	Connection to boundary of Site of telephone lines and natural gas provision	8.08	0.31
40	Maintenance Risks	7.83	0.29
41	Imperfect contract documents	7.57	0.27
42	Land acquisition	7.52	0.27
43	Supervision, organization and control for inspection of Construction works	7.43	0.26
44	Inability of concessionaire	7.36	0.26
45	Coordination risks	7.35	0.25
46	Organization risk	7.3	0.25
47	Change in Market demand	7.22	0.24

48	Unforeseen geotechnical conditions	7.17	0.24
49	Market competition	7.08	0.23
50	Inability of concessionaire	6.96	0.22
51	Technological Risks	6.74	0.21
52	Sustainability Risk	6.74	0.21
53	Performance Security Risk	6.73	0.21
54	Physical Obstacles that cannot be avoided	6.71	0.20
55	Labor unavailability	6.54	0.19
56	Access and delivery of site	5.96	0.15
57	Subjective Project evaluation method	5.83	0.14
58	Antiquities Risks	5.75	0.13
59	Unforeseen Weather conditions	4.08	0.00

Minimum Value	4.08
Maximum Value	16.92

Table 58: Risk Ranking-Normalized Value equal to or greater than 0.5

6.3 Decision Support System Development

In order to develop the risk decision support system, the top 26 risks (with a normalized value equal to or larger than 0.4) are inserted in the model for the Quantitative risk analysis.

In the Decision Support System, there are two concepts: the first one is the "Experts Opinion" which is the Opinion that was obtained through the analysis of the 25 surveys. The second one is the "End user's opinion" which is the opinion of the user who is going to use the Decision Support System. This end user can be from the public sector or from the private sector.

The idea of the Decision Support System is based on the fact that the end user starts by selecting the weighing of his opinion with respect to the experts opinion. If the end user has a considerable background about risk management and about investment in PPP projects, then, he/she can assign a large weight to his/her opinions. On the other hand, if the end user does not have an experience about risk management or cannot determine the probability and the impacts of the risks, therefore, he/she should depend more on the experts' opinion.

Below is a screen shot from the model showing the drop-down menu including the experts' opinion weight. Based on the weight assigned to the experts, the end user's opinion will be automatically updated.

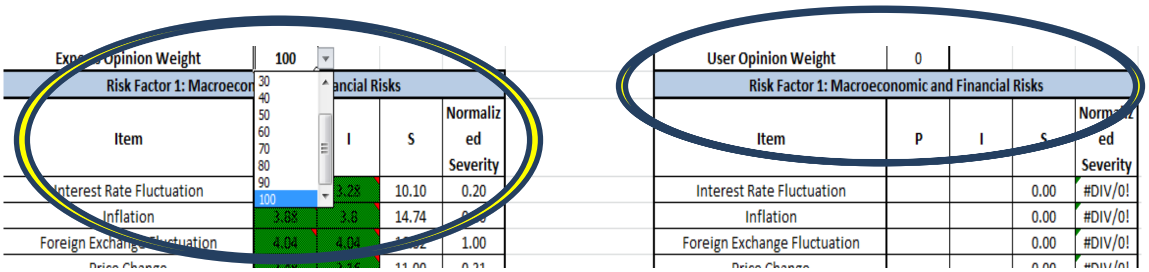


Figure 56: Screen Shot 1 from Crystal Ball model

The experts' opinions were developed through the analysis of the surveys. Accordingly, the values inserted under the section of the "Experts opinion" will remain fixed throughout the calculations unless new questionnaires are filled or unless a larger sample size is inserted.

Moreover, experts' opinions can regularly be updated if the conditions change in the country through the development of new surveys or through distributing a second round of questionnaires. Another screen shot is showing the experts opinion section for the top 26 critical risks:

This section is already filled according to the previous survey results and is not to be filled by the end user				
Risk Factor 1: Macroeconomic and Financial Risks				
Item	**P**	**I**	**S**	**Normalized Severity**
Interest Rate Fluctuation	3.08	3.28	10.10	0.20
Inflation	3.88	3.8	14.74	0.80
Foreign Exchange Fluctuation	4.04	4.04	16.32	1.00
Price Change	3.48	3.16	11.00	0.31
Operation Cost Overrun	3	3.12	9.36	0.10

Revenue Risk	2.84	3.64	10.34	0.23

Risk Factor 2: Commercial and Market Environmental Risks				
Item	**P**	**I**	**S**	**Normalized Severity**
Supply and Demand	2.79	3.08	8.59	0.00
Public Credit	3.24	3.64	11.79	0.41

Risk Factor 3: Legal Risks				
Item	**P**	**I**	**S**	**Normalized Severity**
Permits Risks	2.71	3.42	9.27	0.09
Delay in project approvals/permits	2.8	3.4	9.52	0.12
Legislation Changes	3.32	3.76	12.48	0.50
Dispute resolution	3.21	3.75	12.04	0.45
Change in tax Regulation	3.36	3.92	13.17	0.59
Government policy	3.6	3.92	14.11	0.71

Risk Factor 4: Political Risks				
Item	**P**	**I**	**S**	**Normalized Severity**
Political/Public opposition	3.4	3.96	13.46	0.63
Swings in Public Opinion	3.12	3.68	11.48	0.37
Political Risk	4	4.08	16.32	1.00
Nationalization/Expropriation	2.92	4	11.68	0.40

Risk Factor 5: Regulatory Risks				
Item	**P**	**I**	**S**	**Normalized Severity**
Regulatory/ Contractual Risk	2.96	3.35	9.92	0.17
Government Intervention	3	3.13	9.39	0.10

Risk Factor 6: Government Maturity Risks				
Item	**P**	**I**	**S**	**Normalized Severity**

Poor Public Decision Making Process	3.68	3.92	14.43	0.75
Government Corruption	3.36	3.72	12.50	0.51
Inadequate law and supervision system	2.8	3.48	9.74	0.15

Risk Factor 7: Technical Risks				
Item	**P**	**I**	**S**	**Normalized Severity**
Lack of supporting infrastructure	3.28	4.16	13.64	0.65

Risk Factor 10: Production Risks				
Item	**P**	**I**	**S**	**Normalized Severity**
Completion Risks	2.77	3.64	10.08	0.19

Risk Factor 12: Unforeseen Risks				
Item	**P**	**I**	**S**	**Normalized Severity**
Force Majeure	2.83	3.83	10.84	0.29

Table 59: Experts Opinion part of the model

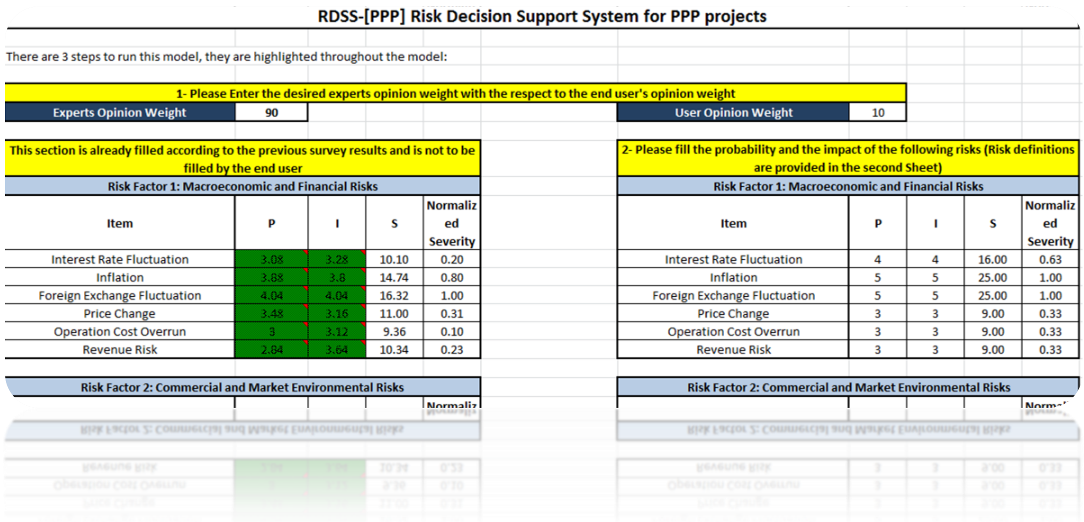
The green cells in the above section of the model are called “Assumptions Cells”. The assumptions cells, in this case, are the probability and the impact.

The End user is asked to fill the probability and the impact of each risk factor based on his personal experience and based on the weight of the end user’s opinion which he/she selects as a first step in the model.

The inputs that the end user is required to fill are:

- The probability of each risk
- The impact of each risk

Below is another screen shot for the model, with the area required to be filled by the end user:



RDSS-[PPP] Risk Decision Support System for PPP projects

There are 3 steps to run this model, they are highlighted throughout the model:

1- Please Enter the desired experts opinion weight with the respect to the end user's opinion weight

Experts Opinion Weight	90	User Opinion Weight	10

This section is already filled according to the previous survey results and is not to be filled by the end user

Risk Factor 1: Macroeconomic and Financial Risks

Item	P	I	S	Normalized Severity
Interest Rate Fluctuation	3.08	3.28	10.10	0.20
Inflation	3.88	3.8	14.74	0.80
Foreign Exchange Fluctuation	4.04	4.04	16.32	1.00
Price Change	3.48	3.16	11.00	0.31
Operation Cost Overrun	3	3.12	9.36	0.10
Revenue Risk	2.84	3.64	10.34	0.23

Risk Factor 2: Commercial and Market Environmental Risks

2- Please fill the probability and the impact of the following risks (Risk definitions are provided in the second Sheet)

Risk Factor 1: Macroeconomic and Financial Risks

Item	P	I	S	Normalized Severity
Interest Rate Fluctuation	4	4	16.00	0.63
Inflation	5	5	25.00	1.00
Foreign Exchange Fluctuation	5	5	25.00	1.00
Price Change	3	3	9.00	0.33
Operation Cost Overrun	3	3	9.00	0.33
Revenue Risk	3	3	9.00	0.33

Risk Factor 2: Commercial and Market Environmental Risks

Figure 57: Screen shot for the model

The Decision Support System's output is the following:

- The Average risk level based on the experts opinion
- The Average normalized risk level based on the experts opinion
- The Average risk level based on the end user's opinion
- The Average normalized risk level based on the end user's opinion
- The overall risk level for the whole project
- The overall normalized risk level for the whole project
- The Contingency percentage for the whole project based on the most critical risks included in the questionnaire and based on the severity obtained.

Based on the severity of the project and based on the contingency percentage associated with the risks in this specific project, the end user can decide whether this specific project should be accepted or not.

6.4 Principle of Operation of the Decision Support System

Due to the limited number of PPP projects in Egypt, and due to the fact that the PPP project that has been completed in Egypt is only finished in terms of construction while the operations have not yet started. The major case study used to develop the decision support system is "New Cairo Waste Water treatment Plant". In this project the construction phase only has been completed. In order to better understand the role and use of the Decision Support System, the different types of expenses incurred by the Private party should be understood. These are the pre-operating expenses, the Bank Fees and the Costs associated with the EPC contractor. On the other hand, the public party incurs the inflation costs associated with the Operations and Maintenance during the concession period (18 to 20 years or more). The Operations and Maintenance costs are usually subject to increase according to the escalation formula agreed upon in the Contract. In the case of New Cairo Waste Water Treatment Plant, the operation fees are calculated per m^3 of the delivered clean water. On the other hand, the project development costs and the costs related to the EPC contractor cannot be changed backwards as these costs are only incurred during the construction period of the project.

Below is a summary for the important costs incurred by the Private Party in the pre-operation phase of a PPP project:

	Special Purpose Vehicle (SPV) fees
	SPV insurance during construction
	Construction Permits
Pre-operating expenses	Environmental consultants

Bank Fees	Technical Experts
	Banks legal fees
	Bank Insurance and Environmental fees
	Performance Security fees
	Administration fees
	Stamp duties
EPC	Buildings
	Equipment
	Mechanical, Electrical and Plumbing
	Maintenance

Table 60: Major expenses incurred by the Private Party in PPP projects

In the case of New Cairo waste water treatment plant, and since the operation phase of the project has not started yet, then the contingency percentage obtained is only for the costs associated with the investment into the project. These costs are divided into two sections: the project development cost and the costs related to the EPC contractor. The contingency percentage incurred for the investment cost of the project was around 3 %.

Due to the lack of the PPP projects that are already performed in Egypt, an assumption was settled in order to develop the Decision Support system. This assumption is that there is a linear relationship between the severity of the project and the percentage of contingency cost associated with this specific project. Accordingly, it is assumed that, theoretically, if the severity of the project is null, then, there will be no contingency costs associated with the project. This was the first point in the graph representing the linear relationship between the severity and the contingency. In order to get the second point and develop the graph, the case study taken into consideration is that of New Cairo waste water treatment plant. In this case, the severity of the project is obtained through the model, by getting an end user acquainted with the project's conditions fill the part related to the end user as it is shown in the below figure extracted from the model:

2- Please fill the probability and the impact of the following risks (Risk definitions are provided in the second Sheet)

Risk Factor 1: Macroeconomic and Financial Risks				
Item	**P**	**I**	**S**	**Normalized Severity**
Interest Rate Fluctuation	4	4	16.00	0.63
Inflation	5	5	25.00	1.00
Foreign Exchange Fluctuation	5	5	25.00	1.00
Price Change	3	3	9.00	0.33
Operation Cost Overrun	3	3	9.00	0.33
Revenue Risk	3	3	9.00	0.33

Risk Factor 2: Commercial and Market Environmental Risks				
Item	**P**	**I**	**S**	**Normalized Severity**
Supply and Demand	4	4	16	0.63
Public Credit	4	4	16.00	0.63

Figure 58: Extract from the Decision Support System-end user's opinion

On the other hand, the contingency of the project was obtained through asking experts who have worked in this project. Accordingly, the linear relationship was developed as follows:

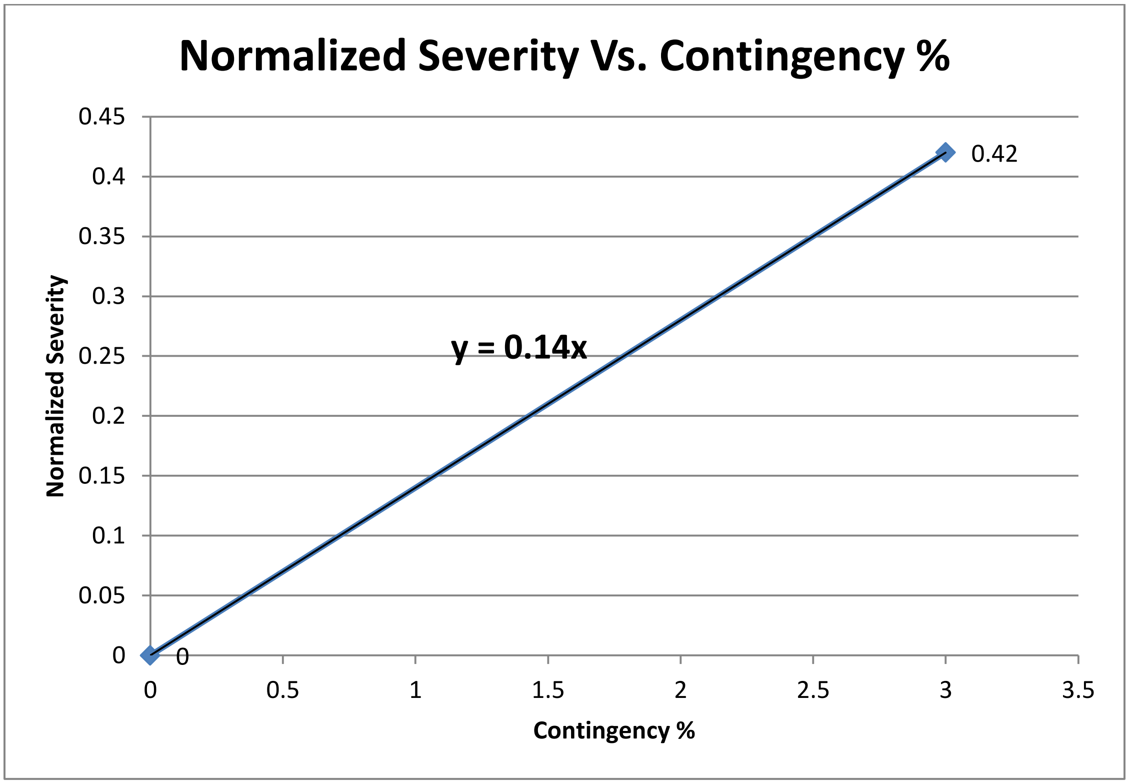


Figure 59: Normalized Severity Vs. Contingency %

However, this relationship is subject to change, because in the above case, the end user's opinion weight was chosen to affect the results by only 10 % whereas the larger weight was given to the experts (90 %).

Changing the experts' opinion's weight with respect to the end user's opinion's weight will affect the severity obtained for the project as it will change the probability and impact entered to the Decision Support System. Below is a table showing the effect of changing the percentage to the experts' opinion weight and the end user's opinions weight on the overall severity of the project:

Experts Opinion's weight	End User's opinion weight	Project's Overall Severity
100	0	0.41
90	10	0.42
80	20	0.42
70	30	0.42
60	40	0.43
50	50	0.43
40	60	0.44
30	70	0.44
20	80	0.44
10	90	0.45

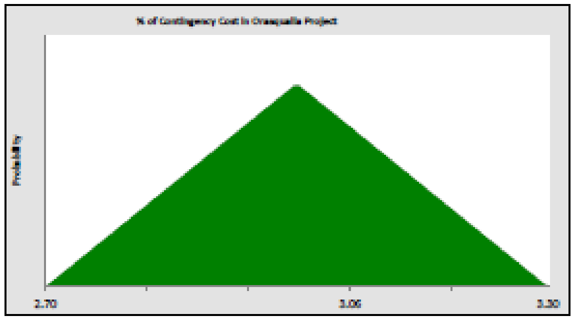
Table 61: Effect of changing the percentage to the experts' opinion weight and the end user's opinions weight on the overall severity of the project

Running the crystal ball model depends on defining Assumptions Cells and Forecast Cells. The Assumptions Cells are the cells that contain uncertain variables which, in this case are the probability and the impact determined from the survey results. The probability and the impact for each risk factor are chosen to have a normal distribution with a mean and standard deviations equal to the ones obtained in the calculations of the survey results (explained in Chapter 4 and present in Appendix 1).

Also, an additional assumption cell is defined which is the percentage of Contingency cost in New Cairo Waste Water treatment plant project. This assumption cell is having a triangular probability distribution ranging from having a minimum value of 2.7 % and a maximum value of 3 % as shown in the below distribution:

Triangular distribution with parameters:

Minimum	2.70
Likeliest	3.00
Maximum	3.30



Assumption: Change In Tax Regulation-Impact

Normal distribution with parameters:

Mean	3.92
Std. Dev.	0.95

Figure 60: Probability Distribution for % of contingency cost in New Cairo Waste Water treatment Plant project

(An illustration for the probability distribution assumed for developing the Decision Support System is presented in Appendix 2).

When the user runs the model, the forecasts cells of the Decision Support System are the overall risk level of the project (overall normalized severity) in addition to the percentage of contingency of the project. The Overall severity of the project is calculated through the combined probability and impact of the experts and the end user. Crystal Ball uses Monte Carlo simulation in order to deliver the results. *"During a simulation, Crystal Ball calculates numerous scenarios of a model by repeatedly picking values from the probability distribution for the uncertain variables and using those values for each assumption cell. Commonly, a Crystal Ball simulation calculates hundreds or thousands of scenarios, or trials, in just a few seconds. The value to use for each assumption for* *each trial is selected randomly from the defined possibilities. For every assumption cell, Crystal Ball generates a random number according to the probability distribution defined and places it into the spreadsheet, then Crystal Ball recalculates the spreadsheet and finally retrieves a value from every forecast"* (Crystal Ball 7.2.2 User Manual).

The figure below is an extract from the Decision support system (RDSS-PPP) showing the different deliverables of the Decision Support System after running the simulation:

3- Click "Start"

Average Risk Level (Experts Opinion)	11.78
Average Normalized Risk Level (Experts Opinion)	0.41
Maximum Severity	16.32
Minimum Severity	8.59

Average Risk Level (Previous End User(s) Opinion)	11.85
Average Normalized Risk Level (End User's Opinion)	0.45
Maximum Severity	25.00
Minimum Severity	1.00

Overall Risk Level	11.84
Normalized Overall Risk Level	0.45

% of Contingency Cost in Orasqualia Project	3
Severity/Contingency (Slope of the Line) for Orasqualia Project	0.15
Contingency % for the New Project	3.00

Figure 61: Deliverables of the Decision Support System

6.5 Analysis of Simulation results

The Decision Support System (RDSS-PPP) delivers two forecast values based on 1000 iterations:

1- The expected project overall severity (based on the experts and the end users' opinions)

2- The expected contingency percentage for any new project

Along with the forecast values, the Decision Support System developed using Crystal Ball displays forecast charts which show each forecast along with its confidence level and range.

6.5.1 Expected Project Overall Normalized Severity

The below chart shows that with a confidence level of 80 %, the Normalized Overall Risk for a given project ranges from 0.33 to 0.5.

