RISK ASSESSMENT OF THE INTEGRATED HEALTH CAMPUS PROJECTS CARRIED OUT WITH THE PUBLIC-PRIVATE PARTNERSHIP (PPP) MODEL IN TURKEY

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ABSTRACT

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The public-private partnership (PPP) model, which has emerged as a prominent approach among project delivery methods in the construction of large-scale infrastructure projects since the 1980s, has been adopted by the Turkish Ministry of Health to realize the integrated health campus (IHC) projects nationwide since 2009. The requirement that PPP projects possess an objective, reliable, and applicable risk assessment process is considered one of the most critical success criteria during the project's life cycle. In line with this objective, a comprehensive risk assessment is carried out in the case of eighteen IHCs implemented by the MoH, encompassing the steps of identification, evaluation, allocation, and management of risks. For this purpose, a structured questionnaire survey was conducted among sixty professionals involved in these PPP projects, and it was used to reveal the probability of occurrence and magnitude of impact of the thirty-six risk factors – regarding both the construction and operation periods of the investments – identified through a comprehensive literature review. The stakeholders responsible for addressing the

adverse consequences of such risks are determined through an in-depth review of a typical project agreement and the relevant legislation governing the implementation of PPP healthcare investments in Turkey. Eventually, effective risk mitigation strategies widely acknowledged in the literature and the industry have been proposed to manage systematic risks of macroeconomic origin – *i.e.*, construction and operation period currency risk, financing risk, variation order risk – which have been identified as posing a high level of threat for the timely and cost-effective implementation of IHC projects.

Keywords: Project Delivery Methods, Public-Private Partnership, Integrated Health Campuses, Risk Assessment, Allocation of Risks

ÖZ

TÜRKİYE'DE KAMU-ÖZEL İŞBİRLİĞİ MODELİ İLE YÜRÜTÜLEN ENTEGRE SAĞLIK KAMPÜSÜ PROJELERİNİN RİSK DEĞERLENDİRMESİ

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1980'lerin başından bu yana öne çıkan bir proje tedarik yöntemi olarak benimsenen kamu-özel iş birliği (KÖİ) modeli, 2009 yılından itibaren Türkiye genelinde ülkenin sağlık altyapısına kazandırılan entegre sağlık kampüsü (ESK) yatırımlarının hayata geçirilmesinde Sağlık Bakanlığı tarafından da tercih edilmiştir. KÖİ projelerinin objektif, güvenilir ve uygulanabilir bir risk değerlendirme sürecine tabi tutulması, proje yaşam döngüsü boyunca en önemli başarı kriterlerinden biri olarak kabul edilmektedir. Bu gereklilik doğrultusunda, çalışma kapsamında Sağlık Bakanlığı tarafından gerçekleştirilen on sekiz ESK projesine ilişkin olarak; risklerin tanımlanması, değerlendirilmesi, tahsisi ve yönetimi aşamalarını içeren kapsamlı bir risk değerlendirme süreci yürütülmüştür. Bu amaçla, literatür taraması sonucunda belirlenen otuz altı risk faktörü kullanılarak, söz konusu KÖİ projelerinde farklı kademelerde görev almış altmış uzmanın katılımıyla gerçekleştirilen bir anket çalışması gerçekleştirilmiştir. Çalışma sonucunda, projelerin gerek inşaat gerekse işletme dönemlerinde risklerin meydana gelme olasılıkları ile etkilerinin büyüklük

dereceleri ortaya konulmuştur. Ayrıca, Türkiye'de sağlık tesisi yatırımlarının KÖİ çerçevesinde gerçekleştirilmesini düzenleyen mevzuat ve tip proje anlaşmalarının detaylı biçimde incelenmesi yoluyla, belirlenen risklerin gerçekleşmesi halinde ortaya çıkabilecek olumsuz sonuçlarının yönetilmesinden hangi proje paydaşının sorumlu olacağı tespit edilmiştir. Sistematik ve makroekonomik temelli olan yatırım dönemi ve işletme dönemi döviz kuru riski, finansman riski ve iş değişikliği risklerinin ESK projelerinin zamanında ve maliyet etkin biçimde sürdürülebilmesi açısından yüksek düzeyde tehdit oluşturduğu tespit edilmiştir. Bu doğrultuda, söz konusu risklerin etkili bir şekilde yönetilebilmesini sağlamak amacıyla, literatürde ve sektörde genel kabul görmüş risk yönetim araçlarına yönelik öneriler geliştirilmiştir.

Anahtar Kelimeler: Proje Tedarik Yöntemleri, Kamu-Özel İşbirliği, Entegre Sağlık Kampüsleri, Risk Değerlendirmesi, Risk Tahsisi

To my beloved wife and our miracle “*Jan*”

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LIST OF ABBREVIATIONS

AGC	Associated General Contractors of America
AIA	American Institute of Architects
AP	Availability Payment
BBO	Buy-Build-Operate
BOO	Build-Own-Operate
BOOT	Build-Own-Operate-Transfer
BOT	Build-Operate-Transfer
BREEAM	Building Research Establishment Environmental Assessment Method
CAPEX	Capital Expenditures
CAR	Commercial Area Revenue
CBRT	Central Bank of the Republic of Turkey
CM	Construction Management
CMAA	The Construction Management Association of America
CMR	Construction Manager at Risk
CPI	Consumer Price Index
DB	Design-Build
DBB	Design-Bid-Build
DBFO	Design-Build-Finance-Operate
DBFOM	Design-Build-Finance-Operate-Maintain
DBOO	Design-Build-Own-Operate

DSCR	Debt Service Coverage Ratio
EIA	Environmental Impact Assessment
EPEC	European PPP Expertise Centre
EU	European Union
EURIBOR	Euro Interbank Offered Rate
FHWA	Federal Highway Association
FIA	Fixed Investment Amount
HIMS	Hospital Information Management System
HM	Her/His Majesty's
IFC	International Finance Corporation
IHC	Integrated Health Campus
IMF	International Monetary Fund
IPD	Integrated Project Delivery
IRR	Internal Rate of Return
ISO	International Organization for Standardization
KB	*Kullanım bedeli* (Availability Payment)
MIGA	Multilateral Investment Guarantee Agency
MoH	Ministry of Health of the Republic of Turkey
O&M	Operation and Maintenance
PA	Project Agreement
PDM	Project Delivery Method
PFI	Project Finance Initiative

PPI	Producer Price Index
PPP	Public-Private Partnership
SP	Service Payments
SPV	Special Purpose Vehicle
TÜFE	*Tüketici Fiyat Endeksi* (Consumer Price Index)
US	United States
USD	United States Dollars
USDoT	United States Department of Transportation
ÜFE	*Üretici Fiyat Endeksi* (Producer Price Index)
VfM	Value for Money
WACC	Weighted Average Cost of Capital
YP	*Yabancı Para* (Foreign Currency)

CHAPTER 1

INTRODUCTION

The emergence of the welfare state paradigm in the early twentieth century significantly expanded the state's role in economic and social domains. In line with this approach, public sector functions have undergone notable expansion. However, factors such as global economic downturns, technological progress, population growth, and increasing expectations from public service recipients have placed additional pressure on public service provision. Consequently, there has been a growing pursuit of alternative models to realize infrastructure investments that support the public sector's responsibilities in service delivery. Hence, new regulations have been introduced to increase the efficiency of public services by encouraging the participation of the private sector.

To enable the public and private sectors to deliver public services in an integrated manner jointly, various models have been tested worldwide, accompanied by corresponding legal frameworks. Today, the term 'Public-Private Partnership (PPP)' refers to a model that envisions the delivery of integrated services by the public and private sectors for public services and investment projects. The model has been implemented in numerous countries. According to the World Bank's annual report, a total of 304 PPP projects attracted private investments totaling $93.3 billion across 52 countries in 2017 alone (Saha, Hong, Shao, Modi, & Zemlytska, 2017).

With the transition to a market economy in Turkey, the private sector was first enabled to operate within a structure corresponding to the build-operate-transfer (BOT) and build-lease-transfer (BLT) models through Law No. 3096, dated 1984, titled 'The Law on Assigning Enterprises Other Than the Turkish Electricity Authority for the Generation, Transmission, Distribution and Trade of Electricity'. This marked the beginning of the first-generation public-private partnership (PPP)

implementations in the energy sector through BOT and BLT models (Cangöz, Emek, & Uyduranoğlu Karaca, 2022). In time, with the evolving understanding of public administration, the adoption of the public-private partnership (PPP) model in Turkey can be attributed to several key factors and developments: (i) rapid population growth and the consequent need for infrastructure; (ii) increasing demand for urban infrastructure services driven by rising urbanization; (iii) the pursuit of large-scale, long-term and profitable projects by international corporations; (iv) global economic crises, which had particularly profound impacts on developing countries; and (v) governments' search for alternative financing mechanisms to substitute privatization (Ministry of Development of the Republic of Turkey, 2018).

1.1 Background Information

The public-private partnership model is tailored to the specific needs of countries and is utilized across various sectors in public infrastructure projects as well as in the delivery of public services. As indicated by the Commission of the European Communities (2004), a public-private partnership, in its most inclusive definition, refers to any collaborative arrangement between the public and private sectors aimed at financing, constructing, renovating, managing, or maintaining infrastructure, or delivering a service. While the model is predominantly applied in developing countries across various sectors, including transportation, energy, healthcare, education, and water infrastructure, in developed countries, it is primarily used to upgrade existing infrastructure systems in line with technological advancements or to enhance service quality (Grimsey & Lewis, 2002).

According to HM Treasury (2000), the PPP model offers numerous advantages that explain its widespread adoption worldwide. The first advantage is that the model enhances the state's investment capacity by creating opportunities for integrated solutions in public investments (Beatley, 1996). Particularly for large-scale public investment projects, implementation through traditional procurement methods becomes increasingly complex due to capacity and budgetary constraints. As also

noted by Lee & Kim (2018), these constraints often lead to inefficiencies in the use of public resources, because projects are divided into smaller segments and implemented over extended periods. However, in the same document, it is asserted that the PPP model structurally addresses such inefficiencies by offering a comprehensive solution for the realization of large-scale public investment projects. Secondly, the model enables the integration of the private sector's expertise and innovative perspective into public investments within the framework of a collaborative approach, including design, construction, and operation. Thirdly, by utilizing economies of scale, the private sector can achieve reductions in lifecycle costs and improvements in efficiency, which in turn lead to decreased construction and operational costs for public infrastructure services or to the implementation of higher-quality projects at the same cost. Although cost reductions remain a debated issue in the literature, it is widely accepted that cost-effectiveness can be quantitatively assessed using the value for money (VfM) methodology. Finally, one of the most significant benefits of the PPP model from the perspective of the public sector, as mentioned in HM Treasury's document (2000) and as also asserted by Zimmermann & Eber (2014), is the ability to ensure optimal risk transfer and/or sharing, which has a considerable impact on construction and operational costs. Risk allocation is widely regarded as one of the key advantages of the PPP model over traditional procurement approaches. "However, due to the long duration and substantial size of investments, the risks associated with PPP projects should not be underestimated (Li & Zou, 2012)". When risks are appropriately allocated or shared and combined with an effective risk management strategy, the PPP model facilitates the implementation of the most effective approach for delivering large-scale public investments (HM Treasury, 2000).

1.2 Problem Statement

In Turkey, the Ministry of Health launched the Health Transformation Program and initiated the implementation of large-scale integrated health campus (IHC) projects

nationwide through the public-private partnership (PPP) model. The objective was to rapidly renew the existing public hospital stock, which was characterized by outdated infrastructure, obsolete technology, and limited capacity, by leveraging the dynamism, technical expertise, and financial resources of the private sector. Commonly referred to as 'City Hospitals', a term widely recognized by the public as a brand name, the first of these projects was completed and opened to service in Yozgat in 2017 (Turkish Ministry of Health, 2024).

Following the commissioning of the Yozgat Integrated Health Campus, with a bed capacity of 475, additional PPP-based IHC facilities were commissioned to provide healthcare services in the provinces of Mersin, Isparta, and Adana within the same year. By 2024, with the completion of projects located in the major metropolitan cities of Istanbul, Izmir, Ankara, as well as Kayseri, Elazığ, Eskişehir, Manisa, Bursa, Tekirdağ, Konya, Kocaeli, Gaziantep, and Kütahya, the total number of IHCs reached 18. These projects accounted for a combined bed capacity of 27,000 and an enclosed area of approximately 10 million square meters (Turkish Ministry of Health, 2024). However, PPP projects may entail more complex risks and expose stakeholders to higher risk levels compared to conventional project delivery methods (Carbonara, Costantino, Gunnigan, & Pellegrino, 2015).

A review of the current literature, based on 63 published sources on PPP project structures and associated risk issues, reveals a lack of studies thoroughly evaluating the risks encountered during the implementation of healthcare infrastructure projects through the PPP model. Accordingly, this study aims to contribute to filling this gap in the literature by conducting a comprehensive risk assessment.

1.3 Aim and Objectives

Guided by the defined research problem and objectives, the following research questions have been developed:

- What are the common project delivery methods used in the construction industry?
- What are the types of public-private partnership (PPP) models? Which model type is utilized in hospital projects in Turkey?
- What are the main risk factors affecting large-scale infrastructure projects?
- What are the most critical risk factors affecting hospital projects carried out by the PPP model?
- Which qualitative, quantitative, and hybrid evaluation methods can be used to evaluate identified risk factors?
- What are the probabilities of occurrence of the significant risk factors and the magnitude of their impacts?
- Considering the integrated health campus (IHC) projects realized by utilizing the PPP model, which party is responsible for bearing the possible adverse consequences of risks in accordance with the project agreements and relevant legislation in Turkey?
- What should be the appropriate risk management tools and/or techniques for the PPP-based IHC projects in Turkey in case identified risks materialize?

1.4 Methodology

The methodology employed in this study is discussed in detail in Chapter 3, titled "Research Methods". In brief, this research employs a hybrid method that incorporates both qualitative and quantitative approaches. Risk factors identified through a comprehensive literature review have been evaluated using a structured questionnaire survey. Sector experts from both the public and private sectors assessed the likelihood and impact of each risk factor by answering Likert-type questions. The collected data were then subjected to descriptive statistical analysis. Accordingly, the probability of occurrence and the severity of the impact of each risk factor are quantified and presented in tabular form. Subsequently, the findings are examined in relation to a typical project agreement, including its 29 annexes, which

govern 18 PPP-based IHC projects, as well as current legislation regulating healthcare PPP initiatives in Turkey, to ensure the appropriate allocation of risks. Ultimately, the study concludes with suggestions on how to effectively manage the risk factors that pose a high level of threat to the IHC projects.

1.5 Disposition

In this thesis, the first chapter provides background information regarding the research topic, the research problem, the aim, and the methodology of the study. The second chapter presents a comprehensive literature review of the commonly used project delivery methods in the construction industry, including a comparison between traditional and complex approaches. It also includes the definition and characteristics of the public-private partnership model, along with the rationales behind the preference for the model, the risk assessment process, and the organizational structure of IHC projects. In the third chapter, firstly, the materials used in this thesis are presented, comprising brief information on the scope and characteristics of IHC projects carried out by the Turkish MoH with the PPP model; the contractual provisions of a typical project agreement signed between the ministry and the contractors; the PPP legislation in force governing healthcare infrastructure projects carried out in Turkey through the use of the PPP model; and finally, a structured questionnaire survey which was utilized to detect the probabilities of occurrence and the magnitude of impacts of significant risk factors as revealed in the literature in the previous chapter. The third chapter concludes by presenting the research methods employed on the materials as mentioned earlier. In the fourth chapter, risk identification is first carried out to form the risk register, listing the significant risk factors most likely to be encountered during the execution of PPP projects, along with their definitions. Secondly, the quantitative outcomes of the questionnaire survey, conducted to establish the probability-impact matrix, are discussed. In the following section of the chapter, risk factors are allocated by examining a typical project agreement and its annexes related to PPP-based IHC

projects – carried out by the Turkish MoH between 2010 and 2024 – and the relevant legislation in force regulating the implementation of those projects in the country. By doing so, the parties responsible for managing the possible consequences of the risks are designated. The chapter concludes with risk mitigation and avoidance suggestions that can be utilized to ensure effective project lifecycles for the IHC projects, focusing on both cost and time. The fifth and final chapter presents the conclusion, summarizing the overall study, its findings, and future expectations.

CHAPTER 2

LITERATURE REVIEW

Although there is a long history of private sector participation in delivering public services, the emergence of the PPP model as one of the primary procurement routes for public infrastructure and services occurred in the 1980s, following a shift toward increased private sector participation and privatization. The need for such a shift was driven by public sector reforms aimed at improving the efficiency of public service provision. This paradigm led to the quest for innovative methods of delivering public services. Not surprisingly, the public sector has turned to the use of market mechanisms to enhance efficiency and secure the funding necessary for delivering public services. This enthusiasm has led to the widespread use of PPPs worldwide (Boussabaine, 2014).

Before delving into the components of the risk assessment process as part of this thesis, a comprehensive literature review is carried out to explore how PPPs are positioned in comparison to other project delivery methods that coordinate and execute design, construction, and consultancy services to ensure successful project completion (Molenaar, Gransberg, Korkmaz, & Horman, 2009). Governments must assess whether the PPP approach delivers greater value for money compared to conventional public procurement methods before engaging in a project (OECD, 2010).