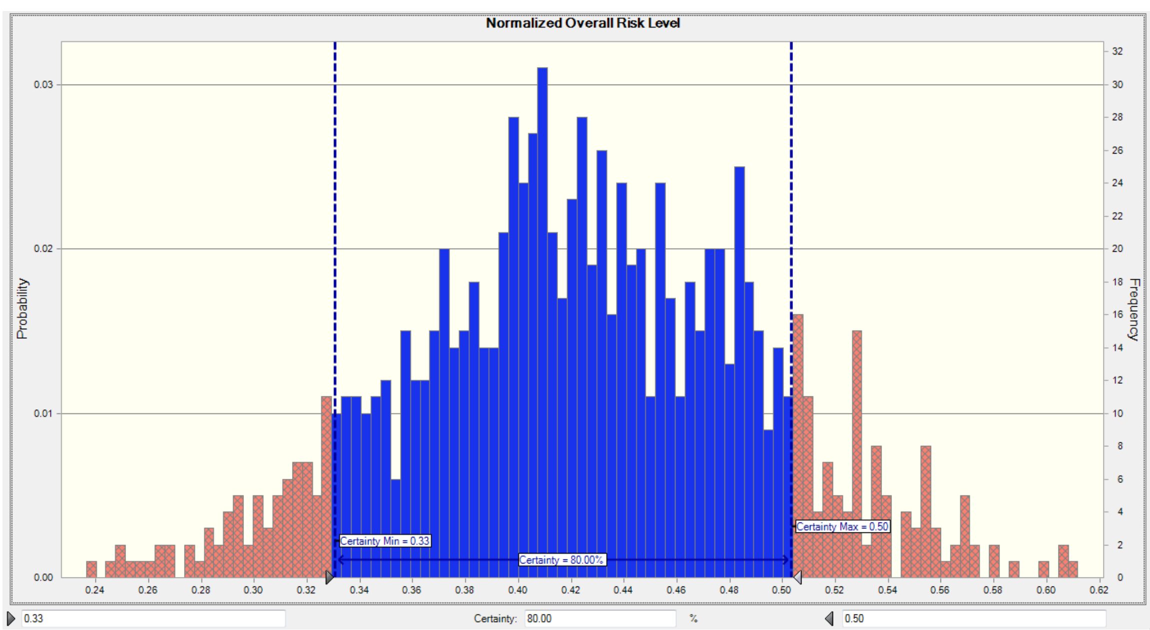


Figure 62: Forecast Chart Normalized Overall Risk Level- 80 % confidence

The minimum normalized severity value is 0.21 and the maximum severity value is 0.68. The Mean and the Median are equal to 0.42 and the standard deviation is equal to 0.07.

Also, it is noticed from the first forecast chart that the distribution that best fits those results is the normal distribution as shown in the below chart:

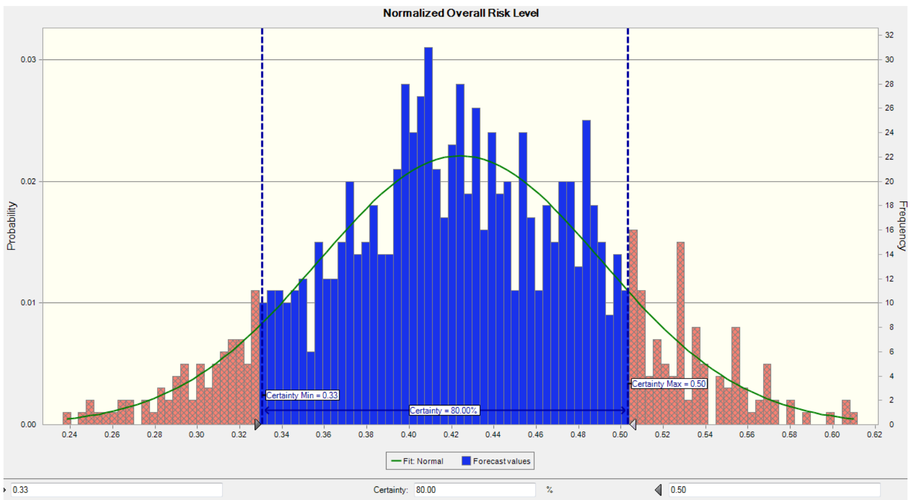


Figure 63: Normalized Overall risk level-normal distribution fitting

The following chart shows the cumulative frequency, or in other words the range for the normalized overall risk level from the minimum value up to the maximum value, with a probability of 50 %. It is noticed that with a certainty of 50 %, the overall normalized risk level for a given project ranges from 0.4 to 0.5.

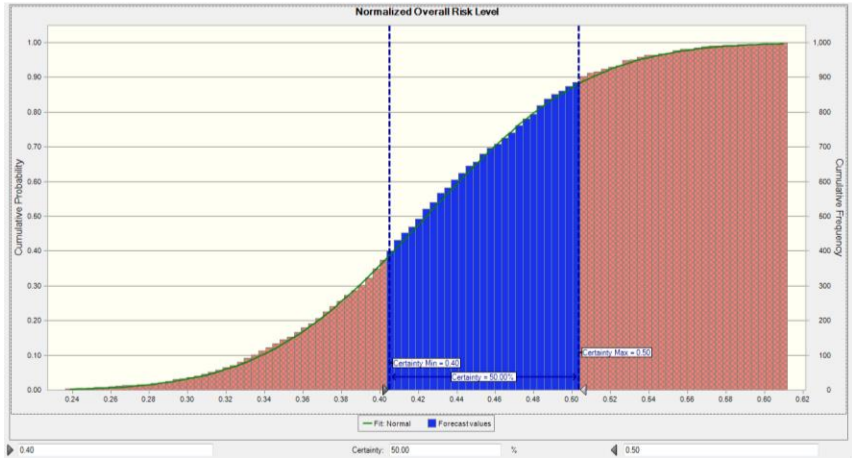


Figure 64: Normalized Overall risk level-cumulative frequency

The Decision Support System delivers as well Sensitivity data through correlation coefficients. *"Correlation coefficients provide a meaningful measure of the degree to which assumptions and forecasts change together. If an assumption and a forecast have a high correlation coefficient, it means that the assumption has a significant impact on the forecast (both through its uncertainty and its model sensitivity). Positive coefficients indicate that an increase in the assumption is associated with an increase in the forecast. Negative coefficients imply the opposite situation. The larger the absolute value of the correlation coefficient, the stronger the relationship"* (Crystal Ball 7.2.2 User Manual).

This is illustrated through the Decision Support System output as it is shown:

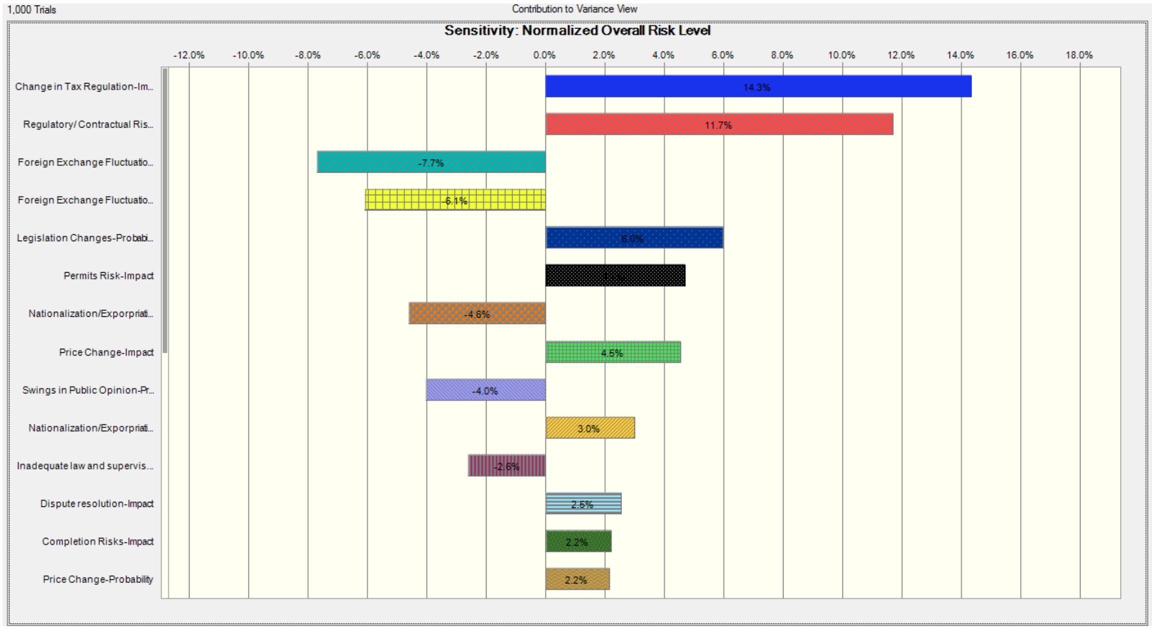


Figure 65: Normalized Overall Risk Level-Contribution to Variance chart

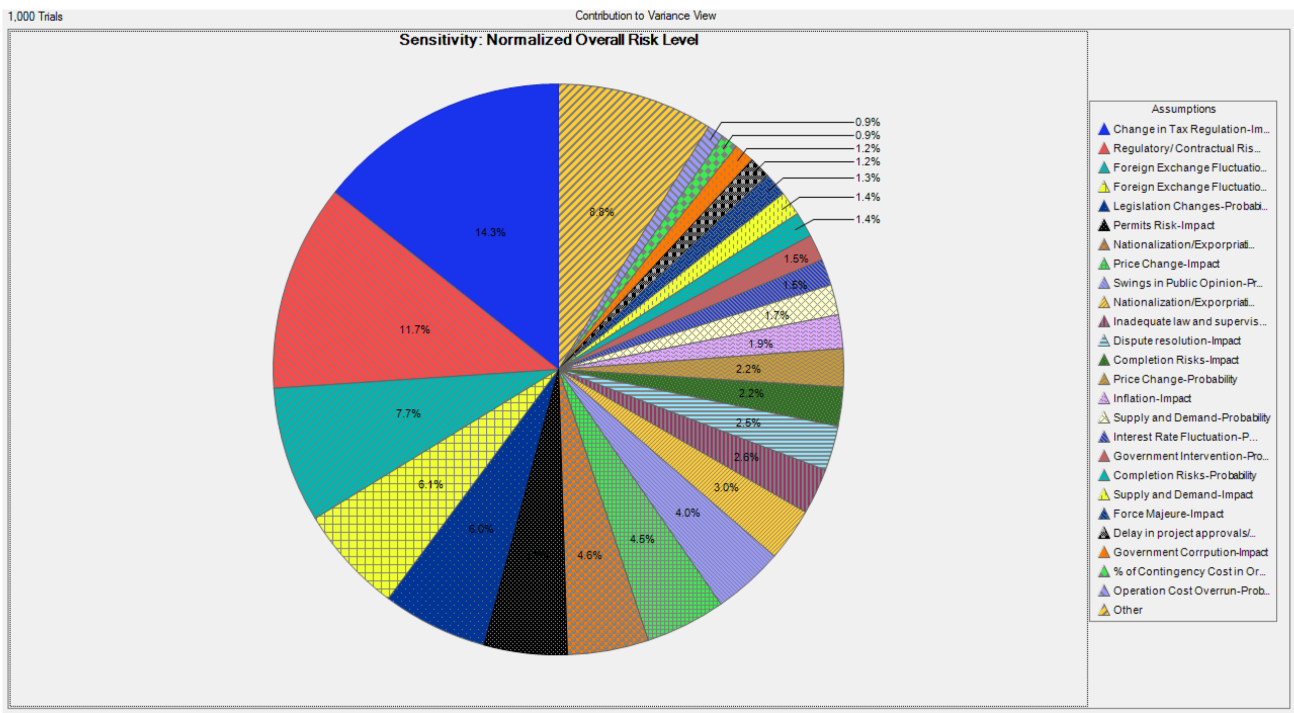


Figure 66: Normalized Overall Risk Level-Contribution to Variance pie chart

00 Trials — Sensitivity Data View

Assumptions	Contribution to Variance	Rank Correlation
Change in Tax Regulation-Impact	14.3%	0.15
Regulatory/ Contractual Risk-Probability	11.7%	0.14
Foreign Exchange Fluctuation-Impact	7.7%	0.11
Foreign Exchange Fluctuation-Probability	6.1%	0.10
Legislation Changes-Probability	6.0%	0.10
Permits Risk-Impact	4.7%	0.09
Nationalization/Exporpriation-Probability	4.6%	0.09
Price Change-Impact	4.5%	0.09
Swings in Public Opinion-Probability	4.0%	0.08
Nationalization/Exporpriation-Impact	3.0%	0.07
Inadequate law and supervision system-Probability	2.6%	0.06
Dispute resolution-Impact	2.5%	0.06
Completion Risks-Impact	2.2%	0.06
Price Change-Probability	2.2%	0.06
Inflation-Impact	1.9%	0.06
Supply and Demand-Probability	1.7%	0.05
Interest Rate Fluctuation-Probability	1.5%	0.05
Government Intervention-Probability	1.5%	0.05
Completion Risks-Probability	1.4%	0.05
Supply and Demand-Impact	1.4%	0.05
Force Majeure-Impact	1.3%	0.05
Delay in project approvals/permits-Impact	1.2%	0.04
Government Corrpution-Impact	1.2%	0.04
% of Contingency Cost in Orasqualia Project	0.9%	0.04
Operation Cost Overrun-Probability	0.9%	0.04
Other	8.8%	---

Table 62: Sensitivity Data View- Normalized Overall Risk Level

From the above two figures and above table, the impact of the change in tax regulation is the assumption that accounts for approximately 14.3 % of the variance in forecast value of the overall risk level of the project and can be considered as the most important assumption in the model. This assumption needs more investigation by the end user in order to reduce its uncertainty in the future. The probability of the regulatory/contractual risks accounts for 11.7 % of the variance in the forecast value of overall risk level of the project. On the other hand, the assumption of the percentage of contingency contributes to only 0.9% to the variance of the forecast value of the overall risk level. This result is reasonable and makes sense since this assumption has almost no effect on the overall risk level of the project.

The role of the trend chart is to determine the confidence intervals of the forecast in one chart. For instance, according to the following chart, the values situated in the 90 % confidence level show the range of values (forecasts) that have a 90 % probability of occurrence.

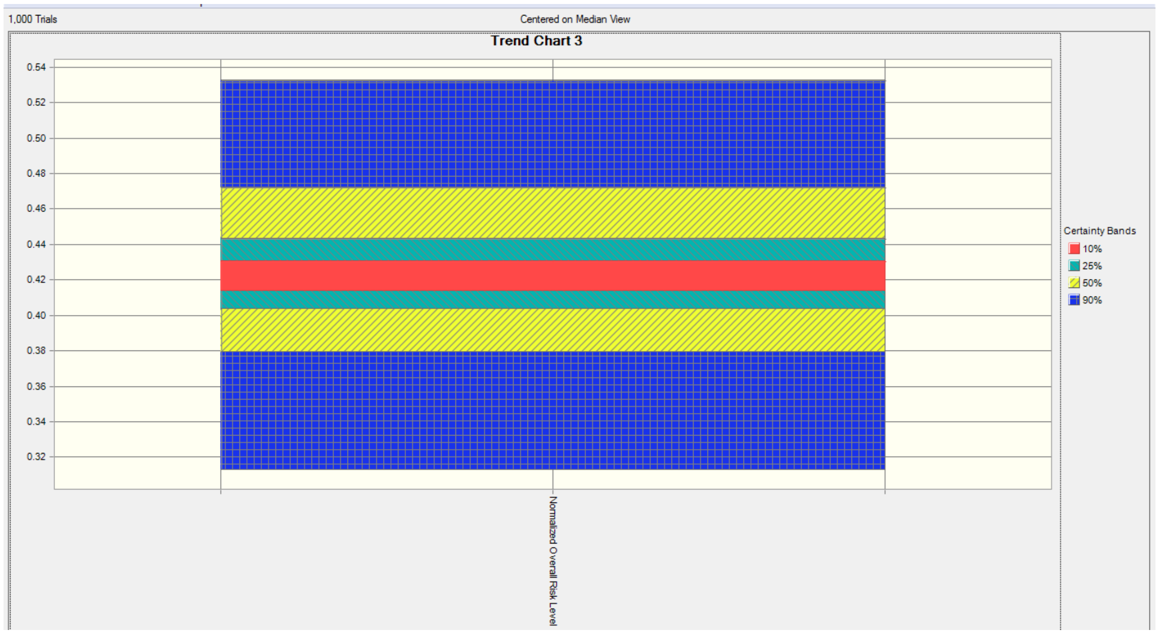


Figure 67: Trend Chart- Cumulative View-Overall Risk Level

6.5.2 Expected Contingency Percentage for the project

The below forecast chart is for the expected contingency percentage of the project. It is shown that with a confidence of 80 % the expected contingency percentage that should be taken into account for the project will range from 2.84% and 3.16 %.

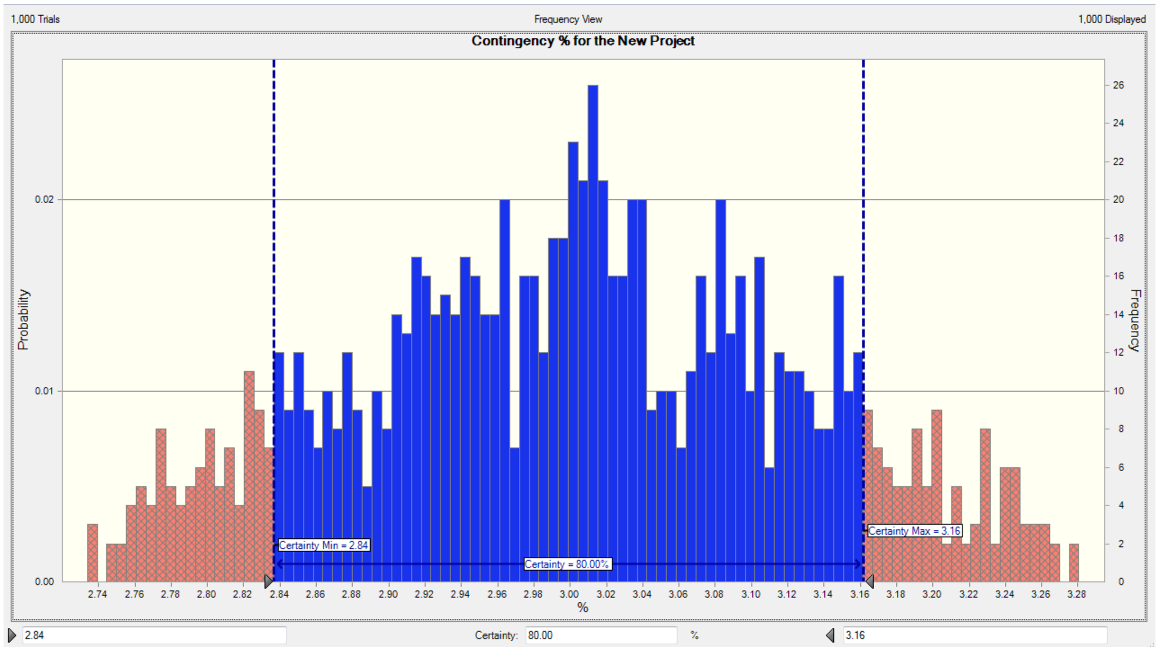


Figure 68: Expected contingency percentage-80 % Confidence Level

The Probability distribution that fits this data the most is the Beta Distribution as shown in the below figure:

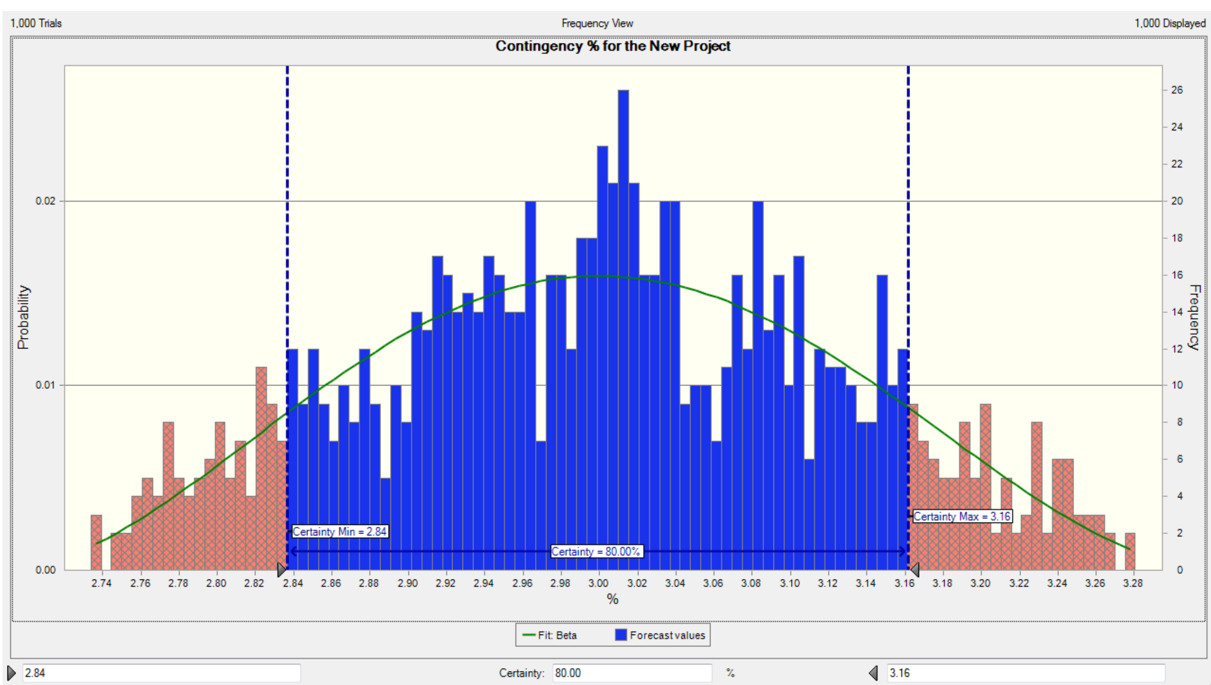


Figure 69: Expected contingency percentage-Beta Distribution

The mean and median of the above probability distribution are equal to 3. The standard deviation is equal to 0.12.