2.1 Project Delivery Methods in the Construction Industry

Project owners are offered a range of project delivery alternatives, from the traditional design-bid-build (DBB) method to integrated project delivery approaches. Ideally, the selection of a delivery method should be guided by the success factors

that most effectively support the achievement of desired project outcomes. Over time, numerous shifts within the construction industry have necessitated continual revisions to the list of success factors, either through the inclusion of new elements or through altering the prioritization of existing ones (Ahmed & El-Sayegh, 2021). Konchar and Sanvido (1998) argue that until the 1980s, the selection of project delivery methods was primarily driven by cost considerations. However, following the early 1990s, client expectations began to evolve, with a growing emphasis on greater integration and collaborative relationships among project stakeholders. This shift decreased disputes and variations, ultimately reducing delays and costs. Researchers set forth various causes of this evolution:

- Technological advancements, such as building information modeling (BIM), which has been embraced by the construction industry, have further underscored the importance of communication as a key criterion in the selection process of PDMs (Kunz & Ballard, 2012).
- Customers have increasingly shifted their focus toward the quality of the delivered project, placing less emphasis solely on economic or transaction-specific considerations (Giachino, Cecil, Husselbee, & Matthews, 2015).
- Clients' and contractors' increasing awareness of risk factors has also contributed to this evolution (Gransberg, Dillon, Reynolds, & Boyd, 1999).

There are numerous definitions of PDM in the literature. Carpenter and Bausman (2016) define PDM as a comprehensive framework for allocating contractual responsibilities related to the design and construction of a project, encompassing a clearly defined project scope, the obligations of parties, the relationships between parties, and structured procedures for managing time, cost, safety, and quality. Touran *et al.* (2009) describe PDM as the process by which a construction project is comprehensively planned and executed on behalf of the owner, encompassing the definition of project scope, coordination of designers, contractors, and consultants, the sequencing of design and construction phases, the implementation of design and construction activities, project closeout, and commissioning. According to Miller *et al.* (2000), PDM is a framework for structuring and funding the design, construction,

operation, and maintenance phases of a project, designed to ensure the efficient delivery of a specific good or service.

Differences among PDMs are attributable to the definition of work breakdown structures, as well as to the distribution of responsibilities and risks throughout the implementation phase. At each stage, stakeholders focus on transforming resources into project outputs to enhance the overall value of the project (Koskela, 2000). Moore (2000) states that there exists no universally applicable optimal PDM. Likewise, Chen *et al.* (2011) claim that it is inherently challenging to determine the most appropriate project delivery method, as the implementation phase of a project is often accompanied by numerous uncertainties. The choice of a project delivery framework should be based on the specific requirements of the project, the unique attributes and circumstances of the owner, and the effective formation of the project team.

According to Zhong *et al.* (2022), when determining the most suitable PDM, identifying and evaluating relevant selection criteria is considered crucial. The selection of such criteria has remained a prominent topic in project management literature, continuously evolving in response to the increasing complexity of project development. These criteria have been further refined and categorized over time. Factors such as technical excellence, design alternatives, anticipated project completion date, and the level of risk borne by the owner organization are typically considered. A well-defined list of selection criteria is considered beneficial for accurately assessing project characteristics and facilitating the adoption of a more suitable delivery approach. Additionally, aspects such as management and financial capabilities, personnel qualifications, prior experience, safety records, and scope options are often evaluated as part of this process (Zhong, Thang, Chen, & Igor, 2022). Accordingly, the allocation of responsibilities for design, construction, financing, and O&M among project stakeholders is a determinant of the choice of an appropriate PDM. Considering this allocation, and following an extensive literature review, the commonly accepted PDMs in the construction industry are listed in Table 2.1.

Table 2.1 Comparison of project delivery methods compiled from twenty-two literature sources*

	Responsibilities					
Method	**Design**	**Construction**	**Financing**	**Operation & Maintenance**	**Ownership**	**Risk Allocation**
Design-Build **(DB)**	Private	Private	Public	Public	Public	Design & Construction: Private
Design-Bid-Build **(DBB)**	Public	Private (via bidding)	Public	Public	Public	Design: Public Construction: Private
Construction Manager at Risk **(CMR)**	Shared (Designer + CM)	Private (managed by CM)	Public	Public	Public	Design: Public Construction: CM
Integrated Project Delivery **(IPD)**	Collaborative (All parties)	Collaborative	Public / Shared	Shared / Agreed	Shared / Defined	Shared among all parties
Build-Operate-Transfer **(BOT)**	Private	Private	Private	Private (during term)	Public (after transfer)	Full project risk is private until transfer
Build-Own-Operate **(BOO)**	Private	Private	Private	Private	Private	All lifecycle risks on private
Buy-Build-Operate **(BBO)**	Private	Private	Private	Private	Private	All risks post-transfer on private
Design-Build-Own-Operate **(DBOO)**	Private	Private	Private	Private	Private	Full design-to-operation risk on private
Build-Own-Operate-Transfer **(BOOT)**	Private	Private	Private	Private (until transfer)	Public (after transfer)	All risks on private until transfer
Design-Build-Finance **(DBF)**	Private	Private	Private	Public	Public	Design, build & finance risk on private
Design-Build-Finance-Operate **(DBFO)**	Private	Private	Private	Private	Public	Lifecycle risks on private, no transfer
Design-Build-Finance-Operate-Maintain **(DBFOM)**	Private	Private	Private	Private	Public (after transfer)	All risks on private until transfer of the asset

* The twenty two literature sources: (Ahmed & El-Sayegh, 2021), (Carpenter & Bausman , 2016), (Chen, Liu, Li, & Lin, 2011), (Giachino, Cecil, Husselbee, & Matthews, 2015), (Roehrich, Lewis, & George, 2014), (Konchar & Sanvido, 1998), (Kumaraswamy & Zhang, 2001), (Kunz & Ballard, 2012), (Miller , 1995), (Miller, Garvin, Ibbs, & Mahoney, 2000), (Molenaar, Gransberg, Korkmaz, & Horman, 2009), (Moore, 2000), (Sharma , Mishra, & Lekhi, 2020), (CMAA, 2012), (Touran, Ghavamifar, Gransberg, Bakhshi , & Molenaar, 2009), (Zhong, Thang, Chen, & Igor, 2022), (Sarmento & Renneboog, 2016), (Mahdi & Alreshaid, 2005), (AIA and AGC, 2011), (Mafakheri, Dai, Slezak, & Nasiri, 2007), (Demetracopoulou, O'Brien, Khwaja, Feghaly, & El Asmar, 2024), (Sullivan , El Asmar, Chalhoub, & Obeid, 2017).

The Construction Management Association of America (CMAA) (2012) reports that each PDM possesses a different level of risk for the project owner. The association provides Table 2.2, which reflects its perspective on the level of control provided to the owner in correlation with the level of risk. According to this table, PPPs pose the least risk to the project owner.

Table 2.2 Risk levels of various PDMs (CMAA, 2012)

2.2 Public-Private Partnership

The public-private partnership (PPP) model has been defined in various ways in international literature, with different features being emphasized. According to the

World Bank's definition, the PPP model is a contractual system under which the private sector assumes the risk and managerial responsibility in the provision of public goods and services, and both parties undertake long-term obligations (World Bank Group, 2018). The International Monetary Fund (IMF) defines the model as a set of agreements resulting from a negotiated compromise between the differing expectations of the public and private sectors, where the service is delivered by the private party, and success depends on the risks undertaken by the private sector (International Monetary Fund, 2007). According to Sharma *et al*. (2020), it refers to contractual arrangements between a public authority and a private sector entity, enabling enhanced involvement of the private sector in the development and provision of transportation infrastructure projects. Engel *et al.* (2011), on the other hand, define the PPP model as an alternative approach that combines the advantages of both public service provision and complete privatization, offering a "best-of-both-worlds" solution.

In the European Commission evaluation report on the impact and effectiveness of EU public procurement legislation, the model is described as a method that brings together the public and private sectors in the delivery of public services, utilizes the managerial capabilities of the private sector, adopts a new public management approach, in which the state assumes a regulatory role, and involves both parties in managing factors such as cost, risk, and social benefits in delivering public goods and services (European Union, 2011). As reported by the European PPP Expertise Centre (2011), the model is characterized as a set of long-term agreements in which the private sector delivers public services – services that the public sector is obliged to provide – by assuming appropriate risks within the production and decision-making processes.

Boussabaine (2014) points out that several definitions of PPPs put forward in the construction industry so far actually depend on the following concepts: (i) risk transfer, (ii) risk sharing, (iii) sharing skills, (iv) sharing resources, (v) sharing rewards, (vi) sharing responsibilities, (vii) mutual benefit, and (viii) achieving value for money (VfM).

Despite these advantages, critics of PPPs contend that these arrangements may fail to deliver value for money. One of the key arguments is that the borrowing costs of the public sector are significantly lower than those of the private sector, which raises concerns about the overall financial efficiency of such partnerships. Moreover, it is argued that the level of risk allocated to the private sector is often insufficient to justify the claimed benefits in terms of value for money (Hall, 2008).

2.2.1 Types of PPP

According to Rybnicek *et al.* (2020), the contractual agreement in a PPP formalizes the mutual responsibilities and interactions between the public authority and the private entity. This agreement is signed upon completion of the procurement process. Various forms of PPP contracts exist, which differ based on factors such as the nature of the project, the extent of risk allocation, the scale of investment, and the intended project outcomes. A wide variety of models and terminology characterizes PPP arrangements. These models differ primarily in the extent and nature of private sector participation. Common variants include build-operate-transfer (BOT), design-build-finance-operate (DBFO), build-own-operate-transfer (BOOT), design-build-finance-operate-maintain (DBFOM), and build-own-operate (BOO), each reflecting different allocations of responsibilities and risks between the public and private parties (Rybnicek, Plakolm, & Baumgartner, 2020).

In Turkey, for the realization of IHC projects through PPP, the DBFOM model is preferred among various PPP models, and it is considered the most complex. In this model, the private sector is responsible not only for the design, construction, and maintenance of the project but also for securing project financing and operating the facility for a specified period. A more detailed PPP project contract structure is illustrated in Figure 2.1 of Boussabaine (2014).

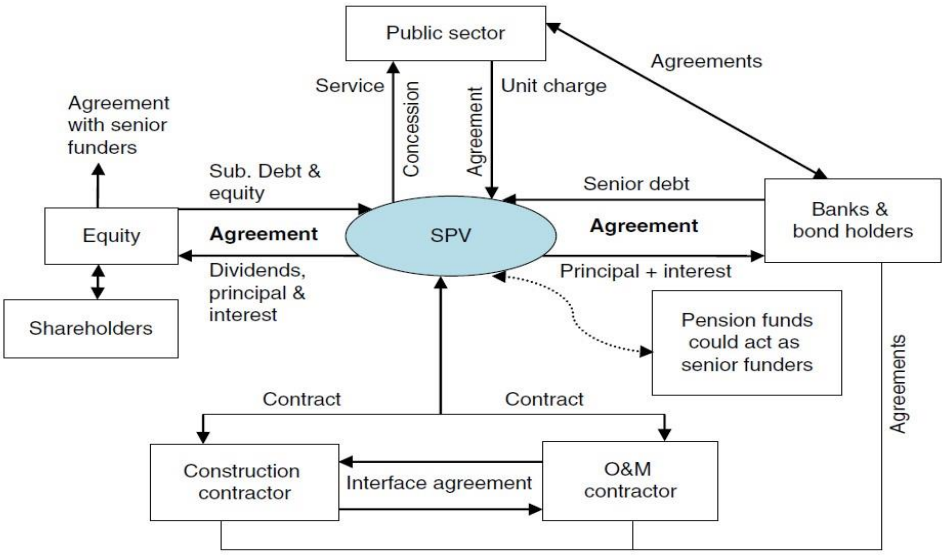

Figure 2.1. Project contract structure of PPP (Boussabaine, 2014)

As illustrated in Figure 2.1, the key actors in this model include the public sector, lenders, equity investors, the special purpose vehicle (SPV) established through a partnership of the investors, and the facility, which constitutes the subject of the partnership between the public sector and the SPV. Within this framework, the SPV is responsible for securing financing and for the construction, operation, and maintenance of the facility. The public authority is contractually obliged to pay availability and service payments to the SPV in return for the facility and the services provided, for a contract period that may extend up to 30 years. In accordance with the conditions outlined in the contract, the public sector may apply deductions from these payments through offsets or penalty mechanisms (Boussabaine, 2014).

As demonstrated through various definitions, the primary objective of employing the PPP model is to foster a long-term, innovative, and efficient service delivery relationship between the public and private sectors, while ensuring the transfer or sharing of certain risks traditionally borne entirely by the public sector under conventional procurement methods.

2.2.2 Traditional Procurement Methods vs. PPPs

In the construction industry, the term ‘traditional procurement’ denotes a fragmented process in which the public sector commissions a series of contracts for the delivery of infrastructure projects. These contracts are separately arranged with financial institutions for funding, construction companies for asset development, and service providers for operational needs. While the government outsources these responsibilities, it ultimately retains overall accountability for planning, financing, delivering, and operating the assets (Lee & Kim, 2018). By contrast, under the PPP model, the public authority enters into a single, long-term agreement with a private entity, typically established as a special purpose vehicle (SPV). This SPV is responsible for delivering both the infrastructure and the related services in accordance with the contractual performance criteria. The private partner coordinates various subcontracts with lenders, builders, and operators. At the same time, the public sector focuses on monitoring compliance with the agreed standards (Molenaar *et al.*, 2009) as illustrated in Figure 2.2.

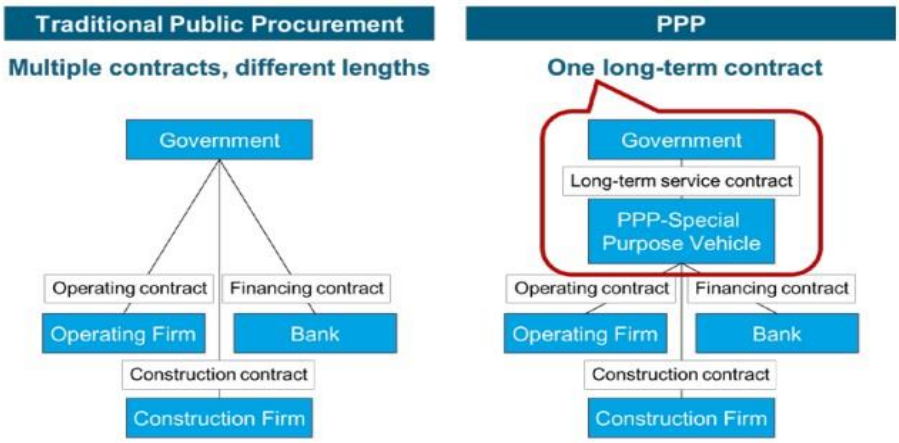

Figure 2.2. PPP versus traditional procurement (World Bank, 2019)

Miller’s (1995) four-quadrant framework, presented in Figure 2.3, simplifies project delivery method terminology by emphasizing two key aspects: delivery integration

and financing source. Delivery integration concerns the extent to which project components such as planning, design, construction, and operation are separated or combined during the project cycle. For instance, in a bridge project, the DBB method requires the owner to hire separate entities for design, construction, and operation. By contrast, under the DBO approach, a single contractor is responsible for design, construction, and operation. The financing source evaluates the degree of financial risk borne by the owner. In DBB and DBO, the owner covers all project costs. In contrast, in a DBFO model, the private sector assumes capital costs, potentially proposing a tunnel instead of a bridge, funded by tolls. The framework clarifies delivery methods by highlighting production and financing responsibilities, thereby assisting strategists in evaluating available options (Miller, Garvin, Ibbs, & Mahoney, 2000).

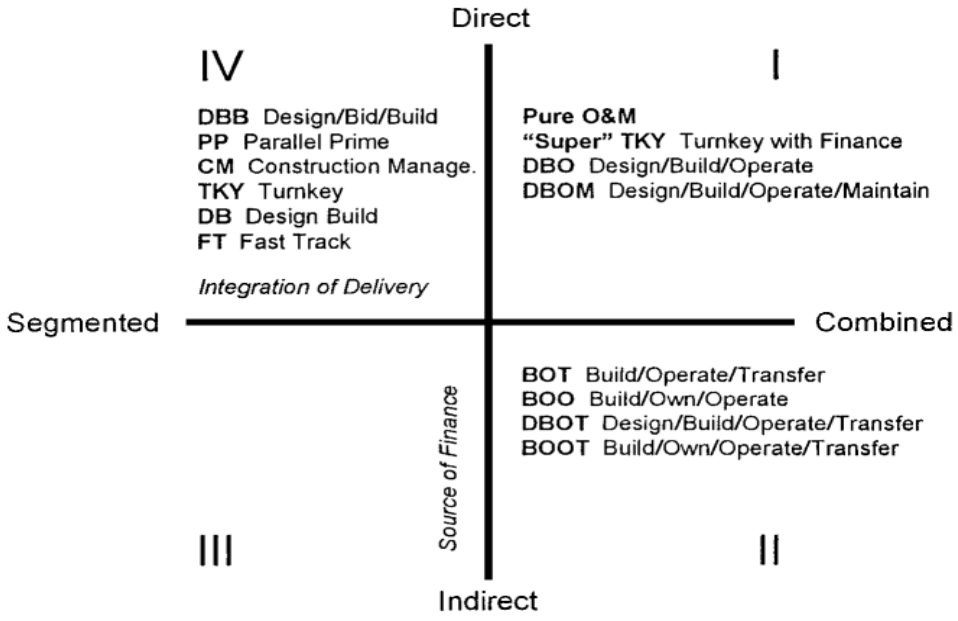

Figure 2.3. Financial framework for PDMs (Miller , 1995)

A key distinction between traditional procurement and PPPs lies in the delegation of financial responsibility. In PPP arrangements, it is the private sector that undertakes

the mobilization of capital, identifying investors, and structuring project finance. Under this model, a consortium of private entities typically forms a special purpose vehicle (SPV) tasked with developing, owning, and operating the infrastructure asset. The SPV is financed through equity contributions made by the participating sponsors. Unlike conventional borrowing arrangements, project finance provides limited or no recourse against the sponsor's non-project assets (Esty, 2003), and the project itself is excluded from the sponsor's balance sheets.