The below chart shows the cumulative frequency for the percentage of contingency cost for the project which in the case of 50 % certainty ranges from 2.92 to 3.09 as shown in the below chart:

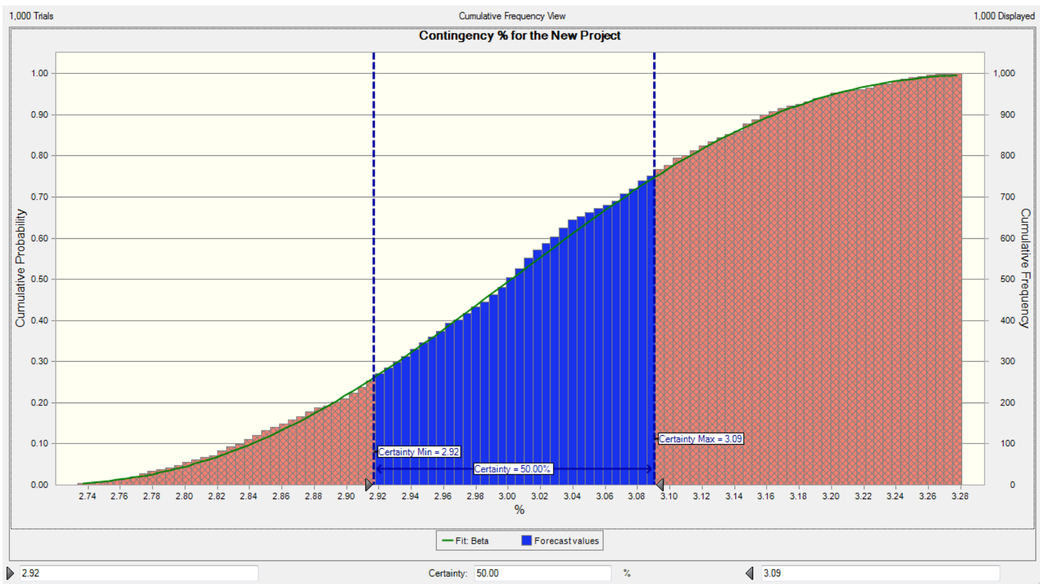


Figure 70: cumulative frequency for the percentage of contingency cost for the project

Concerning the sensitivity chart, it is shown that the assumption of the percentage of contingency in New Cairo Waste Water treatment plant accounts for 95.1 % to the variance in forecast value of the percentage of contingency that should be assigned to the project. This makes perfect sense as this assumption plays a major role in forecasting the percentage of contingency of the project while the other assumptions are less important to the forecast of the contingency percentage that should be assigned to the project as they had a greater importance in the first forecast value related to the overall normalized severity of the project.

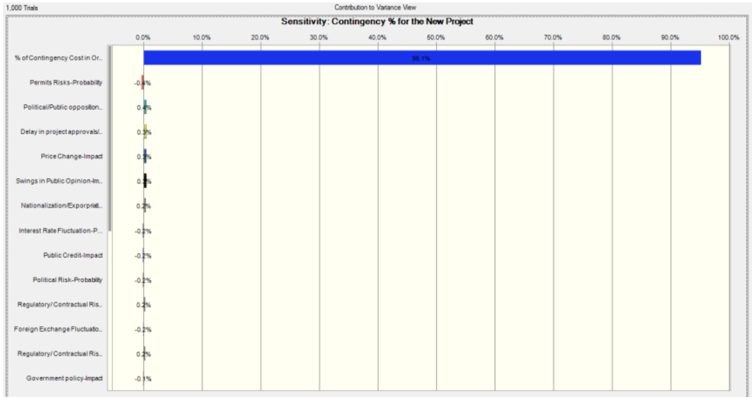


Figure 71: Sensitivity Chart-percentage of contingency cost for the project

According to the below chart, the values situated in the 90 % confidence level show the range of values (forecasts) that have a 90 % probability of occurrence.

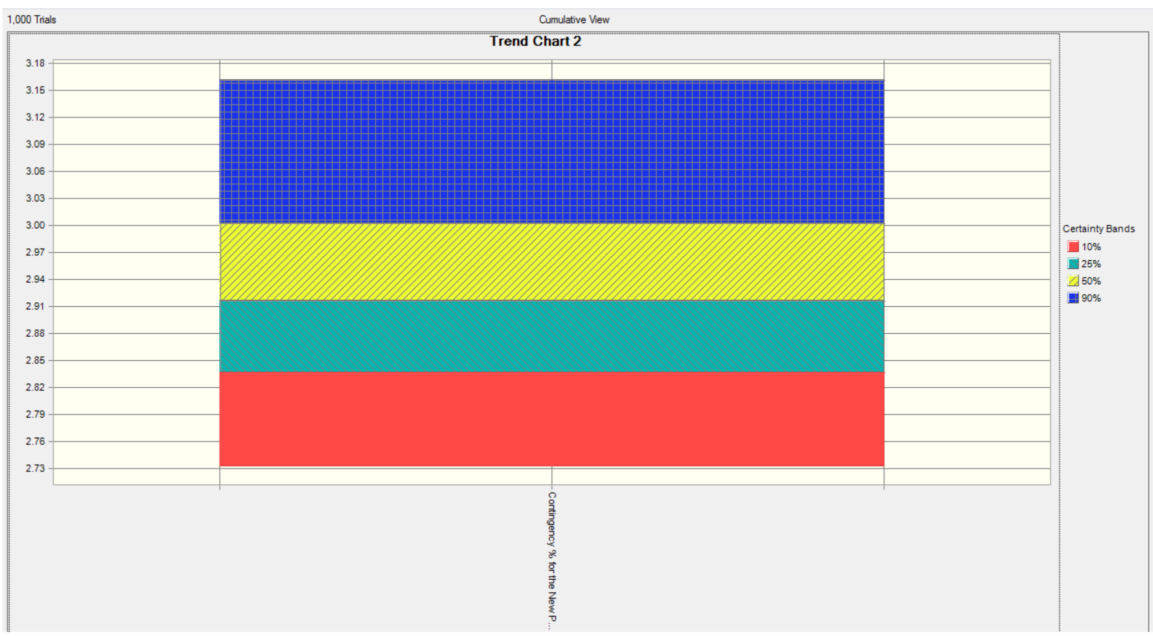


Figure 72: Trend Chart-Contingency %

The below figure shows both forecast charts along with their probability distributions:

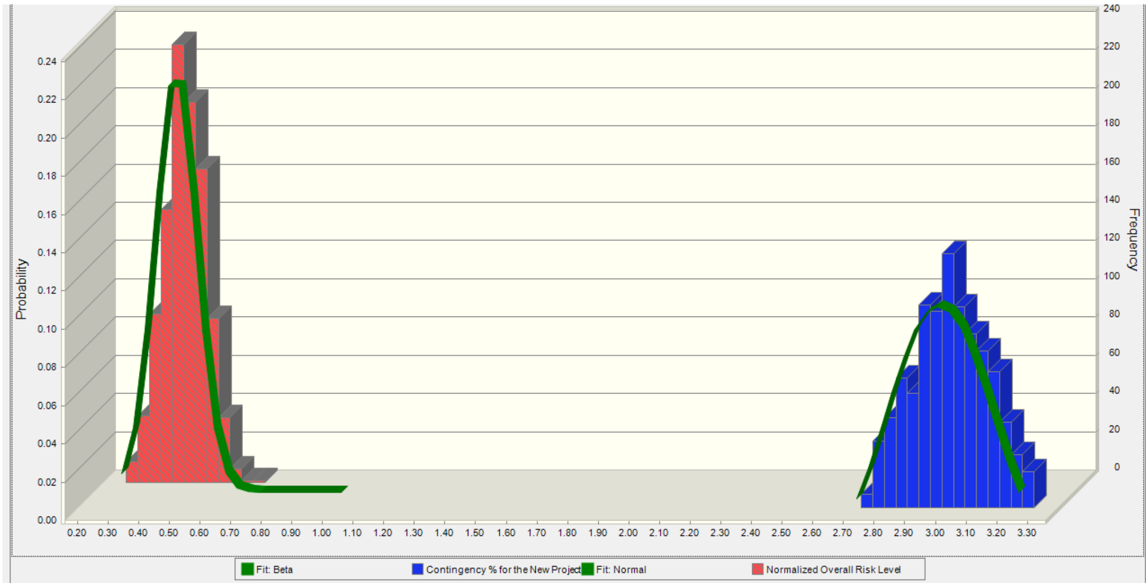


Figure 73: Overlay Charts

6.6 Decision Support System Limitations

The major limitations of the decision support system developed are the following:

1- The top ranked 26 risks inserted in the model are based only on the current status prevailing in Egypt and is depending on the opinion of 25 experts in addition to any end user that will use the decision support system

2- Due to the lack of PPP projects in Egypt, the researcher assumed a linear relationship between the severity of the project and the contingency percentage that should be assigned to the project based on its severity. In case more information has been available concerning the severity of already executed PPP projects and contingency percentage allocated to those projects, the researcher would have been to obtain a best fit line for those values or a suitable probability distribution which will lead to more accurate results concerning the contingency cost of the PPP projects.

3- The case study project which New Cairo waste water treatment plant has not yet reached the operation phase. Therefore, the concession period has not yet commenced. Accordingly, the contingency percentage assumed to this project is based on the construction phase only which includes the project development cost and the EPC cost without taking into consideration the O & M costs.

6.7 Validation for Top Ranked risks

In order to check for the validity and accuracy of the top ranked risks identified and which were inserted in the Risk Decision Support System, a comparison is performed between the top 26 risks (with a normalized Severity equal to or greater than 0.4) are compared to the top risks identified through the Literature Review in two countries: China and India.

6.7.1Validation of the Top Ranked Risks with the Chinese Case

According to the studies published by Xu et al. in 2010 and 2012, the survey results identified 17 critical risk factors with a normalized severity equal to or greater than 0.5. Those critical risk factors are compared to the critical risk factors identified in Egypt. The similar risks in both countries are highlighted.

Risk #	Egypt (2013)	China (2012)
1	Foreign exchange fluctuation	Government Intervention
2	Political Risk	Poor public decision making process
3	Inflation	Government corruption
4	Poor public decision making process	Financing risk
5	Government policy	Inadequate law and supervision system
6	Political/Public opposition	Public credit
7	Lack of supporting infrastructure	Subjective project evaluation method
8	Change in tax regulation	Interest rate fluctuation

9	Government corruption	Conflicting or imperfect contract
10	Legislation changes	Change in Market demand
11	Public Credit	Insufficient Project Finance Supervision
12	Swings in Public Opinion	Operation Cost Overrun
13	Dispute resolution	Foreign exchange fluctuation
14	Nationalization/expropriation	Inflation
15	Force majeure	Project/Operation changes
16	Inadequate law and supervision system	Completion risks
17	Interest Rate Fluctuation	Price Change

Table 63: Comparison between top risks in Egypt and China

From the above tables, it is noticed that when comparing the top 17 risks in Egypt to the top 17 risks in China, some risks are repeated with different ranking. For instance, the most critical risk in Egypt is the Foreign Exchange Fluctuation risk. This risk is taking the twelfth rank in China. On the other hand, the Government Intervention Risk which is the most critical risk in China occupies the twenty third position in Egypt. Also, other risks occupy almost the same position in both countries such as the poor public decision making process risk which occupies the second position in terms of criticality in China and the fourth position in Egypt. Also, the Price Change risk is ranked number 17 in China while it is number 20 in Egypt.

6.7.2 Validation of the Top Ranked Risks with the Indian Case

According to the study performed by Lyer and Sagheer (2010), 17 critical risks are identified for India through interviews, literature review and case studies. The similar risks in both countries are highlighted:

Risk #	Egypt (2013)	India (2010)
1	Foreign exchange fluctuation	Preinvestment risks
2	Political Risk	Delay in Financial Closure
3	Inflation	Resettlement and Rehabilitation
4	Poor public decision making process	Delay in Land acquisition
5	Government policy	Permit/Approval risk
6	Political/Public opposition	Technology risk
7	Lack of supporting infrastructure	Design and latent defect risk
8	Change in tax regulation	Cost Overrun risk
9	Government corruption	Schedule risk
10	Legislation changes	Direct political risk
11	Public Credit	Indirect political risk
12	Swings in Public Opinion	Legal risk
13	Dispute resolution	Financial risk
14	Nationalization/expropriation	Nonpolitical force majeure risk
15	Force majeure	Partnering risk
16	Inadequate law and supervision system	Environmental risk
17	Interest Rate Fluctuation	Physical risk

Table 64: Comparison between top risks in Egypt and India

When comparing the Egyptian model to the Indian model for PPP projects, it is noticed that the risk grouping according to the Indian study is different from that of the Egyptian study. For instance, according to the Indian study, the political risk is divided into direct political risks and indirect political risks. The direct political risks being the risks associated with expropriation, changes in law and the indirect political risks being the risks of war, riots or terrorism. According to the Egyptian study, the division of risks is different where the political risks are not divided as in the Indian case and the nationalization/expropriation risk is identified as a separate risk factor. In India, the Preinvestment risks and the delay in financial closure are the top ranked risks while those risks are not identified in the Egyptian study. The delay in land acquisition, which is the fourth ranked risk in India is taking the forty second rank in Egypt. Also, some risks have a different nomenclature in both countries such as the interest rate fluctuation risk in Egypt which is taking the seventeenth position is already covered under the financial risk in India. Also, due to the difference in the conditions between both countries, India identified a separate risk factor named “nonpolitical force majeure” which is related to the natural disasters such as floods and earthquakes. This risk is not likely to occur in Egypt. For instance, the unforeseen weather conditions risk in Egypt is taking the last position in the 59 identified risks in the questionnaire. The latent defect risk which has a low severity according to the Egyptian study is taking the sixth position in India.

6.7.3 Validation of the Top Ranked Risks with the Singaporean Case

A third comparison is presented in this research which is the comparison with study performed by Hwang et al. (2012). In this study, the top ranked risks are identified along with the proposed risk allocation for each risk. The risk ranking and the risk allocation of the top 26 ranked risks in Singapore are compared with the top 26 ranked risks in Egypt in the following table. The similar risks in both countries are highlighted:

Risk #	Egypt (2013)		Singapore (2012)	
	Risk Factor	**Allocation**	**Risk Factor**	**Allocation**
1	Foreign exchange fluctuation	Both	Lack of support	Public

			from Government	
2	Political Risk	Both	Availability of finance	Private
3	Inflation	Both	Construction time delay	Private
4	Poor public decision making process	Project Dependent	Inadequate experience in PPP	Both
5	Government policy	Both	Unstable government	Public
6	Political/Public opposition	Both	Lack of legal/regulatory framework	Public
7	Lack of supporting infrastructure	Both	Site Safety and Security	Private
8	Change in tax regulation	Project Dependent	Construction cost overrun	Private
9	Government corruption	Private	Organizational and communication risk	Private
10	Legislation changes	Project Dependent	Strong political interference	Public
11	Public Credit	Both	Inflation	Both
12	Swings in Public Opinion	Both	Interest rate	Both

13	Dispute resolution	Both	Corruption and bribery	Both
14	Nationalization/expropriation	Private	Inadequate distribution of responsibilities	Both
15	Force majeure	Both	Delay in approval and permits	Project Dependent
16	Inadequate law and supervision system	Project Dependent	Inconsistent Legal/regulatory framework	Public
17	Interest Rate Fluctuation	Both	Inadequate distribution of authority	Both
18	Regulatory/Contractual Risk	Project Dependent	Lack of commitment between parties	Both
19	Delay in project approvals/permits	Both	Poor financial market	Private
20	Price Change	Both	Differences in working method	Both
21	Revenue Risk	Project Dependent	Excessive contract variation	Project Dependent
22	Completion risk	Private	Financial attraction of project to	Private

			investors	
23	Government Intervention	Project Dependent	Level of demand for project	Private
24	Permits Risks	Both	Operation Cost overrun	Private
25	Operation cost overrun	Private	Material availability	Private
26	Supply and demand	Both	Low operation productivity	Private

Table 65: Comparison between top risks in Egypt and Singapore

From the above table, it is concluded that, the Government Corruption risk in Egypt is called Corruption and Bribery risk in Singapore. However, the risk allocation in the Singaporean case is more logical as it is allocated to both parties rather than to a specific party. This risk is ranked number nine in Egypt while is ranked number thirteen in Singapore. Also, the inadequate law and supervision system risk in Egypt which corresponds to the inconsistent legal/regulatory framework in Singapore has exactly the same ranking (16) in both countries. In Singapore, this risk is purely allocated to the Public party while in Egypt, it is mentioned that its allocation will be based on the specific circumstances of the project. The inflation risk is occupying a high rank in both Egypt and Singapore. The Operation cost overrun is occupying almost the same ranking in both countries as well. The top ranked risk in Singapore is the lack of support from the government which differs from Egypt where the top ranked risk is the foreign exchange fluctuation risk.

Chapter 7: Conclusions and Recommendations for Future Research

7.1 Research Conclusions

This research focuses on contract management and risk analysis for PPP projects in Egypt. The major goal of this study is to perform a contract and risk analysis for PPP projects in Egypt by: (1) Identifying and ranking the various risks affecting PPP projects in Egypt and determining their allocation, (2) An attempt for mapping the identified risks and the risk allocation identified to contract clauses where the risk allocation is defined clearly in the clause (public private or both), and finally (3) Developing a prototype for Risk Decision Support System for the top ranked risks.

Fifty nine risk factors were identified through the literature review and through interviewing experts. The identified risks were included in a questionnaire distributed among 25 experts who assessed the probability, impact and severity of each risk factor in addition to the risk allocation. The following risks were identified to be the top risk groups: Financial and Macroeconomic risk group, Commercial risk group, Legal risk group, Political risk group, Regulatory risk group, Government maturity risk group, Technical risk group, Production risk group and Unforeseen risk group.

After the attempt for contract mapping was performed, it is concluded that most of the risks have been mapped. The Performance Security risk, the Permits risk, the Changes in Law risk, the Dispute Resolution risk, the Force Majeure and the Deficiency of Design are all explicitly covered and addressed in both Contracts. In some cases, the risk allocation according to the survey results was perfectly conforming to the risk allocation according to the real case contracts as in the case of the Performance Security risk, the Permits risk, the Unforeseen Geotechnical conditions risk and the Latent Defect risk. On the other hand, the allocation of Nationalization/Expropriation risk is to the Public Party according to both contracts as it is considered as an Employer's event of default. However, according to the survey results, this risk was allocated to the Private Party. Also, concerning the Government Corruption risk, it was not covered under the real case contracts. However, this risk shall be allocated to the Public Party rather than to the Private Party which does not conform to the survey results. It was also found that some different risks are covered by the same clause under both contracts which are the following pairs of risks:

- The permits risk and the delay in project approvals/permits risk,
- The Legislation Changes risk and the change in tax regulation risk,
- The Contractual risk and the Imperfect Contract documents risk,
- The deficiency of design risk and the latent defect risk,
- The provision of transformers, substations or backup power risk and the connection of public utilities to boundaries of site risk.

The prototype for Risk Decision Support System for the top ranked risks was developed in order to determine the overall risk level (overall normalized severity) and the overall contingency percentage that should be assigned to the project.

Based on the comparison performed between the top ranked risks identified in Egypt and the top ranked risks identified in China, India and Singapore in 2012, 2010 and 2012 respectively in order to determine whether the top ranked risks identified in Egypt are similar to the top ranked risks identified in the aforementioned three countries, it was concluded the interest rate fluctuation risk, the permits risks, the political risks and the government corruption risks are identified in various countries and are top rankled in terms of their impact on the PPP projects.

7.2 Future Work

In order to overcome the current Decision Support System limitations and in order to increase the accuracy of the results, future work is suggested:

1- The relatively small sample size is due to the unfamiliarity of many experts in the domain of Construction Engineering with the nature and with the risks associated with PPP projects. However, with the expected expansion in the domain of PPP, experts will get more acquainted with PPP projects. Also, the questionnaire should be repeated in case of any change in the conditions of the country in order to assess how this change is reflected in the domain of PPP.