Lessambo (2022) identifies the advantages of the project finance aspect of PPPs compared to traditional procurement as follows:

- Project finance provides a mechanism through which investors, lenders, and other independent stakeholders can collaboratively share the costs, risks, and returns associated with new investments in a manner that promotes both economic efficiency and equity.
- Project finance transactions may reduce financing costs when compared to conventional funding methods, as they enable the use of a greater proportion of debt in the capital structure, which contributes to lower overall capital costs and results in more substantial tax savings due to the deductibility of interest payments.
- Although the financed assets serve as collateral for creditors, lenders primarily depend on the operating cash flows generated by those assets for debt repayment. As the debt is structured on a non-recourse basis, sponsors are not exposed to financial distress risk if the project encounters difficulties.

Contrary to Lessambo, Boussabaine (2014) argues that the implementation of PPPs in developing countries often encounters significant obstacles, including limited public financial capacity, inefficiencies within governmental institutions, uncertainty in the legal and contractual frameworks, institutional capacity gaps on both sides, insufficient political commitment, and administrative constraints. For PPPs to function effectively, Boussabaine (2014) states that several conditions must be satisfied:

- A genuine partnership must be established between public authorities and private entities, underpinned by mutual trust and credibility.
- All relevant stakeholders, including those directly participating in the project and those indirectly impacted in the short or long term, must be actively engaged.
- Robust accountability mechanisms must be implemented.
- Transparency must be ensured, particularly in public procurement procedures and contractual arrangements.
- Inclusive participation, especially from local communities affected by the PPP project, must be facilitated.
- Effective systems for managing contingent liabilities and maintaining fiscal sustainability must be adopted.
- The PPP initiative must be aligned with national development goals and the core principles of effective development practices.

On the other hand, in order to overcome the disadvantages of the model, the Ministry of Development of the Republic of Turkey (2016) suggests the following measures and practices to succeed in a PPP project:

(i) Preparation of high-quality and well-structured feasibility studies to avoid the need for amendments during the project's lifetime;
(ii) Accurate identification of project-related risks and their allocation based on thorough risk analyses;
(iii) Inclusion of comparative analyses between traditional procurement methods and PPP models, which differ from the feasibility assessments of other public investments;
(iv) Availability of strong and capable teams within the investor institutions to carry out the necessary analyses;
(v) Implementation of a transparent and competitive tendering process;
(vi) Support from high-level political decision-makers;
(vii) Establishment of a centralized coordination unit;

(viii) Monitoring and reporting of projects through a qualified monitoring and evaluation system.

Cruz and Marques (2013) claim that, due to the extended duration of PPP projects, they may entail numerous risk factors related to the design, implementation, and operation phases, thus rendering them more intricate than traditional procurement models. Since the overarching objective of investment partnerships is to maximize the project's value, Chan *et al.* (2010) emphasize that a reliable risk assessment methodology plays a pivotal role in ensuring the success of PPP projects.

2.3 Risk Assessment Process for Public-Private Partnership Projects

There are various definitions of risk in the literature. Risk is generally understood as the impact of uncertainty on the achievement of objectives, as defined by the British Standards Institution (2018). Jaafari (1990) characterizes risk as the existence of actual or potential constraints that may hinder project performance, potentially leading to partial or total failure during the construction, commissioning, or operational phases. Al-Bahar (1990) defines risk as the potential impact of uncertain events that may positively or negatively influence the attainment of a project's goals. According to Aguria *et al.* (2004), risks essentially represent uncertain events, whether anticipated or unforeseen, that may pose either opportunities or threats. Ziegel (1999) suggests that, in the context of a project, risk refers to the possibility of an adverse event occurring and the associated negative consequences that may result from it.

Findings from various studies indicate that many of the challenges encountered in PPP projects – such as delays in schedule, cost escalations, and the need for rework – are not entirely unforeseen; they can be identified in advance, managed through careful planning, and subjected to systematic evaluation (Xu, et al., 2010).

Given that risk is an inherent feature of all projects, its systematic management is essential. This involves identifying, analyzing, and addressing risks throughout the

entire project lifecycle (Aguria, Wang, & Dulaimi, 2004). According to the British Standards Institution (2018), risk management is a structured set of coordinated actions aimed at guiding and controlling an organization in relation to risk, and it is widely recognized as an iterative and continuous process (Chinyio & Fergusson, 2003).

As mentioned earlier, in comparison to traditional project delivery methods, PPP arrangements present greater risk exposure for project sponsors due to several particular factors. Those factors are outlined by Zayed and Chang (2002) as follows:

- The requirement for substantial upfront development expenditures during the early stages of the project;
- Prolonged and often complex negotiations with the host government;
- The involvement of multiple parties, increasing coordination challenges, and the likelihood of conflicts;
- The requirement for long-term contractual and financial commitments;
- The obligation of sponsors to provide equity investment, which increases their financial responsibility and risk exposure.

Several researchers have developed risk management frameworks tailored to PPP contexts. For instance, Zou *et al.* (2008) introduced a lifecycle-based framework that highlights the importance of dynamically allocating and tracking risks across all phases of the project. Similarly, Fischer and Porath (2010) proposed an integrated risk management system designed to incorporate the diverse viewpoints of stakeholders. In their study, Aguria *et al.* (2004) outlined a three-phase approach to risk management comprising (i) identification of relevant and potential risks, (ii) assessment of their potential impacts, and (iii) formulation of appropriate strategies for risk response and mitigation.

Birgönül and Dikmen (1996) defined the risk assessment process as a project management technique that facilitates the identification of risks in a project, the determination of their potential impacts, and the development of mitigation measures based on the likelihood of their occurrence. They argued that the process should

fundamentally consist of four main stages, namely (i) risk identification, (ii) risk allocation and sharing, (iii) risk valuation, and (iv) risk management. As a dynamic process, risk assessment has a cyclical and iterative nature, which by definition requires periodic repetition throughout the project's life cycle (USDoT, 2013).

Rasheed *et al.* (2022) proposed a conceptual risk management process based on their research findings and a review of the literature, centered on risk allocation and control, as illustrated in Figure 2.4. This process aims to facilitate effective risk management by enhancing the distribution of risks.

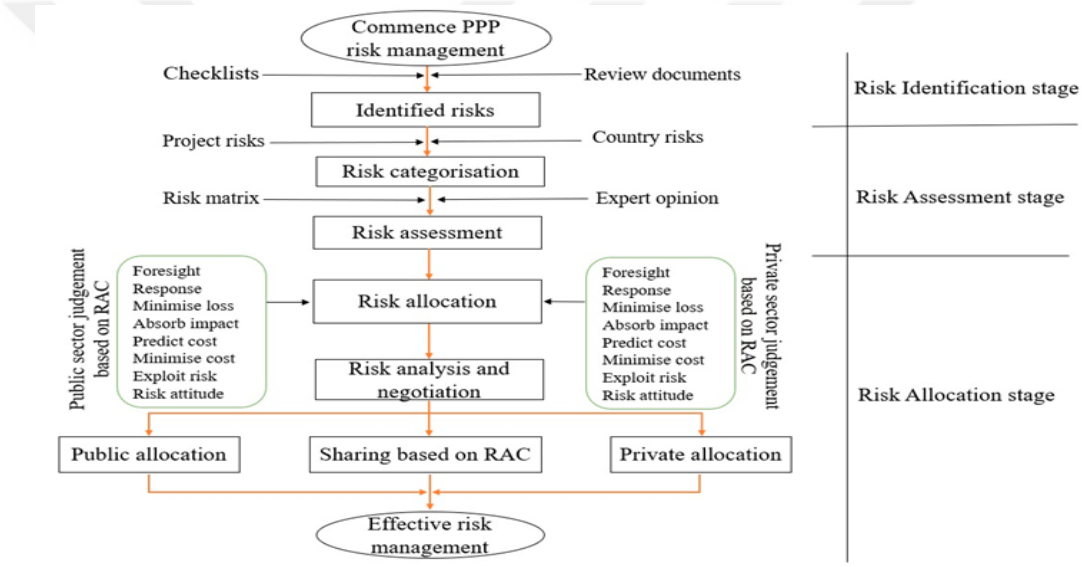

Figure 2.4. A proposal of risk assessment process (Rasheed, Shahzad, Khalfan, & Rotimi, 2022)

2.3.1 Identification of Risk Factors

Weng *et al.* (2024) emphasize that identifying risk factors forms the foundation for developing a robust and effective risk assessment indicator framework. According to the Federal Highway Administration (FHWA) of the USDoT (2013), risk identification should not be regarded merely as an end in itself; instead, it functions as a critical step that directly supports subsequent components of the risk assessment

process, including risk valuation, risk management, and risk allocation. The scope and level of detail in risk identification may differ depending on the objectives and scope of the analysis. In the risk valuation stage, comprehensiveness is particularly essential to ensure the accuracy and reliability of subsequent assessments.

The British Standards Institution's (2018) findings emphasize that the risk identification process aims to detect risks that may either support or hinder an organization's achievement of its objectives. The use of relevant, appropriate, and up-to-date information is considered essential. Organizations may employ various techniques to identify uncertainties that could impact one or more objectives. In this process, it is crucial to examine not only individual factors but also the interdependencies among them. According to the British Standards Institution (2018), these factors include:

- Both tangible and intangible sources of risk,
- Underlying causes and specific events,
- Potential threats as well as opportunities,
- Organizational vulnerabilities and existing capabilities,
- Changes in the internal and external environment,
- Indicators of emerging risks,
- Characteristics and value of organizational assets and resources,
- Potential consequences and their implications for objectives,
- Limitations in available knowledge and the reliability of information,
- Time-related considerations, and
- Biases, assumptions, and beliefs held by stakeholders involved in the process.