2- In case more projects are executed under the PPP scheme, the following table can be added to the decision support system:

Severity		Contingency %
Min	Max	

Table 66: Future additions to the DSS

This table will include a summary for the data obtained from previous projects. It will include the severity ranges and the corresponding contingency percentage that was allocated for each severity range. In this case, after the end user assigns the weight of his opinion in addition to the probability and impact of each risk, the end user will insert the estimated project cost. Based on the severity obtained from the model, the decision support system will help the user knowing the range in which his project falls and accordingly it will calculate the additional project cost caused by the contingency as well as the percentage of contingency cost as shown in the below extract form the future model:

Project Estimated Cost		Step 3: Please enter the project estimated cost (the Contract Price)
Additional Project Cost		Forecast
Total Project Cost		
% of Contingency Cost		Forecast
Step 4: Please run the Model (Crystal Ball Tab and "Start")		

Table 67: Deliverables of the modified RDSS-PPP

3- After performing the contract mapping step, it was found that some different risks are covered by the same clause under the contracts. Accordingly, grouping the risks which can be covered by the same contract clause can be done in future research in order to reduce the number of risk factors.

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Appendix 1: Survey calculations

Factor 1: Macroeconomic and Financial Risks

1- Interest Rate Fluctuation
2- Inflation
3- Foreign Exchange Fluctuation
4- Price Change
5- Operation Cost Overrun
6- Revenue Risk
7- Inability of Concessionaire
8- Subjective Project Evaluation method
9- Insufficient Project Finance Supervision

Respondent #	Interest Rate Fluctuation - Probability	Interest Rate Fluctuation - Impact	Interest Rate Fluctuation- Severity
1	2	4	8
2	4	4	16
3	3	2	6
4	2	4	8
5	4	4	16
6	2	2	4
7	2	2	4
8	4	5	20
9	2	4	8
10	2	3	6
11	3	2	6
12	3	4	12
13	4	2	8
14	3	4	12
15	4	4	16
16	4	4	16
17	4	4	16
18	4	4	16
19	3	2	6
20	3	3	9
21	3	3	9
22	4	4	16
23	3	3	9
24	3	3	9
25	2	2	4

Mean	10.40
Standard Deviation	4.78
Median	9
Minimum Set Value	1
Maximum Set Value	20

Minimum Value	4
Maximum Value	20

Respondent #	Inflation - Probability	Inflation - Impact	Inflation- Severity
1	5	5	25
2	5	5	25
3	4	4	16
4	3	4	12
5	3	4	12
6	5	2	10
7	2	2	4
8	4	5	20
9	3	2	6
10	4	4	16
11	4	4	16
12	4	3	12
13	4	2	8
14	4	4	16
15	4	3	12
16	4	5	20
17	4	5	20
18	4	4	16
19	4	4	16
20	3	3	9
21	3	3	9
22	5	5	25
23	5	5	25
24	5	5	25
25	2	3	6

Mean	15.24
Standard Deviation	6.60
Median	16
Minimum Set Value	2
Maximum Set Value	28

Minimum Value	4
Maximum Value	25

Respondent #	Foreign Exchange Fluctuation - Probability	Foreign Exchange Fluctuation - Impact	Foreign Exchange Fluctuation-Severity
1	5	5	25
2	5	5	25
3	4	4	16
4	2	3	6
5	4	5	20
6	2	2	4
7	5	5	25
8	3	5	15
9	2	2	4
10	5	5	25
11	4	4	16
12	5	3	15
13	4	4	16
14	5	5	25
15	4	4	16
16	5	1	5
17	4	4	16
18	5	5	25
19	4	4	16
20	2	4	8
21	4	4	16
22	5	5	25
23	5	5	25
24	5	5	25
25	3	3	9

Mean	16.92
Standard Deviation	7.49
Median	16
Minimum Set Value	2
Maximum Set Value	32

Minimum Value	4
Maximum Value	25

Respondent #	Price Change - Probability	Price Change - Impact	Price Change-Severity
1	4	4	16
2	5	5	25
3	3	2	6
4	3	2	6
5	3	3	9
6	2	2	4
7	5	5	25
8	3	3	9
9	3	2	6
10	4	2	8
11	4	3	12
12	3	2	6
13	4	4	16
14	4	4	16
15	4	4	16
16	5	1	5
17	4	3	12
18	4	4	16
19	4	4	16
20	2	2	4
21	3	3	9
22	3	3	9
23	1	5	5
24	4	4	16
25	3	3	9

Mean	11.24
Standard Deviation	6.01
Median	9
Minimum Set Value	-1
Maximum Set Value	23

Minimum Value	4
Maximum Value	25

After Outlier Removal

Mean	10.04
Standard Deviation	4.55
Median	9

Respondent #	Operation Cost Overrun - Probability	Operation Cost Overrun - Impact	Operation Cost Overrun- Severity
1	3	4	12
2	4	4	16
3	2	3	6
4	1	1	1
5	3	3	9
6	1	1	1
7	4	4	16
8	3	3	9
9	2	2	4
10	5	5	25
11	3	4	12
12	4	4	16
13	3	3	9
14	4	4	16
15	4	4	16
16	3	4	12
17	2	2	4
18	4	4	16
19	2	2	4
20	3	3	9
21	2	3	6
22	3	3	9
23	3	3	9
24	4	3	12
25	3	2	6

Mean	10.20
Standard Deviation	5.70
Median	9
Minimum Set Value	-1
Maximum Set Value	22

Minimum Value	1
Maximum Value	25

After Outlier Removal

Mean	9.58
Standard Deviation	4.90
Median	9

Respondent #	Revenue Risk - Probability	Revenue Risk - Impact	Revenue Risk-Severity
1	2	2	4
2	5	5	25
3	1	4	4
4	1	5	5
5	4	4	16
6	3	4	12
7	3	3	9
8	4	2	8
9	1	4	4
10	1	1	1
11	3	5	15
12	3	5	15
13	3	3	9
14	3	3	9
15	3	3	9
16	4	5	20
17	4	4	16
18	4	4	16
19	4	4	16
20	1	5	5
21	2	3	6
22	3	3	9
23	4	4	16
24	2	2	4
25	3	4	12

Mean	10.60
Standard Deviation	5.97
Median	9
Minimum Set Value	-1
Maximum Set Value	23

Minimum Value	1
Maximum Value	25

After Outlier Removal

Mean	10.00
Standard Deviation	5.27
Median	9

Respondent #	Inability of Concessionaire - Probability	Inability of Concessionaire - Impact	Inability of Concessionaire-Severity
1	1	3	3
2	1	1	1
3	4	5	20
4	1	5	5
5	3	4	12
6	1	5	5
7	2	2	4
8	5	5	25
9	1	5	5
10	3	2	6
11	2	4	8
12	1	2	2
13	2	2	4
14	3	3	9
15	3	3	9
16	1	5	5
17	4	4	16
18	3	3	9
19	1	1	1
20	3	4	12
21	2	3	6
22	2	4	8
23	2	5	10
24	2	4	8
25	3	4	12

Mean	8.20
Standard Deviation	5.72
Median	8
Minimum Set Value	-3
Maximum Set Value	20

Minimum Value	1
Maximum Value	25

After Outlier Removal

Mean	6.96
Standard Deviation	3.87
Median	6

Respondent #	Subjective Project Evaluation Method - Probability	Subjective Project Evaluation Method - Impact	Subjective Project Evaluation method- Severity
1	3	1	3
2	3	4	12
3	3	4	12
4	1	1	1
5	3	3	9
6	2	3	6
7	1	1	1
8	3	5	15
9	3	1	3
10	3	2	6
11	1	3	3
12	1	1	1
13	3	2	6
14	3	3	9
15	2	4	8
16	3	3	9
17	3	3	9
18	4	4	16
19	3	3	9
20	1	1	1
21	1	4	4
22	1	1	1
23	1	2	2
24	2	2	4
25	3	2	6

Mean	6.24
Standard Deviation	4.46
Median	6
Minimum Set Value	-3
Maximum Set Value	15

Minimum Value	1
Maximum Value	16

After Outlier Removal

Mean	5.83
Standard Deviation	4.05
Median	6

Respondent #	Insufficient project finance supervision - Probability	Insufficient project finance supervision - Impact	Insufficient project finance supervision - Severity
1	1	3	3
2	1	1	1
3	4	5	20
4	3	3	9
5	3	3	9
6	1	3	3
7	2	5	10
8	5	5	25
9	3	3	9
10	5	5	25
11	1	3	3
12	3	1	3
13	3	3	9
14	3	4	12
15	2	3	6
16	1	5	5
17	2	1	2
18	5	5	25
19	2	3	6
20	2	2	4
21	4	5	20
22	1	1	1
23	1	4	4
24	1	2	2
25	1	2	2

Mean	8.72
Standard Deviation	7.96
Median	6
Minimum Set Value	-7
Maximum Set Value	25

Minimum Value	1
Maximum Value	25

Factor 2: Commercial and Market Environmental Risks

10- Market Competition
11- Supply and Demand
12- Change in Market Demand
13- Public Credit

Respondent #	Market Competition - Probability	Market Competition - Impact	Market Competition - Severity
1	3	2	6
2	2	2	4
3	1	3	3
4	1	3	3
5	3	3	9
6	1	1	1
7	2	2	4
8	4	3	12
9	1	4	4
10	2	2	4
11	2	2	4
12	4	4	16
13	3	2	6
14	2	2	4
15	3	3	9
16	2	4	8
17	3	4	12
18	4	4	16
19	3	4	12
20	2	4	8
21	3	2	6
22	5	5	25
23	3	3	9
24	2	3	6
25	2	2	4

Mean	7.80
Standard Deviation	5.38
Median	6
Minimum Set Value	-2.95
Maximum Set Value	18.55

Minimum Value	1
Maximum Value	25

After Outlier Removal

Mean	7.08
Standard Deviation	4.10
Median	6

Respondent #	Supply and demand - Probability	Supply and demand - Impact	Supply and demand - Severity
1	1	2	2
2	5	5	25
3	3	3	9
4	3	4	12
5	3	3	9
6	3	5	15
7	2	2	4
8	3	5	15
9	3	4	12
10	2	2	4
11	2	3	6
12	4	4	16
13	3	2	6
14	2	2	4
15	3	4	12
16	1	1	1
17	2	4	8
18	4	4	16
19	4	4	16
20	4	2	8
21	4	3	12
22	4	4	16
23	3	3	9
24	2	2	4
25	2	2	4

Mean	9.80
Standard Deviation	5.78
Median	9
Minimum Set Value	-1.76
Maximum Set Value	21.36

Minimum Value	1
Maximum Value	25

After Outlier Removal

Mean	9.17
Standard Deviation	4.94
Median	9

Respondent #	Change in market demand - Probability	Change in market demand - Impact	Change in market demand - Severity
1	1	1	1
2	4	4	16
3	2	3	6
4	2	4	8
5	3	3	9
6	1	4	4
7	2	2	4
8	2	2	4
9	2	4	8
10	3	3	9
11	2	4	8
12	3	3	9
13	3	2	6
14	3	3	9
15	2	4	8
16	1	5	5
17	4	4	16
18	5	5	25
19	5	5	25
20	4	2	8
21	2	2	4
22	1	5	5
23	3	3	9
24	1	2	2
25	2	4	8
			stdev

Mean	8.64
Standard Deviation	6.04
Median	8
Minimum Set Value	-3.44
Maximum Set Value	20.72

Minimum Value	1
Maximum Value	25

After Outlier Removal

Mean	7.22
Standard Deviation	3.66
Median	8

Respondent #	Public credit - Probability	Public credit - Impact	Public credit - Severity
1	2	2	4
2	5	5	25
3	4	4	16
4	3	3	9
5	4	4	16
6	2	5	10
7	2	2	4
8	5	5	25
9	3	3	9
10	3	3	9
11	3	3	9
12	3	3	9
13	4	3	12
14	3	3	9
15	4	5	20
16	5	5	25
17	2	4	8
18	4	4	16
19	3	4	12
20	3	3	9
21	3	3	9
22	1	5	5
23	1	1	1
24	5	5	25
25	4	4	16

Mean	12.48
Standard Deviation	7.04
Median	9
Minimum Set Value	-1.59
Maximum Set Value	26.55

Minimum Value	1
Maximum Value	25

Factor 3: Legal Risks

14- Performance Security Risk
15- Permits Risk
16- Delay in Project Approvals/Permits
17- Legislation Changes
18- Dispute Resolution
19- Change in Tax Regulation
20- Government Policy

Respondent #	Performance Security Risk - Probability	Performance Security Risk - Impact	Performance Security Risk - Severity
1	3	5	15
2	5	5	25
3	1	2	2
4	2	5	10
5	2	2	4
6	1	3	3
7	2	2	4
8	2	3	6
9	2	5	10
10	2	3	6
11	2	2	4
12	2	1	2
13	2	2	4
14	4	4	16
15	3	4	12
16	5	5	25
17	4	4	16
18	3	3	9
19	5	5	25
20	2	2	4
21	2	2	4
22	2	4	8
23	1	3	3
24	1	2	2
25	2	2	4

Mean	8.92
Standard Deviation	7.43
Median	6
Minimum Set Value	-5.95
Maximum Set Value	23.79

Minimum Value	2
Maximum Value	25

After Outlier Removal

Mean	6.73
Standard Deviation	4.60
Median	4

Respondent #	Permits Risks - Probability	Permits Risks - Impact	Permits Risks - Severity
1	3	4	12
2	5	5	25
3	3	3	9
4	2	4	8
5	3	3	9
6	5	3	15
7	2	2	4
8	2	3	6
9	2	4	8
10	1	1	1
11	1	3	3
12	1	1	1
13	4	3	12
14	3	4	12
15	3	4	12
16	4	4	16
17	4	4	16
18	3	3	9
19	3	3	9
20	3	3	9
21	1	5	5
22	2	4	8
23	3	5	15
24	4	5	20
25	3	4	12

Mean	10.24
Standard Deviation	5.67
Median	9
Minimum Set Value	-1.09
Maximum Set Value	21.57

Minimum Value	1
Maximum Value	25

After Outlier Removal

Mean	9.63
Standard Deviation	4.86
Median	9

Respondent #	Delay in Project approvals/permits - Probability	Delay in Project approvals/permits - Impact	Delay in Project approvals/permits - Severity
1	4	5	20
2	4	5	20
3	3	3	9
4	1	3	3
5	3	2	6
6	4	3	12
7	2	2	4
8	2	3	6
9	1	3	3
10	1	1	1
11	1	3	3
12	2	2	4
13	4	3	12
14	3	4	12
15	3	4	12
16	4	4	16
17	4	4	16
18	4	4	16
19	4	5	20
20	3	1	3
21	1	4	4
22	2	4	8
23	3	4	12
24	4	5	20
25	3	4	12

Mean	10.16
Standard Deviation	6.30
Median	12
Minimum Set Value	-2.45
Maximum Set Value	22.77

Minimum Value	1
Maximum Value	20

Respondent #	Legislation changes - Probability	Legislation changes - Impact	Legislation changes - Severity
1	3	4	12
2	5	5	25
3	3	4	12
4	4	4	16
5	4	4	16
6	2	3	6
7	4	1	4
8	3	5	15
9	4	3	12
10	1	1	1
11	2	4	8
12	4	4	16
13	5	4	20
14	4	5	20
15	3	3	9
16	5	5	25
17	3	5	15
18	4	4	16
19	3	3	9
20	2	4	8
21	3	3	9
22	2	5	10
23	4	5	20
24	3	2	6
25	3	4	12

Mean	12.88
Standard Deviation	6.17
Median	12
Minimum Set Value	0.55
Maximum Set Value	25.21

Minimum Value	1
Maximum Value	25

Respondent #	Dispute resolution - Probability	Dispute resolution - Impact	Dispute resolution - Severity
1	3	4	12
2	4	5	20
3	3	4	12
4	4	4	16
5	3	4	12
6	2	4	8
7	3	4	12
8	3	4	12
9	4	4	16
10	5	5	25
11	2	3	6
12	4	3	12
13	3	2	6
14	4	5	20
15	3	4	12
16	3	3	9
17	4	4	16
18	4	4	16
19	2	4	8
20	3	3	9
21	3	3	9
22	4	4	16
23	3	4	12
24	3	4	12
25	3	3	9

Mean	12.68
Standard Deviation	4.59
Median	12
Minimum Set Value	3.50
Maximum Set Value	21.86

Minimum Value	6
Maximum Value	25

After Outlier Removal

Mean	12.17
Standard Deviation	3.89
Median	12

Respondent #	Change in tax regulation - Probability	Change in tax regulation - Impact	Change in tax regulation - Severity
1	4	5	20
2	5	5	25
3	4	4	16
4	4	4	16
5	3	4	12
6	2	3	6
7	4	5	20
8	5	5	25
9	4	3	12
10	2	3	6
11	3	4	12
12	4	4	16
13	3	2	6
14	4	5	20
15	3	4	12
16	1	5	5
17	4	4	16
18	4	4	16
19	2	4	8
20	4	3	12
21	3	3	9
22	3	5	15
23	3	5	15
24	3	3	9
25	3	2	6

Mean	13.40
Standard Deviation	5.80
Median	12
Minimum Set Value	1.81
Maximum Set Value	24.99

Minimum Value	5
Maximum Value	25

Respondent #	Government policy - Probability	Government policy - Impact	Government policy - Severity
1	3	4	12
2	5	5	25
3	3	3	9
4	5	4	20
5	3	4	12
6	3	3	9
7	4	5	20
8	5	5	25
9	4	4	16
10	1	2	2
11	2	4	8
12	4	4	16
13	3	2	6
14	4	5	20
15	3	3	9
16	5	5	25
17	4	4	16
18	5	5	25
19	4	4	16
20	3	4	12
21	3	3	9
22	3	5	15
23	4	4	16
24	4	4	16
25	3	3	9

Mean	14.72
Standard Deviation	6.41
Median	16
Minimum Set Value	1.91
Maximum Set Value	27.53

Minimum Value	2
Maximum Value	25

Factor 4: Political Risks

21- Political/Public Opposition
22- Swings in Public Opinion
23- Political Risk
24- Nationalization/Expropriation

Respondent #	Political/Public Opposition - Probability	Political/Public Opposition - Impact	Political/Public Opposition - Severity
1	3	4	12
2	5	5	25
3	4	4	16
4	2	3	6
5	3	3	9
6	1	3	3
7	5	5	25
8	3	2	6
9	2	3	6
10	5	5	25
11	1	5	5
12	4	5	20
13	4	3	12
14	5	5	25
15	3	4	12
16	5	5	25
17	3	5	15
18	4	4	16
19	5	5	25
20	3	3	9
21	3	3	9
22	2	5	10
23	1	1	1
24	4	5	20
25	5	4	20

Mean	14.28
Standard Deviation	7.92
Median	12
Minimum Set Value	-1.57
Maximum Set Value	30.13

Minimum Value	1
Maximum Value	25

Respondent #	Swings in public opinion - Probability	Swings in public opinion - Impact	Swings in public opinion - Severity
1	2	2	4
2	4	5	20
3	3	4	12
4	5	4	20
5	3	3	9
6	1	5	5
7	5	5	25
8	4	3	12
9	4	3	12
10	3	3	9
11	1	4	4
12	4	5	20
13	4	3	12
14	5	5	25
15	3	3	9
16	5	5	25
17	4	5	20
18	4	4	16
19	4	4	16
20	1	1	1
21	1	1	1
22	2	5	10
23	1	1	1
24	3	5	15
25	2	4	8

Mean	12.44
Standard Deviation	7.60
Median	12
Minimum Set Value	-2.76
Maximum Set Value	27.64

Minimum Value	1
Maximum Value	25

Respondent #	Political Risk - Probability	Political Risk - Impact	Political Risk - Severity
1	4	3	12
2	5	5	25
3	4	4	16
4	3	4	12
5	4	4	16
6	1	3	3
7	5	5	25
8	5	4	20
9	4	4	16
10	3	3	9
11	2	3	6
12	4	5	20
13	4	3	12
14	5	5	25
15	4	4	16
16	5	5	25
17	4	5	20
18	4	4	16
19	5	5	25
20	3	4	12
21	3	4	12
22	3	3	9
23	4	4	16
24	4	4	16
25	5	4	20

Mean	16.16
Standard Deviation	6.18
Median	16
Minimum Set Value	3.81
Maximum Set Value	28.51

Minimum Value	3
Maximum Value	25

After Outlier Removal

Mean	16.71
Standard Deviation	5.65
Median	16

Respondent #	Nationalization/expropriation - Probability	Nationalization/expropriation - Impact	Nationalization/expropriation -Severity
1	3	2	6
2	4	4	16
3	2	5	10
4	1	5	5
5	4	4	16
6	1	5	5
7	2	2	4
8	5	3	15
9	1	5	5
10	4	4	16
11	1	2	2
12	4	5	20
13	3	3	9
14	5	5	25
15	2	4	8
16	5	5	25
17	4	5	20
18	5	5	25
19	2	2	4
20	3	3	9
21	3	3	9
22	1	5	5
23	3	5	15
24	2	4	8
25	3	5	15

Mean	11.88
Standard Deviation	7.17
Median	9
Minimum Set Value	-2.45
Maximum Set Value	26.21

Minimum Value	2
Maximum Value	25

Factor 5: Regulatory Risks

25- Regulatory/Contractual Risk
26- Government Intervention

Respondent #	Regulatory/Contractual Risk - Probability	Regulatory/Contractual Risk - Impact	Regulatory/Contractual Risk -Severity
1	2	1	2
2	4	5	20
3	3	3	9
4	3	3	9
5	3	3	9
6	1	2	2
7	3	2	6
8	3	2	6
9	3	3	9
10	2	2	4
11	3	4	12
12	4	5	20
13	3	3	9
14	5	5	25
15	3	4	12
16	5	5	25
17	3	3	9
18	3	3	9
19	4	3	12
20	2	4	8
21	2	5	10
22	3	5	15
23	4	4	16
24	3	4	12
25	4	4	16

Mean	11.44
Standard Deviation	6.19
Median	9
Minimum Set Value	-0.93
Maximum Set Value	23.81

Minimum Value	2
Maximum Value	25

After Outlier Removal

Mean	10.26
Standard Deviation	4.85
Median	9

Respondent #	Government Intervention - Probability	Government Intervention - Impact	Government Intervention - Severity
1	3	2	6
2	4	5	20
3	4	3	12
4	1	2	2
5	3	3	9
6	3	3	9
7	3	2	6
8	3	2	6
9	2	2	4
10	3	3	9
11	1	3	3
12	3	3	9
13	3	3	9
14	5	5	25
15	3	4	12
16	5	5	25
17	3	3	9
18	4	4	16
19	3	2	6
20	3	3	9
21	3	4	12
22	3	4	12
23	4	4	16
24	3	4	12
25	4	4	16

Mean	10.96
Standard Deviation	6.04
Median	9
Minimum Set Value	-1.12
Maximum Set Value	23.04

Minimum Value	2
Maximum Value	25

After Outlier Removal

Mean	9.74
Standard Deviation	4.50
Median	9

Factor 6: Government Maturity Risks

27- Poor Public Decision Making Process
28- Government Corruption
29- Inadequate Law and Supervision System

Respondent #	Poor public decision making process - Probability	Poor public decision making process - Impact	Poor public decision making process - Severity
1	3	2	6
2	5	5	25
3	3	4	12
4	5	5	25
5	2	3	6
6	2	3	6
7	4	2	8
8	3	2	6
9	5	5	25
10	4	4	16
11	3	4	12
12	5	5	25
13	2	4	8
14	4	4	16
15	4	4	16
16	4	4	16
17	4	5	20
18	4	4	16
19	5	4	20
20	2	4	8
21	2	3	6
22	5	5	25
23	2	3	6
24	5	5	25
25	5	5	25

Mean	15.16
Standard Deviation	7.65
Median	16
Minimum Set Value	-0.14
Maximum Set Value	30.46

Minimum Value	6
Maximum Value	25

Respondent #	Government corruption - Probability	Government corruption - Impact	Government corruption - Severity
1	2	2	4
2	4	5	20
3	2	2	4
4	5	3	15
5	2	3	6
6	1	3	3
7	4	3	12
8	2	4	8
9	5	3	15
10	5	5	25
11	3	4	12
12	5	5	25
13	5	4	20
14	4	4	16
15	2	5	10
16	4	3	12
17	5	5	25
18	5	5	25
19	5	5	25
20	1	5	5
21	1	4	4
22	1	1	1
23	4	3	12
24	4	4	16
25	3	3	9

Mean	13.16
Standard Deviation	7.90
Median	12
Minimum Set Value	-2.64
Maximum Set Value	28.96

Minimum Value	1
Maximum Value	25

Respondent #	Inadequate law and supervision system - Probability	Inadequate law and supervision system - Impact	Inadequate law and supervision system - Severity
1	1	2	2
2	5	5	25
3	2	3	6
4	3	2	6
5	2	2	4
6	1	3	3
7	4	3	12
8	2	5	10
9	3	2	6
10	4	4	16
11	2	3	6
12	5	5	25
13	5	4	20
14	4	4	16
15	3	4	12
16	2	5	10
17	3	4	12
18	5	5	25
19	1	2	2
20	1	4	4
21	1	4	4
22	1	1	1
23	2	3	6
24	4	4	16
25	4	4	16

Mean	10.60
Standard Deviation	7.55
Median	10
Minimum Set Value	-4.50
Maximum Set Value	25.70

Minimum Value	1
Maximum Value	25

Factor 7: Technical Risks

30- Imperfect Contract Documents
31- Deficiency of Design
32- Quality Assurance
33- Quality Control
34- Latent Defect Risk
35- Lack of Supporting Infrastructure

Respondent #	Imperfect contract documents - Probability	Imperfect contract documents - Impact	Imperfect contract documents - Severity
1	1	2	2
2	5	5	25
3	2	4	8
4	2	3	6
5	2	4	8
6	1	2	2
7	3	4	12
8	2	2	4
9	2	3	6
10	3	3	9
11	2	3	6
12	3	2	6
13	3	3	9
14	2	4	8
15	4	4	16
16	2	5	10
17	4	4	16
18	5	5	25
19	1	3	3
20	3	3	9
21	1	4	4
22	1	5	5
23	1	4	4
24	3	4	12
25	3	3	9

Mean	8.96
Standard Deviation	6.10
Median	8
Minimum Set Value	-3.24
Maximum Set Value	21.16

Minimum Value	2
Maximum Value	25

After Outlier Removal

Mean	7.57
Standard Deviation	3.89
Median	8

Respondent #	Deficiency of design - Probability	Deficiency of design - Impact	Deficiency of design - Severity
1	2	4	8
2	4	5	20
3	3	4	12
4	1	5	5
5	2	4	8
6	1	4	4
7	2	3	6
8	2	1	2
9	1	5	5
10	2	2	4
11	1	3	3
12	3	3	9
13	3	4	12
14	3	4	12
15	3	4	12
16	2	5	10
17	4	4	16
18	4	4	16
19	1	1	1
20	1	5	5
21	1	5	5
22	2	5	10
23	1	5	5
24	2	4	8
25	4	4	16

Mean	8.56
Standard Deviation	4.97
Median	8
Minimum Set Value	-1.37
Maximum Set Value	18.49

Minimum Value	1
Maximum Value	20

After Outlier Removal

Mean	8.08
Standard Deviation	4.45
Median	8

Respondent #	Quality Assurance - Probability	Quality Assurance - Impact	Quality Assurance - Severity
1	2	3	6
2	4	3	12
3	3	5	15
4	1	4	4
5	3	4	12
6	2	3	6
7	3	2	6
8	2	1	2
9	2	4	8
10	3	5	15
11	2	4	8
12	2	4	8
13	4	4	16
14	3	4	12
15	4	4	16
16	2	5	10
17	2	3	6
18	4	4	16
19	1	3	3
20	2	4	8
21	2	4	8
22	2	4	8
23	1	2	2
24	2	3	6
25	2	3	6

Mean	8.76
Standard Deviation	4.40
Median	8
Minimum Set Value	-0.04
Maximum Set Value	17.56

Minimum Value	2
Maximum Value	16

Respondent #	Quality Control - Probability	Quality Control - Impact	Quality Control - Severity
1	3	3	9
2	3	4	12
3	3	5	15
4	1	4	4
5	3	4	12
6	2	3	6
7	2	3	6
8	2	1	2
9	2	3	6
10	2	5	10
11	2	4	8
12	2	4	8
13	4	4	16
14	3	4	12
15	4	4	16
16	4	5	20
17	3	2	6
18	4	4	16
19	3	3	9
20	2	4	8
21	2	4	8
22	2	4	8
23	1	2	2
24	2	4	8
25	3	2	6

Mean	9.32
Standard Deviation	4.58
Median	8
Minimum Set Value	0.16
Maximum Set Value	18.48

Minimum Value	2
Maximum Value	20

After Outlier Removal

Mean	8.88
Standard Deviation	4.09
Median	8

Respondent #	Latent Defect Risk - Probability	Latent Defect Risk - Impact	Latent Defect Risk - Severity
1	3	4	12
2	2	5	10
3	2	4	8
4	2	5	10
5	3	4	12
6	1	4	4
7	3	3	9
8	2	1	2
9	2	5	10
10	2	5	10
11	2	4	8
12	2	3	6
13	2	2	4
14	4	4	16
15	3	3	9
16	1	5	5
17	2	4	8
18	5	5	25
19	2	1	2
20	3	3	9
21	3	3	9
22	2	3	6
23	2	4	8
24	3	4	12
25	2	3	6

Mean	8.80
Standard Deviation	4.70
Median	9
Minimum Set Value	-0.60
Maximum Set Value	18.20

Minimum Value	2
Maximum Value	25

After Outlier Removal

Mean	8.13
Standard Deviation	3.34
Median	8.5

Respondent #	Lack of supporting infrastructure - Probability	Lack of supporting infrastructure - Impact	Lack of supporting infrastructure - Severity
1	4	5	20
2	5	5	25
3	3	3	9
4	4	5	20
5	3	3	9
6	2	4	8
7	2	4	8
8	2	1	2
9	4	5	20
10	4	5	20
11	2	3	6
12	4	4	16
13	3	5	15
14	4	4	16
15	3	4	12
16	4	5	20
17	4	5	20
18	5	5	25
19	4	4	16
20	1	4	4
21	1	4	4
22	5	5	25
23	2	4	8
24	3	4	12
25	4	4	16

Mean	14.24
Standard Deviation	6.98
Median	16
Minimum Set Value	0.28
Maximum Set Value	28.20

Minimum Value	2
Maximum Value	25

Factor 8: Construction and Operational Risks

36- Project/Operations Changes
37- Inability of Concessionaire
38- Provision of Transformers, Substations or backup power
39- Construction risk
40- Organization risk
41- Coordination risk
42- Land acquisition
43- Physical Obstacles that cannot be avoided
44- Maintenance risks
45- Access and Delivery of site
46- Connection of Public Utilities to boundaries of site
47- Connection to boundary of site of telephone lines and natural gas provision

Respondent #	Project/Operation changes - Probability	Project/Operation changes - Impact	Project/Operation changes - Severity
1	1	1	1
2	4	5	20
3	2	2	4
4	3	2	6
5	4	4	16
6	2	2	4
7	4	2	8
8	2	1	2
9	3	2	6
10	1	3	3
11	2	2	4
12	2	4	8
13	3	2	6
14	3	3	9
15	3	3	9
16	4	4	16
17	4	4	16
18	4	4	16
19	4	4	16
20	2	2	4
21	2	3	6
22	2	3	6
23	4	4	16
24	1	3	3
25	3	4	12

Mean	8.68
Standard Deviation	5.60
Median	6
Minimum Set Value	-2.53
Maximum Set Value	19.89

Minimum Value	1
Maximum Value	20

Respondent #	Inability of concessionaire - Probability	Inability of concessionaire - Impact	Inability of concessionaire -Severity
1	1	1	1
2	1	5	5
3	1	4	4
4	1	5	5
5	4	4	16
6	1	3	3
7	3	2	6
8	3	2	6
9	1	4	4
10	2	4	8
11	2	4	8
12	2	4	8
13	3	3	9
14	3	3	9
15	2	4	8
16	1	5	5
17	2	4	8
18	4	4	16
19	1	1	1
20	3	3	9
21	3	3	9
22	2	4	8
23	4	4	16
24	1	4	4
25	2	4	8

Mean	7.36
Standard Deviation	4.04
Median	8
Minimum Set Value	-0.72
Maximum Set Value	15.44

Minimum Value	1
Maximum Value	16

Respondent #	Provision of transformers, substations or backup power - Probability	Provision of transformers, substations or backup power - Impact	Provision of transformers, substations or backup power - Severity
1	1	2	2
2	2	3	6
3	3	3	9
4	2	5	10
5	3	4	12
6	2	2	4
7	2	3	6
8	3	2	6
9	1	5	5
10	2	5	10
11	2	3	6
12	2	5	10
13	2	2	4
14	4	3	12
15	2	4	8
16	3	4	12
17	2	4	8
18	4	4	16
19	4	4	16
20	1	1	1
21	1	4	4
22	3	3	9
23	3	4	12
24	2	5	10
25	2	2	4

Mean	8.08
Standard Deviation	4.00
Median	8
Minimum Set Value	0.08
Maximum Set Value	16.08

Minimum Value	1
Maximum Value	16

Respondent #	Construction risk - Probability	Construction risk - Impact	Construction risk -Severity
1	2	2	4
2	2	5	10
3	3	3	9
4	1	3	3
5	2	3	6
6	1	2	2
7	2	4	8
8	2	1	2
9	2	3	6
10	3	5	15
11	3	4	12
12	2	4	8
13	3	3	9
14	3	3	9
15	4	4	16
16	4	5	20
17	3	3	9
18	5	5	25
19	2	1	2
20	2	3	6
21	2	2	4
22	2	4	8
23	3	4	12
24	3	4	12
25	3	3	9

Mean	9.04
Standard Deviation	5.60
Median	9
Minimum Set Value	-2.16
Maximum Set Value	20.24

Minimum Value	2
Maximum Value	25

After Outlier Removal

Mean	8.38
Standard Deviation	4.60
Median	8.5

Respondent #	Organization risk - Probability	Organization risk - Impact	Organization risk -Severity
1	1	1	1
2	2	4	8
3	3	4	12
4	1	3	3
5	2	3	6
6	1	2	2
7	3	3	9
8	2	1	2
9	1	3	3
10	3	3	9
11	3	4	12
12	1	3	3
13	3	3	9
14	3	3	9
15	4	3	12
16	4	5	20
17	4	5	20
18	3	3	9
19	3	2	6
20	2	3	6
21	2	2	4
22	2	4	8
23	1	3	3
24	3	4	12
25	3	3	9

Mean	7.88
Standard Deviation	5.03
Median	8
Minimum Set Value	-2.18
Maximum Set Value	17.94

Minimum Value	1
Maximum Value	20

After Outlier Removal

Mean	7.30
Standard Deviation	4.53
Median	8

Respondent #	Coordination risks - Probability	Coordination risks - Impact	Coordination risks -Severity
1	3	2	6
2	2	3	6
3	3	2	6
4	1	3	3
5	2	4	8
6	3	2	6
7	3	3	9
8	2	1	2
9	2	3	6
10	3	4	12
11	3	3	9
12	2	3	6
13	3	3	9
14	3	3	9
15	4	3	12
16	4	5	20
17	4	3	12
18	5	5	25
19	4	4	16
20	2	3	6
21	2	2	4
22	2	4	8
23	1	3	3
24	1	2	2
25	3	3	9

Mean	8.56
Standard Deviation	5.43
Median	8
Minimum Set Value	-2.30
Maximum Set Value	19.42

Minimum Value	2
Maximum Value	25

After Outlier Removal

Mean	7.35
Standard Deviation	3.52
Median	6

Respondent #	Land acquisition - Probability	Land acquisition - Impact	Land acquisition - Severity
1	1	3	3
2	1	5	5
3	3	3	9
4	1	4	4
5	3	4	12
6	1	3	3
7	3	3	9
8	2	1	2
9	1	4	4
10	3	4	12
11	1	4	4
12	1	5	5
13	3	3	9
14	3	3	9
15	2	4	8
16	1	5	5
17	2	4	8
18	4	4	16
19	2	1	2
20	2	3	6
21	1	4	4
22	3	5	15
23	2	5	10
24	3	5	15
25	3	3	9

Mean	7.52
Standard Deviation	4.15
Median	8
Minimum Set Value	-0.79
Maximum Set Value	15.83

Minimum Value	2
Maximum Value	16

Respondent #	Physical obstacles that cannot be avoided - Probability	Physical obstacles that cannot be avoided - Impact	Physical obstacles that cannot be avoided - Severity
1	2	2	4
2	2	5	10
3	3	3	9
4	1	5	5
5	3	4	12
6	2	4	8
7	3	2	6
8	2	1	2
9	1	4	4
10	3	3	9
11	1	3	3
12	1	5	5
13	2	4	8
14	3	3	9
15	2	4	8
16	1	5	5
17	2	4	8
18	5	5	25
19	3	3	9
20	2	3	6
21	2	3	6
22	1	5	5
23	2	3	6
24	2	4	8
25	3	2	6

Mean	7.44
Standard Deviation	4.35
Median	6
Minimum Set Value	-1.26
Maximum Set Value	16.14

Minimum Value	2
Maximum Value	25

After Outlier Removal

Mean	6.71
Standard Deviation	2.40
Median	6

Respondent #	Maintenance risks - Probability	Maintenance risks - Impact	Maintenance risks -Severity
1	2	2	4
2	5	5	25
3	3	2	6
4	3	3	9
5	3	4	12
6	3	2	6
7	4	3	12
8	2	1	2
9	3	3	9
10	2	5	10
11	1	1	1
12	4	4	16
13	2	2	4
14	3	2	6
15	4	4	16
16	1	4	4
17	2	3	6
18	4	4	16
19	3	3	9
20	3	3	9
21	3	3	9
22	2	3	6
23	5	5	25
24	1	2	2
25	3	2	6

Mean	9.20
Standard Deviation	6.35
Median	9
Minimum Set Value	-3.50
Maximum Set Value	21.90

Minimum Value	1
Maximum Value	25

After Outlier Removal

Mean	7.83
Standard Deviation	4.40
Median	6

Respondent #	Access and delivery of site - Probability	Access and delivery of site - Impact	Access and delivery of site - Severity
1	2	3	6
2	1	5	5
3	2	4	8
4	2	2	4
5	3	3	9
6	2	1	2
7	4	2	8
8	2	1	2
9	2	2	4
10	2	4	8
11	1	1	1
12	2	4	8
13	2	2	4
14	3	2	6
15	2	3	6
16	3	4	12
17	2	3	6
18	4	4	16
19	1	1	1
20	3	3	9
21	3	4	12
22	2	3	6
23	2	3	6
24	1	4	4
25	3	2	6

Mean	6.36
Standard Deviation	3.55
Median	6
Minimum Set Value	-0.73
Maximum Set Value	13.45

Minimum Value	1
Maximum Value	16

After Outlier Removal

Mean	5.96
Standard Deviation	2.99
Median	6

Respondent #	Connection of public utilities to boundaries of site - Probability	Connection of public utilities to boundaries of site - Impact	Connection of public utilities to boundaries of site - Severity
1	5	5	25
2	5	5	25
3	3	4	12
4	4	5	20
5	2	3	6
6	3	3	9
7	4	2	8
8	2	1	2
9	3	5	15
10	2	5	10
11	1	3	3
12	1	4	4
13	3	3	9
14	3	2	6
15	2	4	8
16	1	5	5
17	3	4	12
18	4	4	16
19	3	4	12
20	2	2	4
21	1	5	5
22	3	4	12
23	2	5	10
24	1	3	3
25	2	2	4

Mean	9.80
Standard Deviation	6.42
Median	9
Minimum Set Value	-3.03
Maximum Set Value	22.63

Minimum Value	2
Maximum Value	25

After Outlier Removal

Mean	8.48
Standard Deviation	4.70
Median	8

Respondent #	Connection to boundary of site of telephone lines and natural gas provision - Probability	Connection to boundary of site of telephone lines and natural gas provision - Impact	Connection to boundary of site of telephone lines and natural gas provision - Severity
1	4	3	12
2	2	2	4
3	3	4	12
4	4	5	20
5	2	3	6
6	5	2	10
7	5	3	15
8	2	1	2
9	3	5	15
10	2	5	10
11	1	3	3
12	2	4	8
13	3	3	9
14	3	2	6
15	2	4	8
16	1	4	4
17	3	4	12
18	4	4	16
19	4	3	12
20	1	1	1
21	1	5	5
22	3	4	12
23	2	3	6
24	1	4	4
25	2	1	2

Mean	8.56
Standard Deviation	5.01
Median	8
Minimum Set Value	-1.46
Maximum Set Value	18.58

Minimum Value	1
Maximum Value	20

After Outlier Removal

Mean	8.08
Standard Deviation	4.50
Median	8

Factor 9: Resources Risks

48- Labor unavailability
49- Material Shortage

Respondent #	Labor unavailability - Probability	Labor unavailability - Impact	Labor unavailability - Severity
1	1	3	3
2	3	3	9
3	3	4	12
4	1	3	3
5	2	3	6
6	1	3	3
7	2	3	6
8	1	1	1
9	1	3	3
10	2	3	6
11	3	4	12
12	1	1	1
13	4	3	12
14	3	2	6
15	1	4	4
16	1	3	3
17	4	4	16
18	5	5	25
19	3	4	12
20	2	4	8
21	3	3	9
22	2	3	6
23	2	3	6
24	2	4	8
25	2	1	2

Mean	7.28
Standard Deviation	5.42
Median	6
Minimum Set Value	-3.56
Maximum Set Value	18.12

Minimum Value	1
Maximum Value	25

After Outlier Removal

Mean	6.54
Standard Deviation	4.05
Median	6

Respondent #	Material shortage - Probability	Material shortage - Impact	Material shortage - Severity
1	2	4	8
2	2	5	10
3	3	3	9
4	2	3	6
5	2	4	8
6	1	3	3
7	3	1	3
8	2	1	2
9	2	3	6
10	2	4	8
11	2	4	8
12	3	2	6
13	3	3	9
14	3	2	6
15	2	4	8
16	2	2	4
17	4	4	16
18	4	4	16
19	4	4	16
20	3	3	9
21	3	3	9
22	2	3	6
23	2	4	8
24	2	4	8
25	4	4	16