USDoT (2013) reports that the methods of risk identification may vary depending on the specific objectives of the risk assessment. Nonetheless, the overall purpose of risk identification encompasses four key components:

(i) Identifying the risks associated with a project in relation to the scope of the risk assessment;

(ii) Ensuring that all project stakeholders share a mutual understanding of the identified risks;

(iii) Prioritizing and determining the most significant risks; and

(iv) Structuring the risk register and evaluating the overall risk profile.

Given the increasing reliance on the PPP model and its extensive role in infrastructure development, a precise and comprehensive identification of risks in such projects is essential to ensure effective planning and implementation (Xu, et al., 2010). The primary objectives of the risk identification process are to determine the project's major risk factors, create a shared understanding between the public and private sectors regarding the identified risks, prioritize the risks based on their significance, and collect data to determine the overall risk profile. Zayed and Chang (2002) list the main risk areas they identified in Figure 2.5.

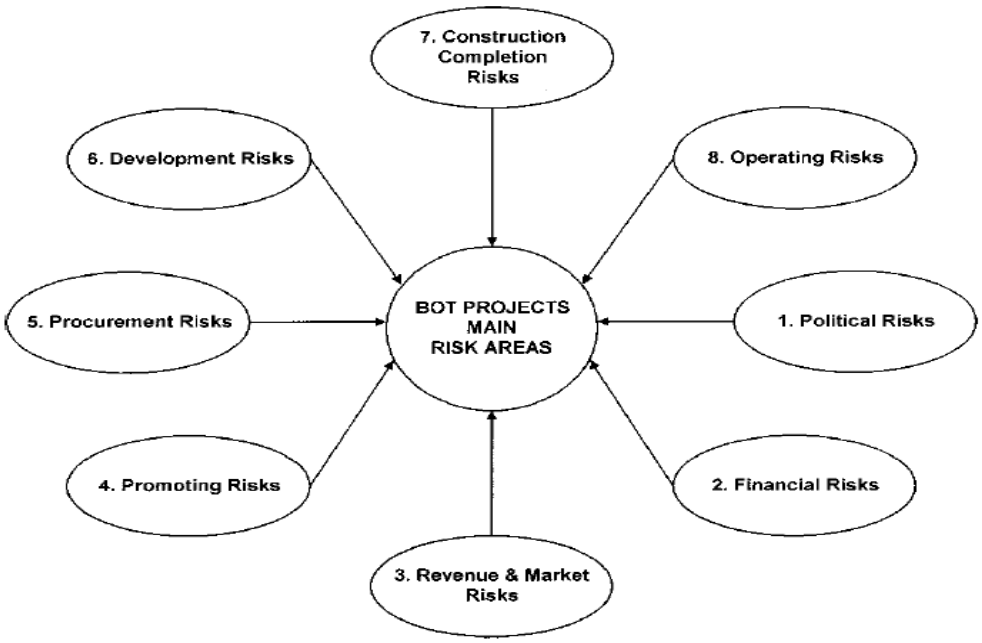

Figure 2.5. Main risk areas for PPP projects (Zayed & Chang, 2002)

Dias and Ioannou (1995) emphasize the importance of identifying and analyzing risk factors across various phases of a project, utilizing various evaluation parameters, particularly within the context of project financing. The researchers categorized the sources of risk in project environments into distinct groups as given in Figure 2.5. They assert that numerous scholars have contributed to the classification and conceptualization of risks in this domain, generally agreeing that the appropriate allocation of risks among the stakeholders in PPP projects is fundamental for ensuring financial viability. In their framework, risks are categorized according to the distinct phases of PPP projects as follows (Dias & Ioannou, 1995):

- The development phase includes risks related to technology selection, creditworthiness, and the bidding process.
- The construction phase encompasses risks such as project completion delays, cost overruns, performance failures, and exposure to political instability.
- The operation phase involves risks associated with operational performance, unexpected cost increases, legal liabilities, resale of equity stakes, and off-take agreements.
- The ongoing phase includes financial risks, particularly those arising from fluctuations in interest and currency exchange rates.

During the initial stage of risk identification, one of the significant challenges is avoiding blind spots. These blind spots can occur when areas are overlooked, either due to negligence or because attention is disproportionately focused on specific risks. In contrast, others are overlooked in relation to the subcomponents defined within the risk assessment process. Thaheem and De Marco (2013) surveyed the methods commonly discussed in the literature on large-scale construction projects and presented a comprehensive review of the techniques employed at different stages of the process. In their study, the authors found that participants preferred different methods for the risk identification stage. According to their findings, 72% of the participants reported using information and documentation from previously executed projects of similar scale, 64% highlighted the importance of decisions made through

workshops, and 48% indicated that they employed checklists to identify risk factors to which projects were exposed (Thaheem & De Marco, 2013).

To avoid creating a new process, the Federal Highway Administration (FHWA) of the USDoT (2013) described the following approaches:

- Ensure the involvement of all relevant expertise perspectives involved and present in the risk workshops. Staff members and experts with knowledge and experience in all of the fields listed in Checklist #1 should be involved in the process.
- Use existing risk assessments for inspiration. This should not be a simple "cut and paste" exercise; instead, it should be tailored to the specific project, while simultaneously utilizing information from previous projects as guidance.
- Use standard categories and checklists to facilitate completeness. Relevant checklists are provided in Table 2.3.

Table 2.3 Standard risk categories and checklists for risk identification (USDoT, 2013)

Checklist #1: Issues	Checklist #2: Project Phases	Contractual categories
➢ Financial and Economic ➢ Legal ➢ Engineering ➢ Permit Processes ➢ Technical and Technological ➢ Organizational ➢ Spatial ➢ Demographic ➢ Environmental ➢ Political ➢ Public Safety	➢ Project Development ➢ Design ➢ Engineering ➢ Construction ➢ Operation ➢ Maintenance and Repair ➢ Return and Transfer Process	➢ Compensation Event ➢ Delay Event ➢ *Force Majeure*

Akomea-Frimpong and Jin (2020) categorized the risks associated with PPP projects into five groups, namely: pre-construction, construction, operation, maintenance, and market-level risks. Lessambo (2022) lists the 15 general risk categories of a PPP project as follows: country risk, political risk, industry risk, project risk, customer risk, supplier risk, sponsor risk, contractor risk, operating risk, product risk, environmental risk, funding risk, competitor risk, currency risk, and interest rate risk. Based on previous research by Xu *et al.* (2011b), a comprehensive classification of risks associated with PPP projects is presented in Table 2.4. This classification encompasses two primary categories: systematic risks and project-specific risks, as well as over 30 identified risk factors.

Table 2.4 Risk factors in PPP infrastructure projects (Xu *et al.*, 2011b)

Categories	Risk Factors
Systematic risk	Political risk group: government corruption, government intervention, expropriation, public credit, poor public decision-making process
	Economic risk group: interest rate fluctuation, foreign exchange fluctuation, inflation, undeveloped financing market
	Legal risk group: legislation change, imperfect law and supervision system, change in tax regulation
	Social risk group: public objection of pollution/high toll rate
	Natural risk group: *force majeure*, unforeseen weather/geotechnical conditions, environment risk
Specific project risk	Construction risk group: construction cost overrun, construction time delay, material/labor non-availability, unproven engineering techniques
	Operation risk group: project/operation changes, operation cost overrun, price change, expense payment risk
	Market risk group: market competition, demand shortfall
	Relationship risk group: third-party delay/violation, organization and coordination risk, inability of the concessionaire
	Other risks: land acquisition, delay in project approvals and permits, conflicting or imperfect contract, lack of supporting infrastructure, residual risk, inadequate competition for tender

2.3.2 Quantification of Risks

As outlined in the preceding chapters, risk analysis in PPP projects begins at the initial stages of project development and continues throughout the entire lifecycle. Chapman (1998) asserts that once risks are identified, it is essential to evaluate and quantify their potential effects and consequences. The author further explains that risk quantification refers to the process of analyzing and estimating the potential impacts associated with the identified risks. This step is crucial for effective risk reallocation and informed decision-making. Quantification aims to determine both the probability of a risk occurring and the extent of its impact, which in turn facilitates the classification and prioritization of project risks based on their severity (Mazher, 2019).

Various techniques are available for risk quantification (Chapman, 1998). They are generally categorized into two main groups: qualitative and quantitative methods. The choice of methodology is contingent upon various factors, including the availability of information regarding risks, the risk management capacities of the parties involved, and the level of maturity of the PPP market (Mazher, 2019). A previous study conducted by Zhang *et al.* (2016) highlighted that PPP projects in developed countries tend to adopt quantitative risk assessment methodologies, while qualitative approaches are more commonly employed in developing nations. Since the use of the PPP model in developing healthcare infrastructure in Turkey is relatively recent, a qualitative method has been adopted in this study. Therefore, quantitative methods are outside the scope of this study and not included in the literature review.

According to Boussabaine (2014), qualitative methods are employed for two primary purposes in PPP projects. First, they are utilized to assess subjective risk elements that cannot be expressed in monetary terms. Second, they are applied during the early phases of project development, when reliable data are limited. These techniques are particularly effective for classifying project risks into meaningful categories and play a critical role in both risk planning and management. To evaluate the cost

implications and variability of risks in PPP projects, various quantitative methods are subsequently employed. Qualitative approaches to quantifying risk costs should be considered an initial framework upon which more robust and systematic quantitative risk pricing analyses can be constructed (Boussabaine, 2014).

a) Risk Mapping

Risk mapping is generally regarded as a qualitative approach (Savci & Kayis, 2006). It involves plotting risks on a matrix, where the vertical axis represents potential impact and the horizontal axis represents the likelihood of occurrence, as illustrated in Figure 2.6.

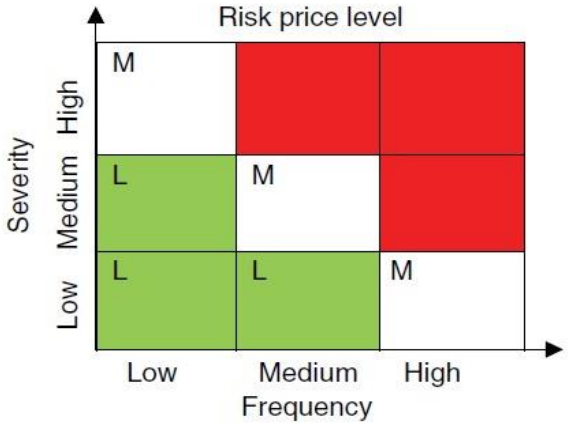

Figure 2.6. Example of a risk map (Boussabaine, 2014)

The process of developing a risk map typically follows a series of structured steps. In the context of a PPP project, risk mapping begins with the project's risk register, from which the complete list of identified risk events is extracted. For each event, the probability of occurrence should be determined based on expert judgment, historical data, or qualitative assessment scales. Subsequently, the potential consequences or the magnitude of impact associated with each risk must be assessed.

Once both parameters (probability and impact) have been identified, the risk events can be plotted on a matrix to depict their relative positions. This enables the classification and prioritization of risks based on their significance, providing a robust foundation for effective risk response strategies (Boussabaine, 2014).

Risk maps are then used to establish threshold zones for risk pricing, with each zone corresponding to a specific risk category determined by the severity of the impact. These maps are typically constructed using data drawn from risk registers and stakeholder workshops, drawing extensively on insights from previous projects. The outcomes of the mapping process can serve as the basis for ranking risks by severity and assigning corresponding cost values. They also support the formulation of targeted risk management strategies (Boussabaine, 2014).

b) Probability-Impact

This approach involves evaluating risks through subjective estimates of their likelihood of occurrence, using a qualitative scale. Similarly, the potential impact of each identified risk is assessed using a subjective grading system similar to the one applied in risk mapping. The probability-impact matrix is structured with columns representing the probability, impact, time, and cost dimensions, while the horizontal rows denote the individual risk items. An example of a probability-impact matrix is presented by Boussabaine (2014) in Figure 2.7.

Identified risk			probability			impact			time	cost
scale	Detectability	interdependency	unlikely	possible	likely	low	moderate	high	year	£000
R_1	1	R4	U				M		2	50
R_2	3	R3		P		L			1	2
R_3	2	R2		P				H	5	80
.....			..	...	...	..	...	..	...	.....
R_n	1	R_{n-1}			L		M		10	30

Figure 2.7. Probability-impact quantification matrix (Boussabaine, 2014)

These qualitative matrices offer a straightforward yet insightful means of demonstrating the relative significance and severity of risk levels. The qualitative risk descriptors may include terms such as ‘unlikely’ or ‘possible,’ reflecting subjective assessments. The matrix captures the overall effect by integrating probability, impact, timing, and cost considerations. Additional qualitative risk data may also be incorporated into the matrix to enhance its explanatory capacity (Boussabaine, 2014).

c) Interviews

Interview methods serve as a valuable tool for collecting data on the likelihood and consequences of risks. Interviews are typically conducted with stakeholders involved in PPP projects as well as with domain-specific risk experts, representing an initial phase in the process of quantifying risk costs. The nature of the information determines the specific approach to the interview. For instance, when aiming to elicit estimates regarding the probability and impact of risks, data may be collected based on optimistic, pessimistic, and most likely scenarios (Boussabaine, 2014).

d) Questionnaires

A substantial body of findings in the domain of PPP risk management has primarily relied on the questionnaire methodology, whether evaluating the criticality of risks or their distribution (Xu, et al., 2010). Jokar, Aminnejad, and Lork (2021) contend that it is imperative to ascertain both the probability of occurrence and the severity of impact associated with each risk in order to conduct a comprehensive qualitative analysis of the diverse risks identified. In their study, the researchers assessed that the frequency of occurrence and the severity of impact for both primary and secondary risks are assessed based on evaluations provided by 92 experts, using linguistic descriptors ranging from very low (1) to very high (5), consistent with a 5-point Likert scale. Likert-type questions are a data collection tool that provides response options to capture participants' attitudes and opinions, and to identify overall trends.

To ascertain the determinants of success and failure within PPP-based integrated health campus initiatives in Turkey, Songur and Top (2018) undertook a comprehensive analysis of these projects, utilizing a survey methodology involving 97 respondents. The findings indicated that the foremost criteria for selecting the PPP framework in integrated health campus projects were the infrastructural competencies of the private sector and its effective management capabilities. The factors contributing to the success of the PPP model are systematically ranked, with "adequate risk allocation" and "well-structured contractual documentation" being underscored as critical indicators of the significance of risk assessment in these initiatives (Songur & Top, 2018).

Xu *et al.* (2011a) developed a computational framework for assessing risks associated with public-private initiatives, utilizing multiple input variables including survey data and comprehensive literature reviews. This investigation involved soliciting insights from more than 500 professionals within the construction industry in China to gather their evaluations regarding the likelihood of incidents, the levels of impact, and the recognition of previously unacknowledged risks.

Li *et al.* (2005) elucidated the inherent risks associated with the private finance initiative (PFI) projects in the United Kingdom through a questionnaire survey. They systematically classified these risks according to specific dimensions of the project, including design, delays, cost, and performance. The viewpoints of lenders and contractors were sought regarding these classifications.

2.3.3 Allocation and Sharing of Risks

Public-private partnership procurement entails a considerable degree of risk redistribution among stakeholders. Kangari (1995) notes that risks in a construction project cannot be entirely eradicated; yet, they can either be mitigated or allocated to another party in the project.

The allocation, transfer, or sharing of risks between the public and private entities is considered a fundamental principle of the PPP model. Studies indicate that the transfer of key risk factors to the private sector under the PPP model contributes to its relative advantage over traditional public procurement methods (USDoT, 2013). The core principle in the risk allocation process involves evaluating the capacity and willingness of both the public and private parties to manage each specific risk (Boussabaine, 2014). In theory, risks are allocated to the party most capable of managing them and absorbing their potential consequences. It is also widely assumed that the private sector is generally better positioned than the public sector to handle such risks. In practice, however, risk allocation is primarily driven by commercial logic. The private sector adjusts its pricing to reflect the degree of exposure it undertakes by incorporating risk premiums into its financial models. This highlights the need to strike a balance between transferring and retaining risks. According to Boussabaine (2014), achieving an effective balance requires careful consideration of the following key factors:

- The degree of risk exposure,
- The financial implications of retaining or transferring each risk,

- The acceptable level of retained risk by each party.

As also noted by Boussabaine (2014), the optimal balance of risk allocation is achieved at the point where the cost curve for risk transfer intersects with the cost curve for risk retention. The interdependence of key parameters in risk optimization, as put forward by the researcher, is illustrated in Figure 2.8, where the area below the intersection typically indicates a zone where retaining risk is considered feasible. The intersection line itself serves as a benchmark for guiding decisions regarding the appropriate distribution of risks. In theory, risks falling below that threshold should be retained, whereas those above it should be further evaluated to determine whether they can be retained or transferred.

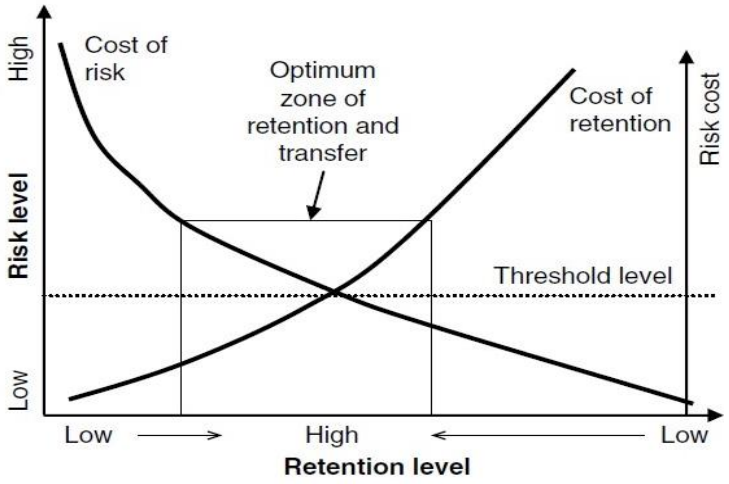

Figure 2.8. Curves of risk and retention costs (Boussabaine, 2014)

Another study conducted by Delmon (2011) supports this perspective. According to Delmon, risk management based on efficiency is undoubtedly an ideal objective. In practical applications, the allocation of risk is shaped by commercial leverage and negotiating power. The stronger party tends to transfer undesirable risks to the weaker party. This dynamic does not necessarily yield the most effective and efficient approach to risk management.