Mean	8.32
Standard Deviation	4.00
Median	8
Minimum Set Value	0.33
Maximum Set Value	16.31

Minimum Value	2
Maximum Value	16

Factor 10: Production Risks

50- Third Party Delay/Violation
51- Planning Risks
52- Supervision, Organization and Control for inspection of Construction works
53- Technological Risks
54- Completion Risks

Respondent #	Third Party delay/violation - Probability	Third Party delay/violation - Impact	Third Party delay/violation - Severity
1	3	2	6
2	4	5	20
3	4	4	16
4	1	2	2
5	2	3	6
6	2	2	4
7	3	2	6
8	3	2	6
9	1	2	2
10	4	4	16
11	3	3	9
12	2	3	6
13	3	3	9
14	3	2	6
15	3	4	12
16	3	4	12
17	4	4	16
18	5	5	25
19	2	3	6
20	3	3	9
21	3	3	9
22	3	3	9
23	2	3	6
24	3	3	9
25	2	3	6

Mean	9.32
Standard Deviation	5.57
Median	9
Minimum Set Value	-1.81
Maximum Set Value	20.45

Minimum Value	2
Maximum Value	25

After Outlier Removal

Mean	8.67
Standard Deviation	4.60
Median	7.5

Respondent #	Planning risks - Probability	Planning risks - Impact	Planning risks - Severity
1	2	2	4
2	3	3	9
3	3	4	12
4	1	3	3
5	3	3	9
6	3	3	9
7	3	2	6
8	2	2	4
9	1	3	3
10	4	4	16
11	1	4	4
12	3	3	9
13	3	3	9
14	2	2	4
15	3	4	12
16	4	4	16
17	2	4	8
18	5	5	25
19	3	3	9
20	3	3	9
21	2	2	4
22	3	3	9
23	4	5	20
24	4	3	12
25	2	2	4

Mean	9.16
Standard Deviation	5.53
Median	9
Minimum Set Value	-1.90
Maximum Set Value	20.22

Minimum Value	3
Maximum Value	25

After Outlier Removal

Mean	8.50
Standard Deviation	4.53
Median	9

Respondent #	Supervision, organization and control for inspection of construction works - Probability	Supervision, organization and control for inspection of construction works - Impact	Supervision, organization and control for inspection of construction works -Severity
1	1	2	2
2	2	3	6
3	3	3	9
4	2	3	6
5	3	3	9
6	2	4	8
7	1	2	2
8	3	3	9
9	2	3	6
10	3	4	12
11	2	3	6
12	2	3	6
13	3	3	9
14	2	2	4
15	3	4	12
16	4	5	20
17	2	3	6
18	5	5	25
19	3	3	9
20	2	4	8
21	3	2	6
22	2	3	6
23	3	3	9
24	3	4	12
25	3	3	9

Mean	8.64
Standard Deviation	4.99
Median	8
Minimum Set Value	-1.34
Maximum Set Value	18.62

Minimum Value	2
Maximum Value	25

After Outlier Removal

Mean	7.43
Standard Deviation	2.76
Median	8

Respondent #	Technological risks - Probability	Technological risks - Impact	Technological risks -Severity
1	2	2	4
2	4	5	20
3	2	2	4
4	2	3	6
5	3	3	9
6	1	2	2
7	2	3	6
8	2	2	4
9	3	4	12
10	2	4	8
11	1	1	1
12	1	3	3
13	3	3	9
14	2	2	4
15	2	5	10
16	4	1	4
17	2	2	4
18	4	4	16
19	3	3	9
20	2	4	8
21	3	3	9
22	2	4	8
23	3	3	9
24	2	3	6
25	3	3	9

Mean	7.36
Standard Deviation	4.29
Median	8
Minimum Set Value	-1.22
Maximum Set Value	15.94

Minimum Value	1
Maximum Value	20

After Outlier Removal

Mean	6.74
Standard Deviation	3.51
Median	6

Respondent #	Completion risks - Probability	Completion risks - Impact	Completion risks - Severity
1	3	3	9
2	5	5	25
3	4	4	16
4	2	3	6
5	4	4	16
6	4	3	12
7	3	2	6
8	3	3	9
9	2	2	4
10	4	4	16
11	1	4	4
12	2	5	10
13	3	3	9
14	2	2	4
15	2	5	10
16	5	5	25
17	4	4	16
18	5	5	25
19	2	4	8
20	2	4	8
21	2	5	10
22	1	5	5
23	4	4	16
24	4	4	16
25	3	3	9

Mean	11.76
Standard Deviation	6.44
Median	10
Minimum Set Value	-1.11
Maximum Set Value	24.63

Minimum Value	4
Maximum Value	25

After Outlier Removal

Mean	9.95
Standard Deviation	4.35
Median	9

Factor 11: Environmental Risks

55- Sustainability Risk
56- Antiquities Risk

Respondent #	Sustainability risk - Probability	Sustainability risk - Impact	Sustainability risk - Severity
1	2	4	8
2	5	5	25
3	3	3	9
4	1	3	3
5	3	2	6
6	1	4	4
7	3	3	9
8	2	1	2
9	1	3	3
10	3	3	9
11	1	1	1
12	2	4	8
13	2	3	6
14	2	2	4
15	2	4	8
16	1	5	5
17	2	2	4
18	4	4	16
19	4	4	16
20	3	3	9
21	3	3	9
22	2	3	6
23	1	1	1
24	4	5	20
25	3	3	9

Mean	8.00
Standard Deviation	5.85
Median	8
Minimum Set Value	-3.69
Maximum Set Value	19.69

Minimum Value	1
Maximum Value	25

After Outlier Removal

Mean	6.74
Standard Deviation	3.99
Median	6

Respondent #	Antiquities risk - Probability	Antiquities risk - Impact	Antiquities risk - Severity
1	1	5	5
2	1	2	2
3	3	3	9
4	1	3	3
5	3	2	6
6	1	4	4
7	4	3	12
8	2	1	2
9	1	5	5
10	3	4	12
11	1	4	4
12	2	2	4
13	2	2	4
14	2	2	4
15	2	5	10
16	1	4	4
17	2	2	4
18	5	5	25
19	1	1	1
20	2	4	8
21	3	2	6
22	1	5	5
23	3	2	6
24	3	3	9
25	3	3	9

Mean	6.52
Standard Deviation	4.87
Median	5
Minimum Set Value	-3.23
Maximum Set Value	16.27

Minimum Value	1
Maximum Value	25

After Outlier Removal

Mean	5.75
Standard Deviation	3.05
Median	5

Factor 12: Unforeseen Risks

57- Unforeseen Weather Conditions
58- Unforeseen Geotechnical Conditions
59- Force Majeure

Respondent #	unforeseen Weather conditions - Probability	unforeseen Weather conditions - Impact	unforeseen Weather conditions - Severity
1	1	2	2
2	1	1	1
3	3	1	3
4	1	3	3
5	3	2	6
6	1	1	1
7	2	4	8
8	2	4	8
9	1	2	2
10	3	3	9
11	1	3	3
12	1	2	2
13	1	3	3
14	3	2	6
15	2	4	8
16	1	3	3
17	2	2	4
18	4	4	16
19	1	1	1
20	1	1	1
21	3	3	9
22	1	1	1
23	1	1	1
24	2	2	4
25	3	3	9

Mean	4.56
Standard Deviation	3.75
Median	3
Minimum Set Value	-2.95
Maximum Set Value	12.07

Minimum Value	1
Maximum Value	16

After Outlier Removal

Mean	4.08
Standard Deviation	2.96
Median	3

Respondent #	unforeseen Geotechnical conditions - Probability	unforeseen Geotechnical conditions - Impact	unforeseen Geotechnical conditions - Severity
1	3	5	15
2	1	1	1
3	3	3	9
4	1	2	2
5	3	4	12
6	2	2	4
7	2	3	6
8	2	4	8
9	2	3	6
10	2	3	6
11	1	4	4
12	3	3	9
13	2	3	6
14	2	2	4
15	3	4	12
16	1	3	3
17	2	4	8
18	4	4	16
19	3	4	12
20	2	2	4
21	3	4	12
22	3	4	12
23	1	5	5
24	2	3	6
25	3	2	6

Mean	7.52
Standard Deviation	4.06
Median	6
Minimum Set Value	-0.61
Maximum Set Value	15.65

Minimum Value	1
Maximum Value	16

After Outlier Removal

Mean	7.17
Standard Deviation	3.74
Median	6

Respondent #	Force Majeure - Probability	Force Majeure - Impact	Force Majeure - Severity
1	2	4	8
2	4	5	20
3	3	3	9
4	2	3	6
5	3	3	9
6	1	5	5
7	4	2	8
8	3	4	12
9	2	4	8
10	4	4	16
11	1	4	4
12	5	5	25
13	3	4	12
14	2	2	4
15	4	4	16
16	3	5	15
17	4	4	16
18	3	3	9
19	4	5	20
20	3	3	9
21	3	4	12
22	2	2	4
23	2	5	10
24	4	5	20
25	2	5	10

Mean	11.48
Standard Deviation	5.70
Median	10
Minimum Set Value	0.08
Maximum Set Value	22.88

Minimum Value	4
Maximum Value	25

After Outlier Removal

Mean	10.92
Standard Deviation	5.06
Median	9.5

Factor 13: Other Risks

60- Death or Bodily Injury
61- Safety Breaches

Respondent #	Death or Bodily injury- Probability	Death or Bodily injury - Impact	Death or Bodily injury - Severity
1	3	5	15

Respondent #	Safety Breaches - Probability	Safety Breaches - Impact	Safety Breaches - Severity
1	4	4	16

Appendix 2: Probability Distributions for the development of the Decision Support System

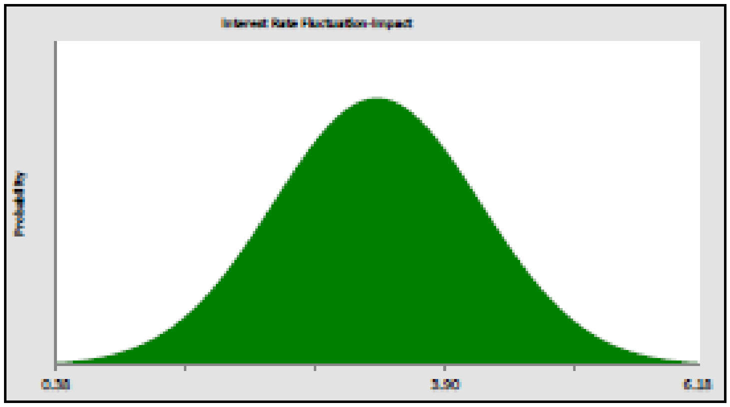
Factor 1: Macroeconomic and Financial Risks

1- Interest Rate Fluctuation
2- Inflation
3- Foreign Exchange Fluctuation
4- Price Change
5- Operation Cost Overrun
6- Revenue Risk

Assumption: Interest Rate Fluctuation-Impact

Normal distribution with parameters:

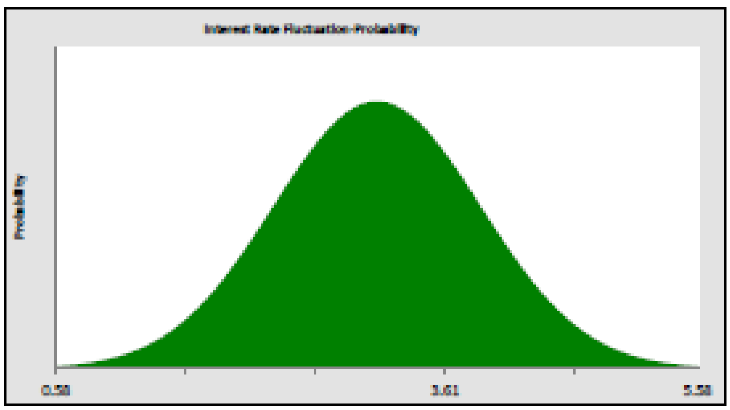
Mean	3.28
Std. Dev.	0.94



Assumption: Interest Rate Fluctuation-Probability

Normal distribution with parameters:

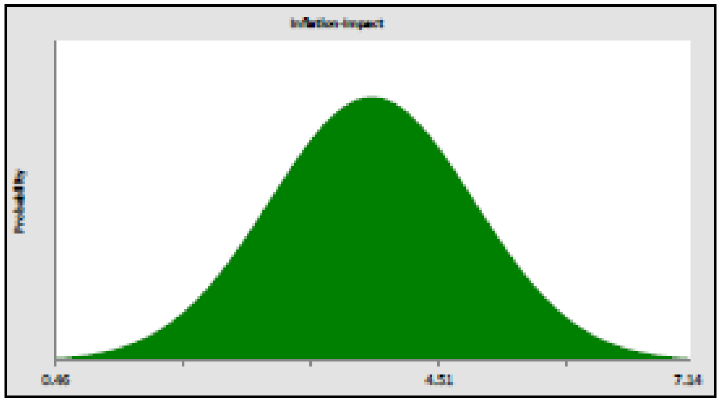
Mean	3.08
Std. Dev.	0.81



Assumption: Inflation-Impact

Normal distribution with parameters:

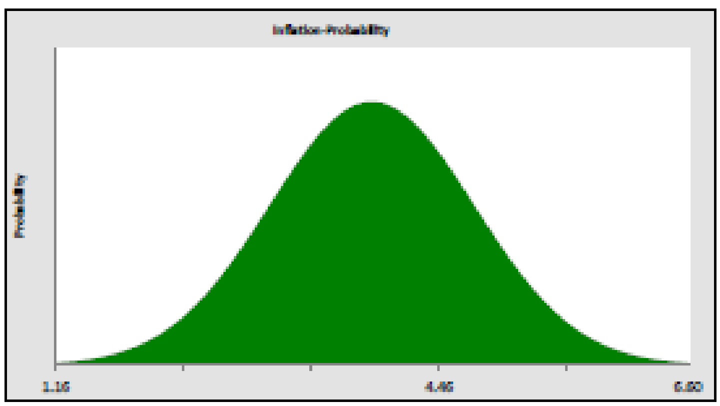
Mean	3.80
Std. Dev.	1.08



Assumption: Inflation-Probability

Normal distribution with parameters:

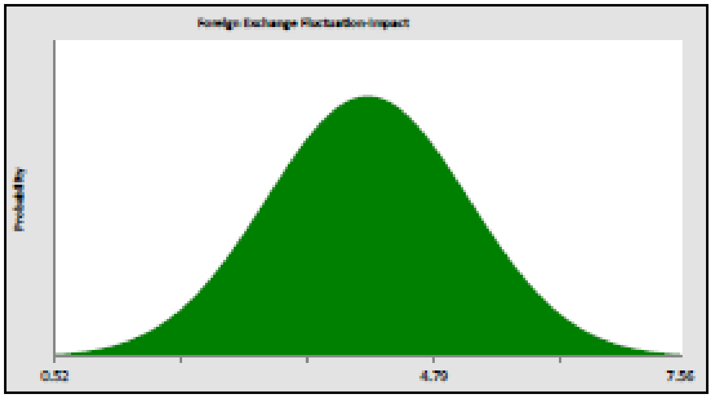
Mean	3.88
Std. Dev.	0.88



Assumption: Foreign Exchange Fluctuation-Impact

Normal distribution with parameters:

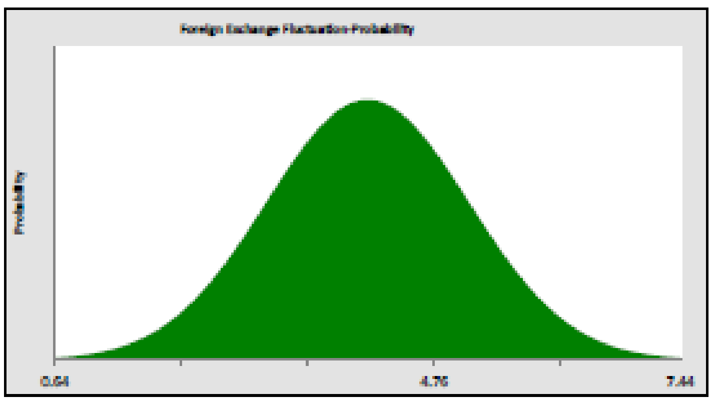
Mean	4.04
Std. Dev.	1.14



Assumption: Foreign Exchange Fluctuation-Probability

Normal distribution with parameters:

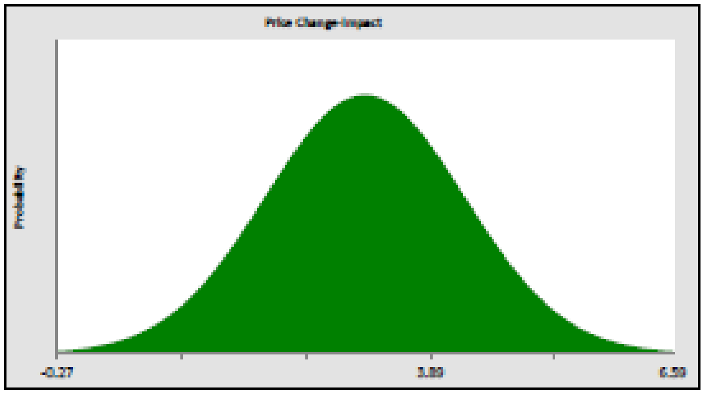
Mean	4.04
Std. Dev.	1.10



Assumption: Price Change-Impact

Normal distribution with parameters:

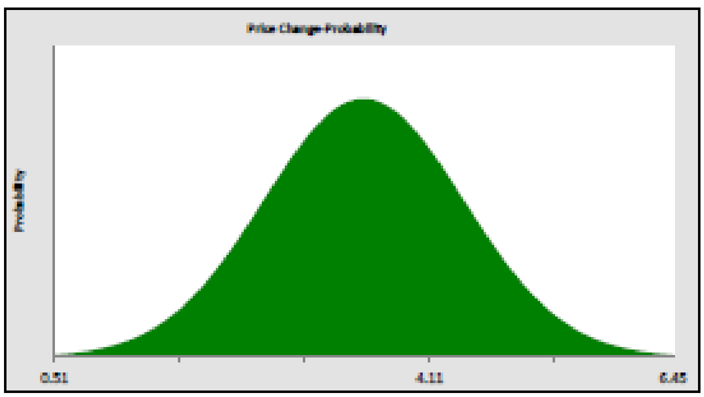
Mean	3.16
Std. Dev.	1.11



Assumption: Price Change-Probability

Normal distribution with parameters:

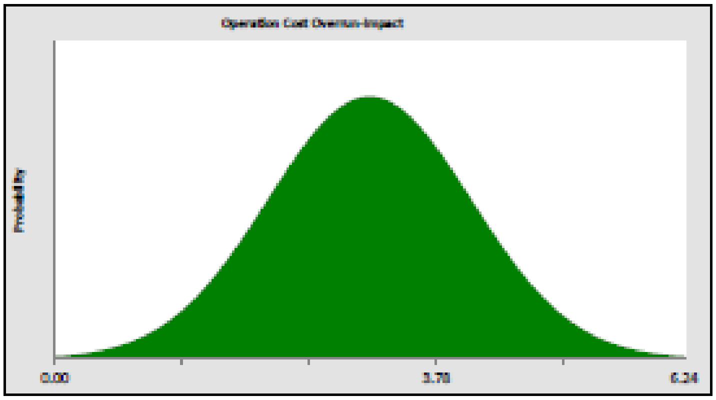
Mean	3.48
Std. Dev.	0.96



Assumption: Operation Cost Overrun-Impact

Normal distribution with parameters:

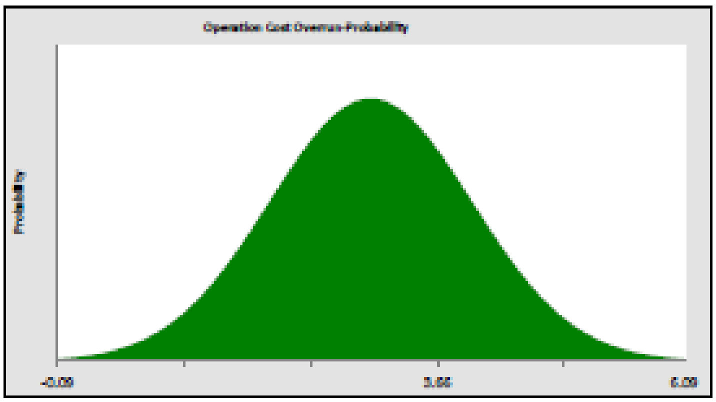
Mean	3.12
Std. Dev.	1.01



Assumption: Operation Cost Overrun-Probability

Normal distribution with parameters:

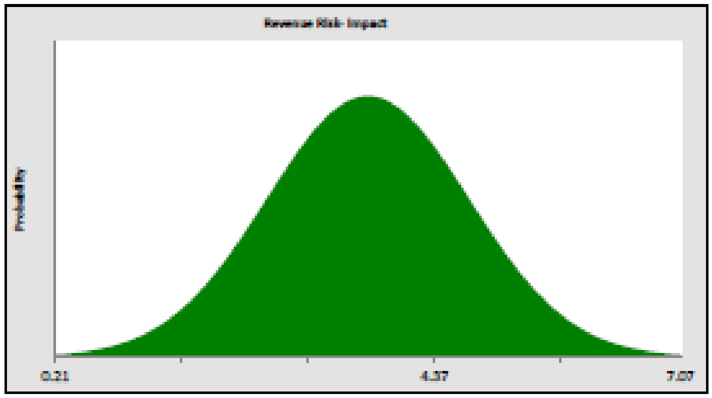
Mean	3.00
Std. Dev.	1.00



Assumption: Revenue Risk- Impact

Normal distribution with parameters:

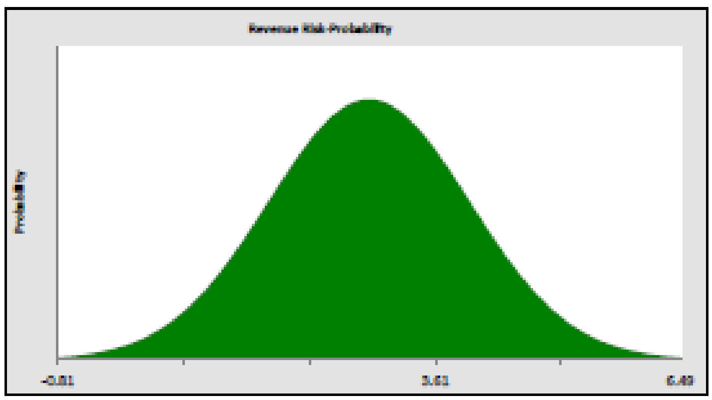
Mean	3.64
Std. Dev.	1.11



Assumption: Revenue Risk-Probability

Normal distribution with parameters:

Mean	2.84
Std. Dev.	1.18



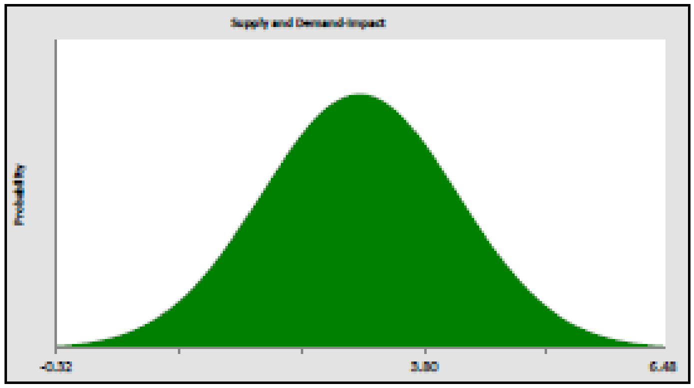
Factor 2: Commercial and Market Environmental Risks

1- Supply and Demand
2- Change in Market Demand

Assumption: Supply and Demand-Impact

Normal distribution with parameters:

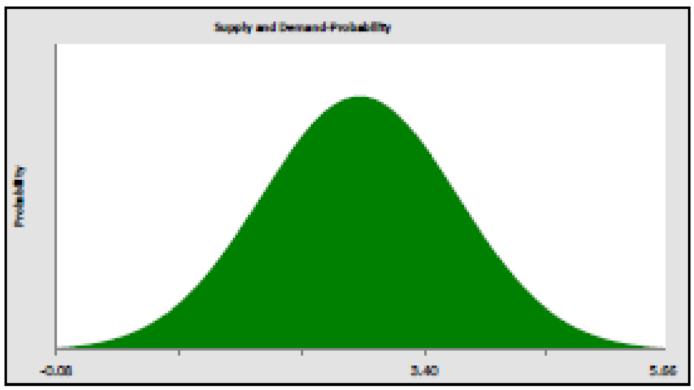
Mean	3.08
Std. Dev.	1.10



Assumption: Supply and Demand-Probability

Normal distribution with parameters:

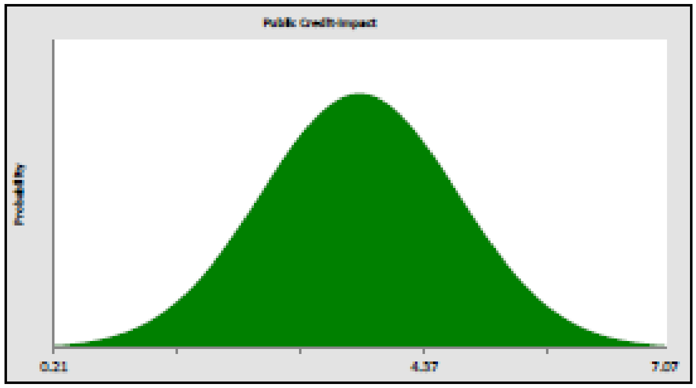
Mean	2.79
Std. Dev.	0.93



Assumption: Public Credit-Impact

Normal distribution with parameters:

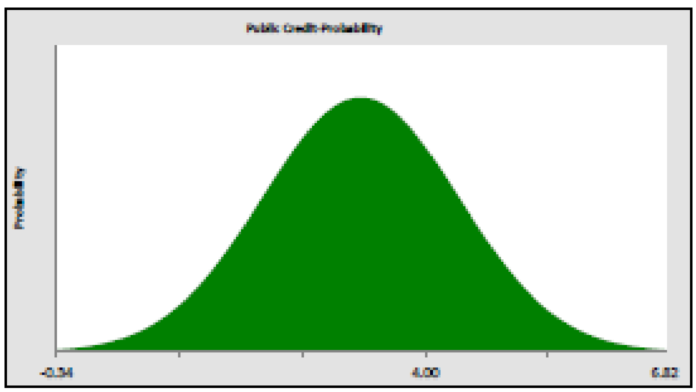
Mean	3.64
Std. Dev.	1.11



Assumption: Public Credit-Probability

Normal distribution with parameters:

Mean	3.24
Std. Dev.	1.16



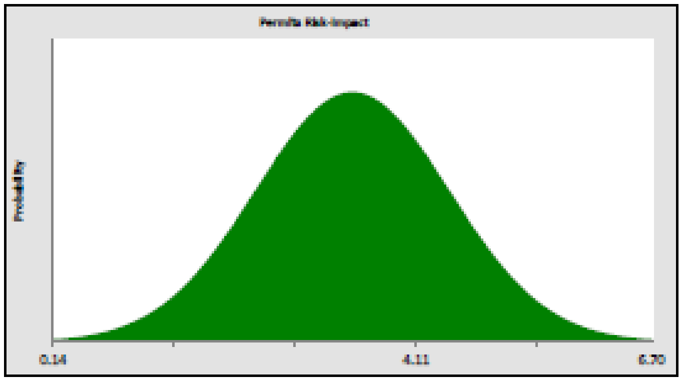
Factor 3: Legal Risks

1- Permits Risk
2- Delay in Project Approvals/Permits
3- Legislation Changes
4- Dispute Resolution
5- Change in Tax Regulation
6- Government Policy

Assumption: Permits Risk-Impact

Normal distribution with parameters:

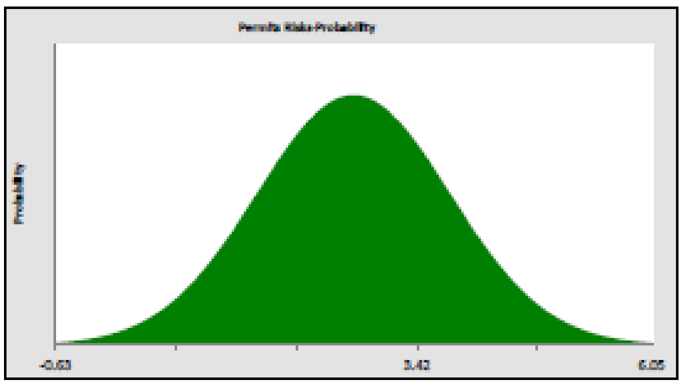
Mean	3.42
Std. Dev.	1.06



Assumption: Permits Risks-Probability

Normal distribution with parameters:

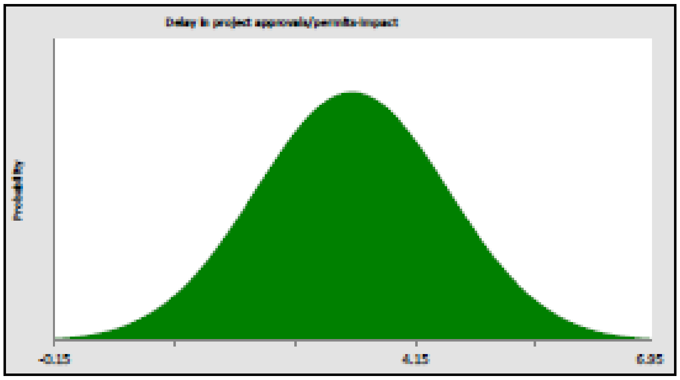
Mean	2.71
Std. Dev.	1.08



Assumption: Delay in project approvals/permits-Impact

Normal distribution with parameters:

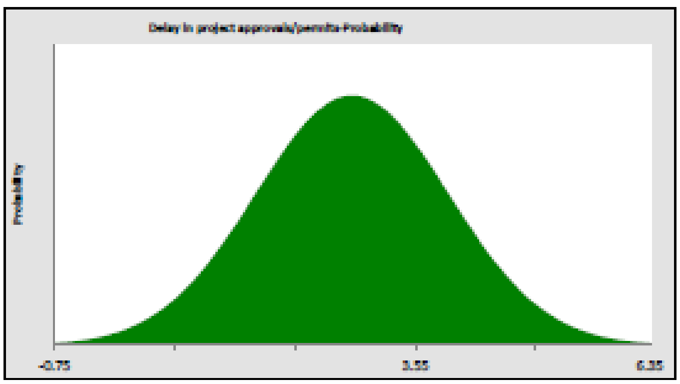
Mean	3.40
Std. Dev.	1.15



Assumption: Delay in project approvals/permits-Probability

Normal distribution with parameters:

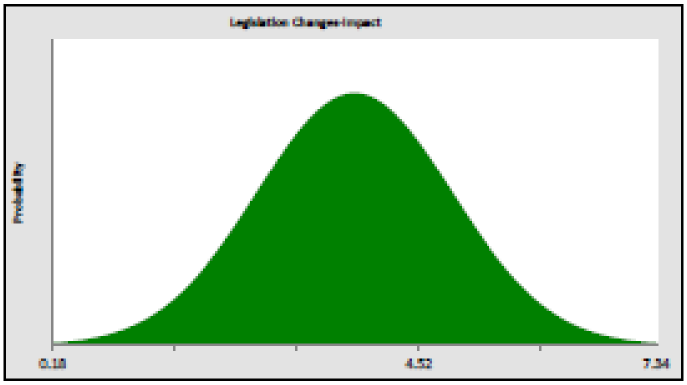
Mean	2.80
Std. Dev.	1.15



Assumption: Legislation Changes-Impact

Normal distribution with parameters:

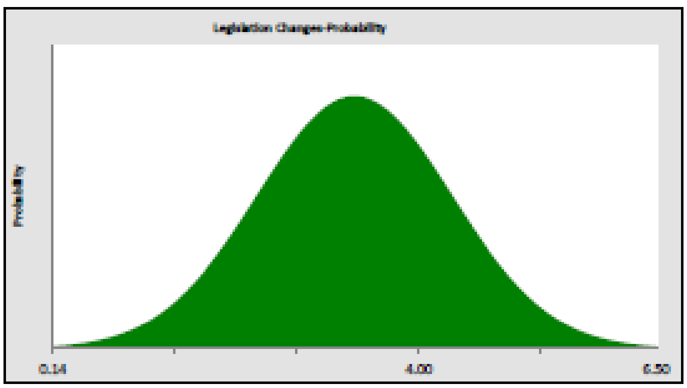
Mean	3.76
Std. Dev.	1.16



Assumption: Legislation Changes-Probability

Normal distribution with parameters:

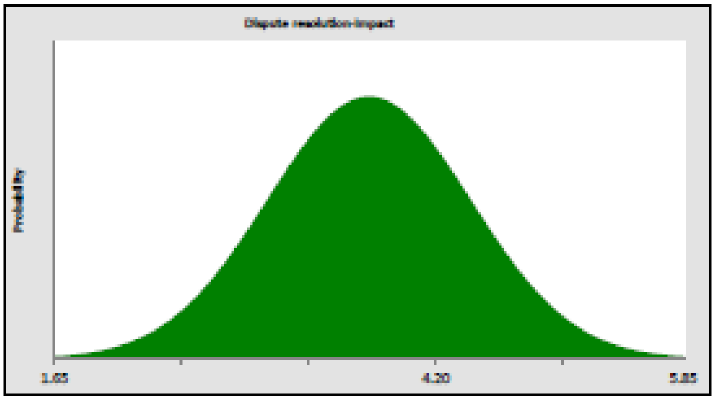
Mean	3.32
Std. Dev.	1.03



Assumption: Dispute resolution-Impact

Normal distribution with parameters:

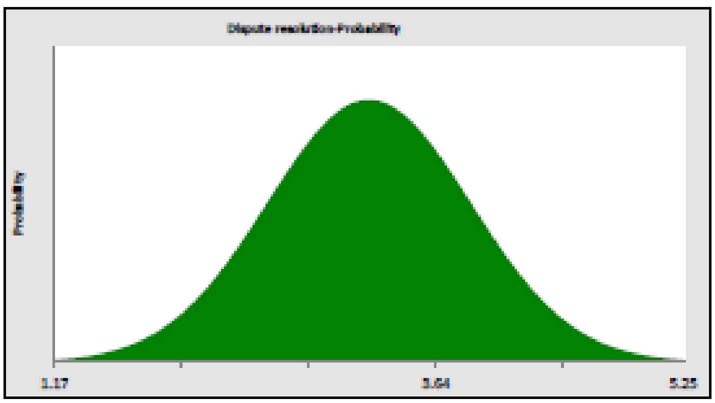
Mean	3.75
Std. Dev.	0.68



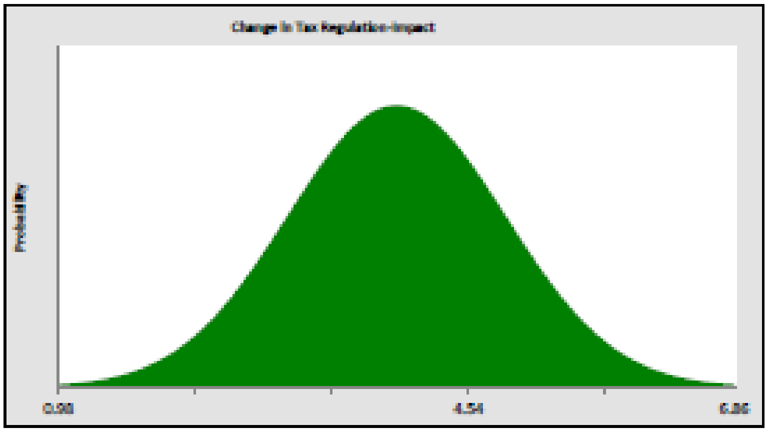
Assumption: Dispute resolution-Probability

Normal distribution with parameters:

Mean	3.21
Std. Dev.	0.66



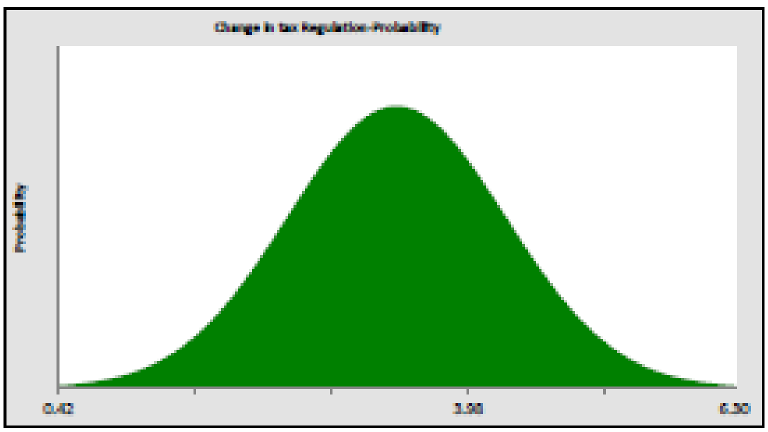
Assumption: Change In Tax Regulation-Impact (cont'd)



Assumption: Change In tax Regulation-Probability

Normal distribution with parameters:

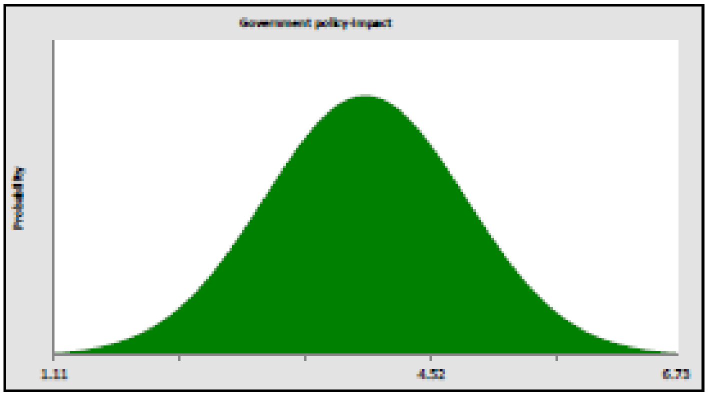
Mean	3.36
Std. Dev.	0.95



Assumption: Government policy-Impact

Normal distribution with parameters:

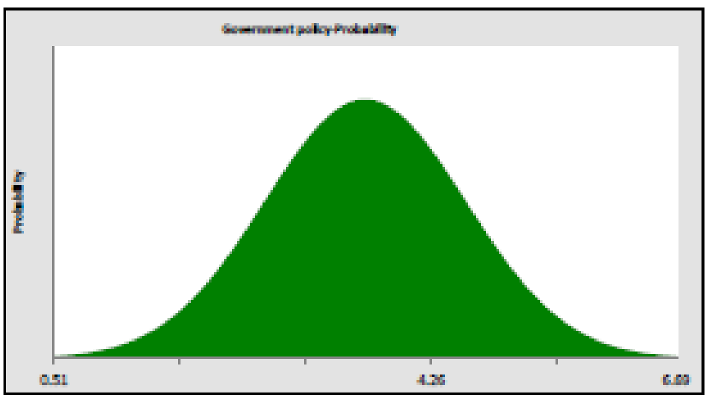
Mean	3.92
Std. Dev.	0.91



Assumption: Government policy-Probability

Normal distribution with parameters:

Mean	3.60
Std. Dev.	1.00



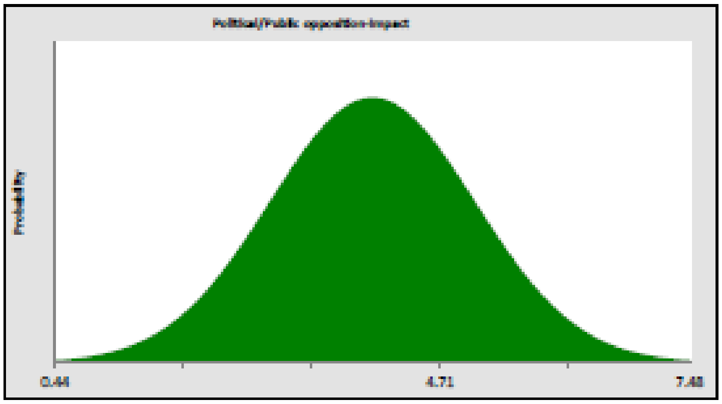
Factor 4: Political Risks

1- Political/Public Opposition
2- Swings in Public Opinion
3- Political Risk
4- Nationalization/Expropriation

ssumption: Political/Public opposition-Impact

Normal distribution with parameters:

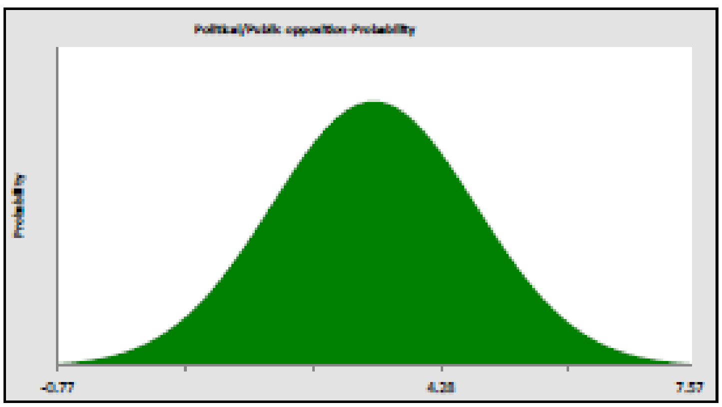
Mean	3.96
Std. Dev.	1.14



ssumption: Political/Public opposition-Probability

Normal distribution with parameters:

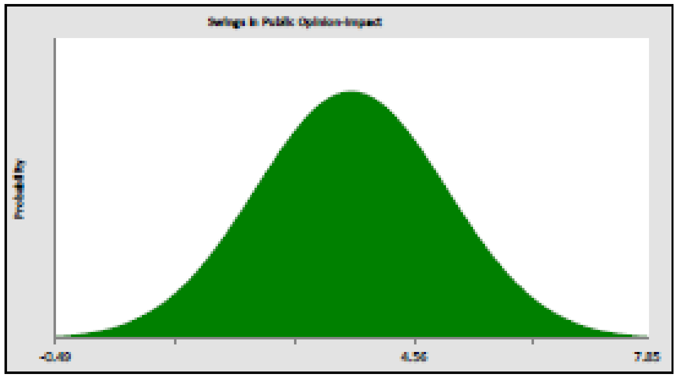
Mean	3.40
Std. Dev.	1.35



Assumption: Swings in Public Opinion-Impact

Normal distribution with parameters:

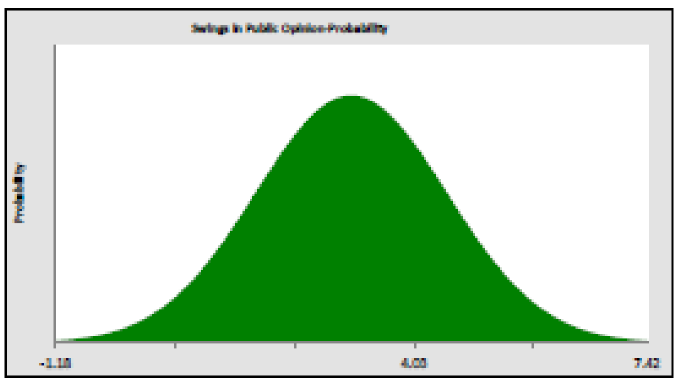
Mean	3.68
Std. Dev.	1.35



Assumption: Swings in Public Opinion-Probability

Normal distribution with parameters:

Mean	3.12
Std. Dev.	1.39

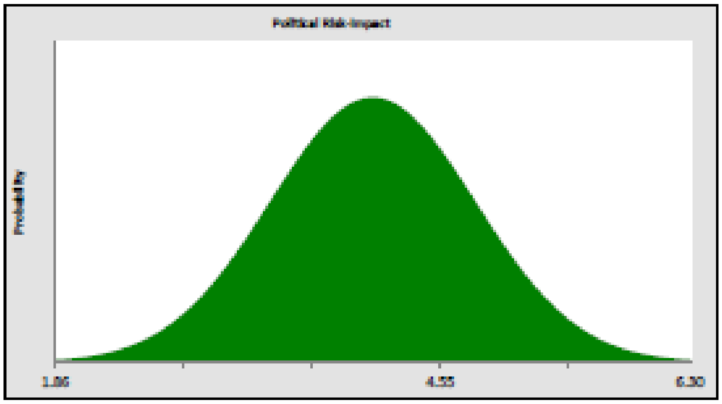


End of Assumptions

Assumption: Political Risk-Impact

Normal distribution with parameters:

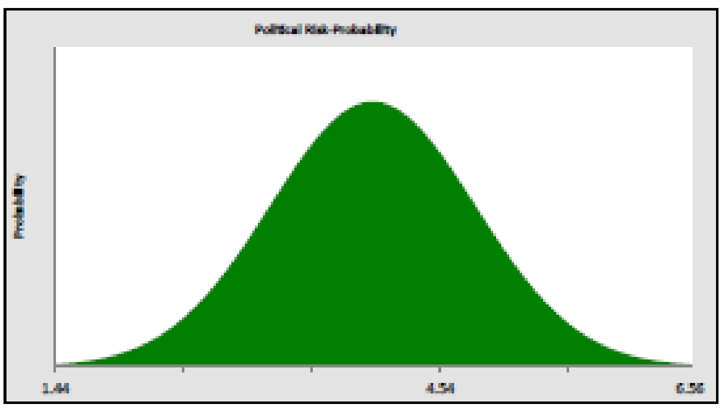
Mean	4.08
Std. Dev.	0.72



Assumption: Political Risk-Probability

Normal distribution with parameters:

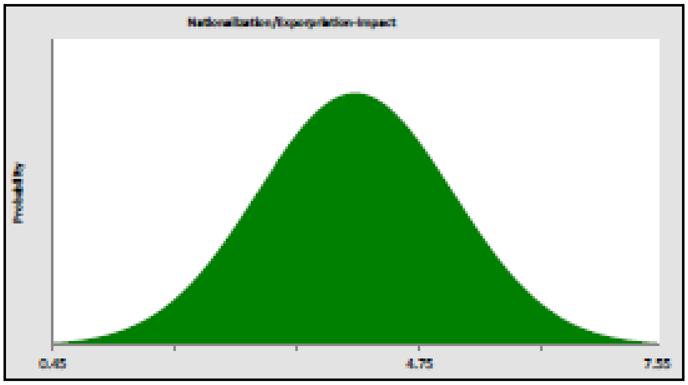
Mean	4.00
Std. Dev.	0.83



Assumption: Nationalization/Exporpriation-Impact

Normal distribution with parameters:

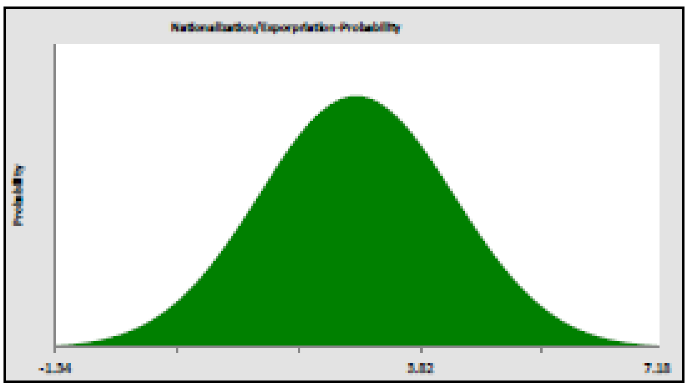
Mean	4.00
Std. Dev.	1.15



Assumption: Nationalization/Exporpriation-Probability

Normal distribution with parameters:

Mean	2.92
Std. Dev.	1.38



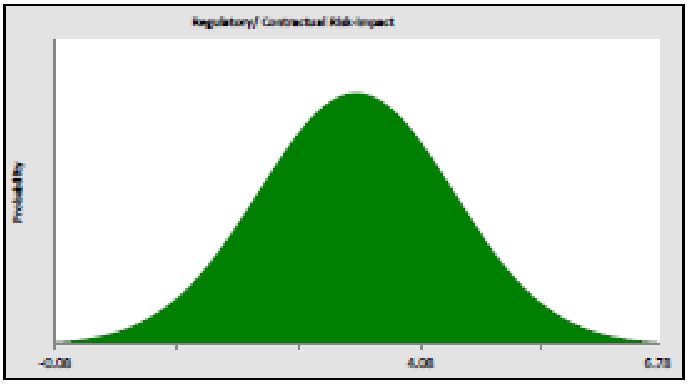
Factor 5: Regulatory Risks

1- Regulatory/Contractual Risk
2- Government Intervention

Assumption: Regulatory/ Contractual Risk-Impact

Normal distribution with parameters:

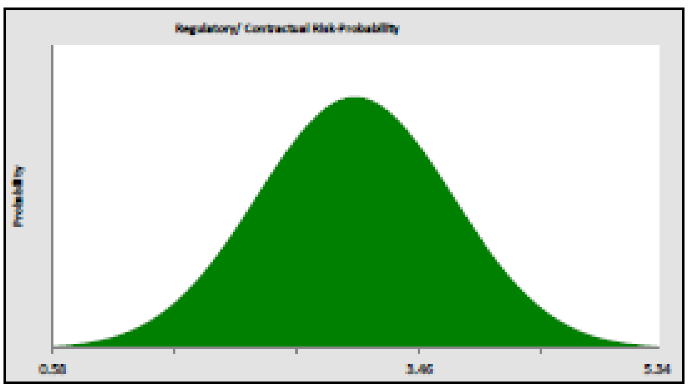
Mean	3.35
Std. Dev.	1.11



Assumption: Regulatory/ Contractual Risk-Probability

Normal distribution with parameters:

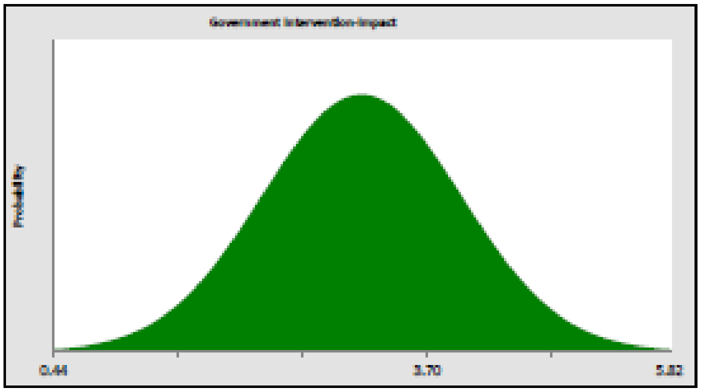
Mean	2.96
Std. Dev.	0.77



Assumption: Government Intervention-Impact

Normal distribution with parameters:

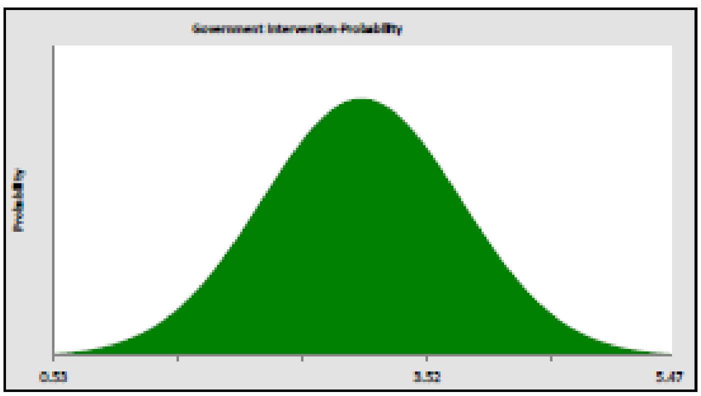
Mean	3.13
Std. Dev.	0.87



Assumption: Government Intervention-Probability

Normal distribution with parameters:

Mean	3.00
Std. Dev.	0.80



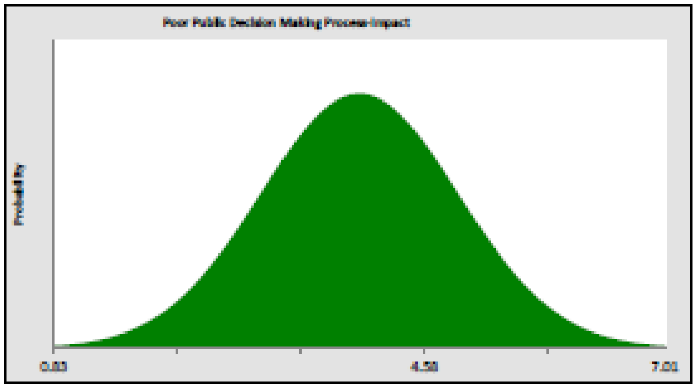
Factor 6: Government Maturity Risks

1- Poor Public Decision Making Process
2- Government Corruption
3- Inadequate Law and Supervision System

Assumption: Poor Public Decision Making Process-Impact

Normal distribution with parameters:

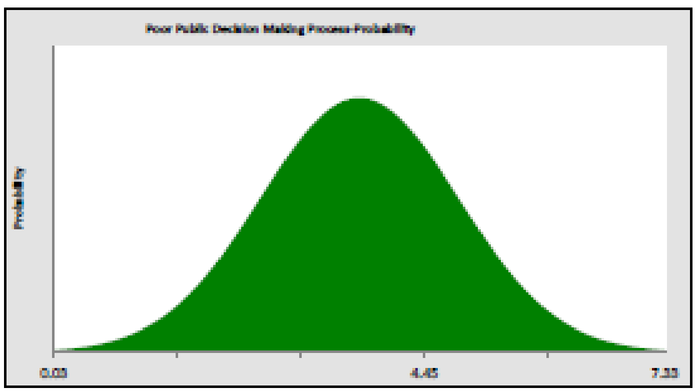
Mean	3.92
Std. Dev.	1.00



Assumption: Poor Public Decision Making Process-Probability

Normal distribution with parameters:

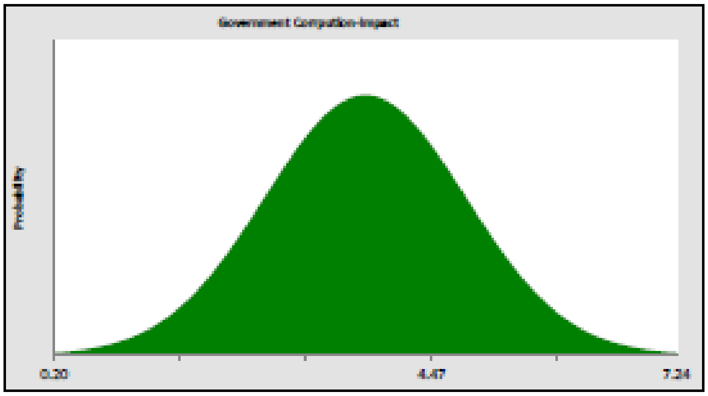
Mean	3.68
Std. Dev.	1.18



Assumption: Government Corrpution-Impact

Normal distribution with parameters:

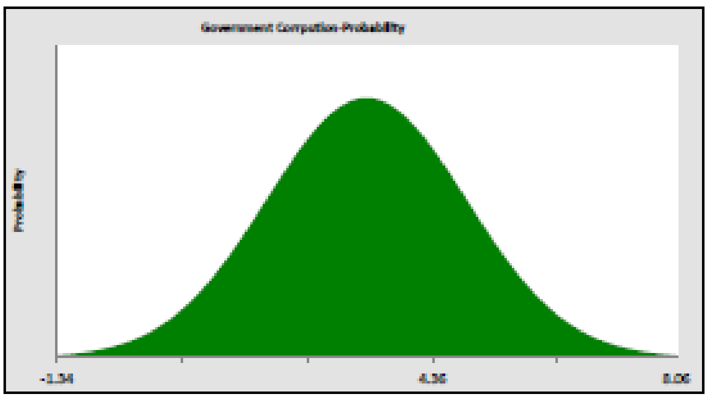
Mean	3.72
Std. Dev.	1.14



Assumption: Government Corrpution-Probability

Normal distribution with parameters:

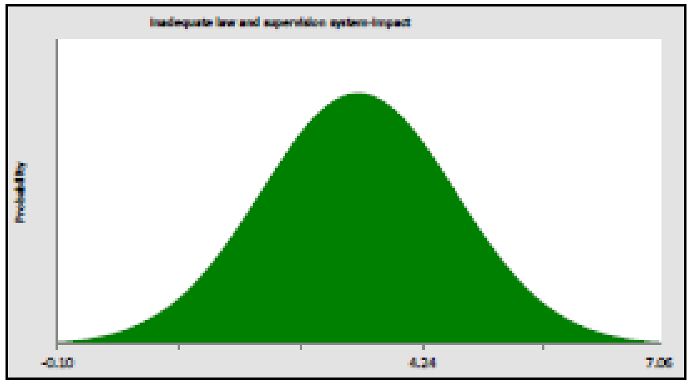
Mean	3.36
Std. Dev.	1.52



Assumption: Inadequate law and supervision system-Impact

Normal distribution with parameters:

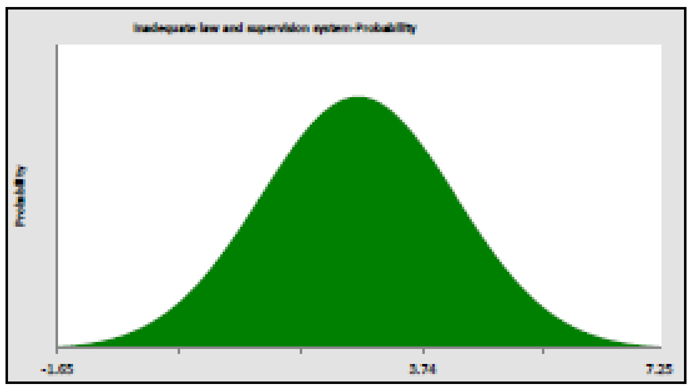
Mean	3.48
Std. Dev.	1.16



Assumption: Inadequate law and supervision system-Probability

Normal distribution with parameters:

Mean	2.80
Std. Dev.	1.44



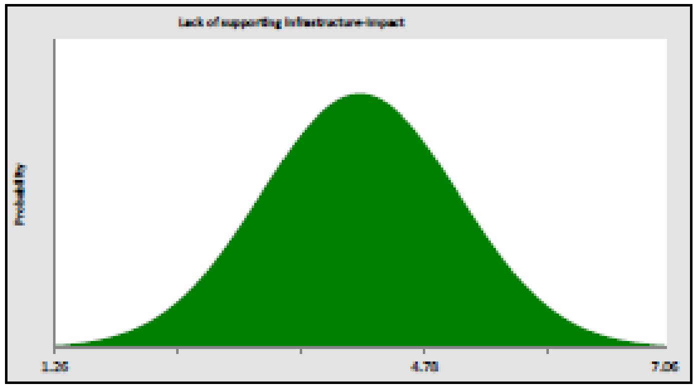
Factor 7: Technical Risks

1- Lack of Supporting Infrastructure

Assumption: Lack of supporting Infrastructure-Impact

Normal distribution with parameters:

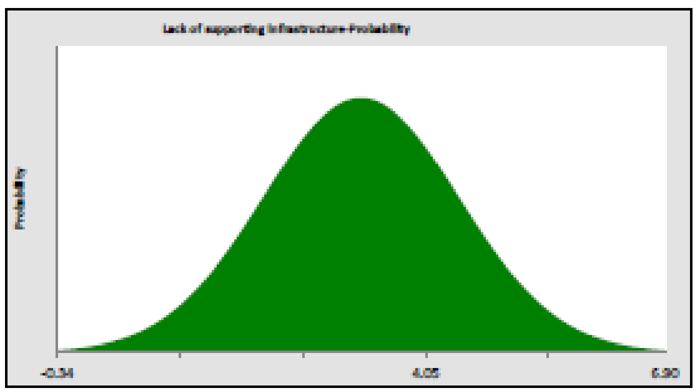
Mean	4.16
Std. Dev.	0.94



Assumption: Lack of supporting Infrastructure-Probability

Normal distribution with parameters:

Mean	3.28
Std. Dev.	1.17



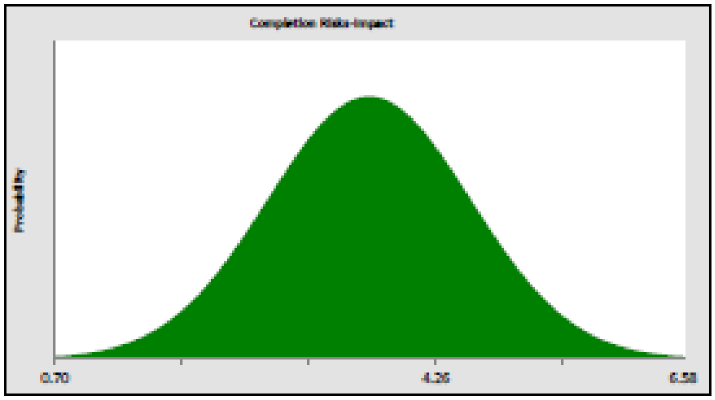
Factor 10: Production Risks

1- Completion Risks

Assumption: Completion Risks-Impact

Normal distribution with parameters:

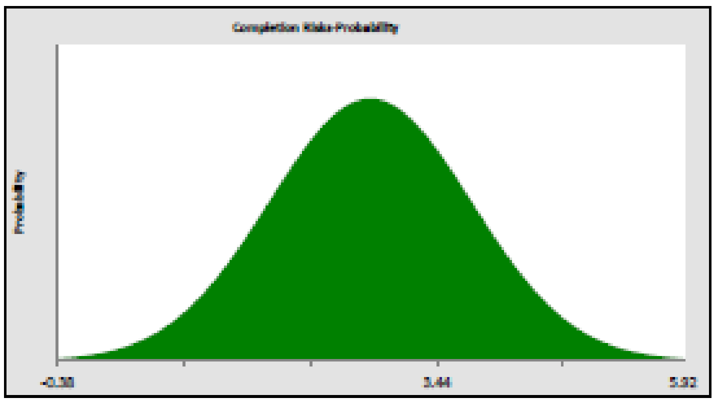
Mean	3.64
Std. Dev.	0.95



Assumption: Completion Risks-Probability

Normal distribution with parameters:

Mean	2.77
Std. Dev.	1.02



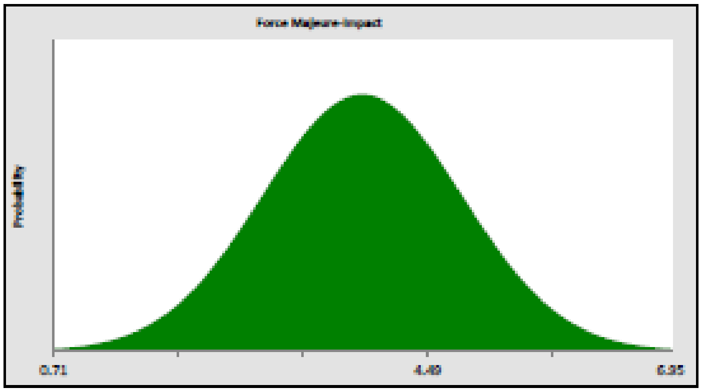
Factor 12: Unforeseen Risks

1- Force Majeure

Assumption: Force Majeure-Impact

Normal distribution with parameters:

Mean	3.83
Std. Dev.	1.01



Assumption: Force Majeure-Probability

Normal distribution with parameters:

Mean	2.83
Std. Dev.	0.96