Figure 2.9 illustrates this phenomenon from the perspective of governmental authorities: an excessive allocation of risk to the project company results in a costly and precarious project; conversely, an inadequate allocation of risk leads to reduced value for money. Achieving an appropriate balance in this regard is particularly challenging (Delmon, 2011).

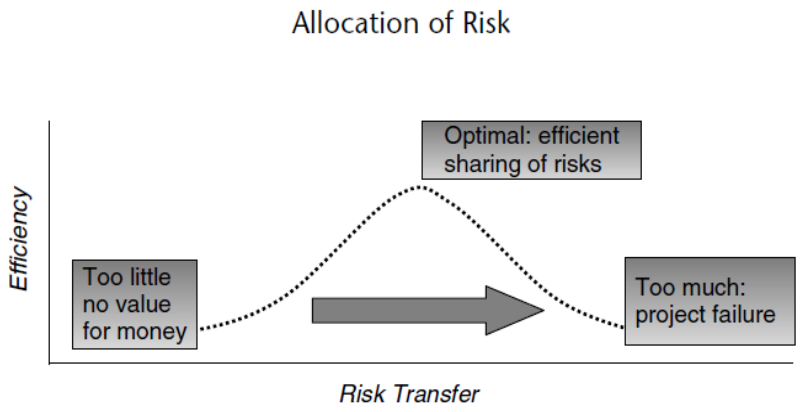

Figure 2.9. Efficient risk allocation (Delmon, 2011)

Ensuring that contracts are accurately and consistently structured is essential when risks are to be allocated or transferred from the public sector to the private sector. Poorly designed risk allocation mechanisms may lead not only to implementation challenges, contractual amendments related to risk distribution, or even termination, but also to increased risk-related costs, thereby hindering the achievement of optimal pricing (Akintoye, Hardcastle, Beck, Chinyio, & Asenova, 2003).

Research on PPP projects implemented in Latin American countries reveals that, among 1,000 projects examined, 53% of those in the transportation sector and 76% of water and sanitation projects required contractual amendments due to inadequately structured risk-sharing arrangements (Guasch, 2004). In a separate study, Xiong *et al.* (2015) analyzed 4,874 PPP projects undertaken in developing

countries. They found that 6.85% of these projects were terminated early due to improper risk allocation in the contractual framework.

In summary, the risk allocation and sharing process under the PPP model can be divided into three stages. The first stage involves assigning risks (based on their frequency of occurrence) to the party best equipped to prevent their likelihood of occurrence. The second stage focuses on the severity of risks, whereby risks are allocated to the party that possesses greater capacity to manage the adverse impacts if those risks do occur. The final stage involves cost optimization by transferring risks with a known frequency and severity to the party capable of managing them at the lowest cost, or by proportionally distributing them between the parties to minimize total cost escalation.

2.3.4 Risk Management

The guidebook developed by the Federal Highway Administration (FHWA) of the USDoT (2013) is based on the premise that various categories of risk require distinct evaluation methodologies, and that applying multiple evaluation strategies concurrently can enhance data reliability. Consequently, the risk classifications illustrated in Figure 2.10 are designed to aid in identifying risks based on the project's characteristics, its phases, and the diverse disciplines and viewpoints involved.

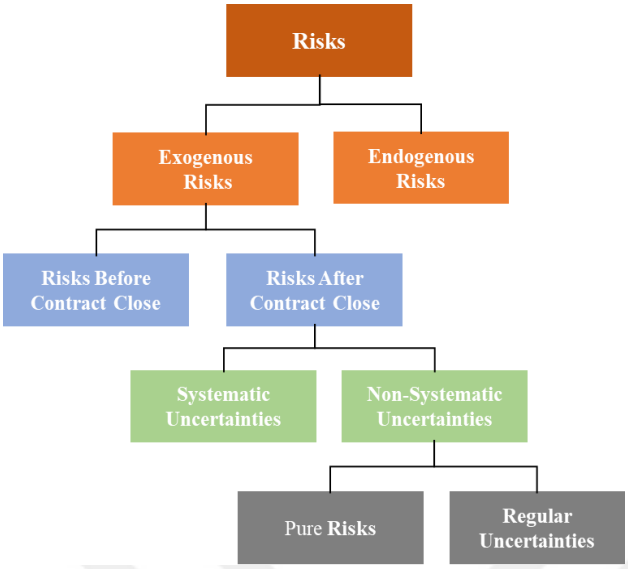

Figure 2.10. Categories of risks (USDoT, 2013)

As illustrated in Figure 2.10, the initial distinction in classifying risks for evaluation purposes lies between exogenous (external) and endogenous (internal) risks. According to Rebeiz (2012), exogenous risks arise from external events and occur accidentally or unintentionally. For instance, an accident on a construction site is an example of an exogenous risk. Projects situated in regions characterized by a rapidly evolving macro-environment (*e.g.*, inflationary price shifts, changing social dynamics, demographic transitions, technological advancements, and alterations in regulatory frameworks) are confronted with greater uncertainties (classified as exogenous risks) compared to projects established in relatively stable macro-environments characterized by gradual changes (Rebeiz, 2012). On the other hand, endogenous risks stem from stakeholder decisions or issues that arise during the implementation process. A change in the project scope initiated by the public or private sector can serve as an example of an endogenous risk. Distinguishing between endogenous and exogenous risks is a critical aspect of the risk management process. However, only exogenous risks are considered during the risk valuation stage (USDoT, 2013).

The exogenous risks to which PPP projects are exposed are categorized by the USDoT (2013), with consideration of the time factor, into two groups:

(i) Risks arising before contract signing,
(ii) Risks arising after contract signing.

The significance of contract signing in distinguishing risks lies in the fact that, once the contracts are signed, the risks encountered are allocated between the parties. Risks encountered prior to the signing of contracts are typically short-term and uncertain in nature. Although they are addressed within the scope of effective risk management, they are generally excluded from risk valuation unless they involve critical factors that could significantly affect the future or viability of the project (USDoT, 2013).

As reported by USDoT (2013), risks encountered following the signing of contracts are further divided into systematic and unsystematic risks. Systematic risks are those that affect the entire economy or a large segment of the market, with examples including inflation, interest rates, wars, or market demand risk faced by the private sector. Rejda and McNamara (2014) refer to systematic risks as non-diversifiable risks and point out that, unlike diversifiable (or unsystematic) risks, non-diversifiable risks refer to uncertainties that impact the overall economy or broad segments of the population. These risks cannot be mitigated or avoided through diversification strategies. The authors provide examples of systematic risks, such as rapid inflation, cyclical unemployment, war, hurricanes, floods, and earthquakes, because they affect large numbers of individuals or groups. Conversely, unsystematic risks are not tied to macroeconomic conditions and affect only a single individual or a small community within the economy. Examples of such risks include accidents on construction sites, administrative issues within a hospital, and adverse weather conditions (Rejda & McNamara, 2014). Since unsystematic risks are unrelated to broader economic conditions, they can be eliminated through proper risk allocation and managed effectively through effective risk management strategies. Nonetheless,

according to Rejda and McNamara (2014), systematic risks may require government intervention or support mechanisms to ensure sufficient protection.

Unsystematic risks are further classified into pure risks and regular uncertainties. Pure risks involve unforeseeable events that result in losses, whereas regular uncertainties are risk factors that arise independently of market conditions, typically due to information asymmetry or insufficient information (USDoT, 2013). The risk categories subject to the valuation process are illustrated and summarized in Table 2.5

Table 2.5 Examples and descriptions of risk categories (USDoT, 2013)

Category	Example	Description
Endogenous Risks	Change in the Hospital Information Management System	Uncertainties arising from decisions made by project stakeholders can result in changes to the project scope.
Pre-Contractual Risks	Delays in project initiation due to socioeconomic factors	Uncertainties that negatively affect project implementation before the Investment Phase begins.
Systematic Risks	Inflation risk	Uncertainties that affect cost, revenue, and risk value projections of the project, depending on economic conditions and market dynamics.
Pure Risks	Accidents on the construction site	Unpredictable uncertainties with potentially definite negative impacts (damage or loss), occurring within the range of probability.
Regular Uncertainties	Technological changes in medical equipment	Uncertainties independent of market conditions, arising due to lack of access to new information or asymmetric information, affecting cost, revenue, and risk estimations.

The identification, analysis, and allocation of risks are of critical importance in PPP projects, particularly given the limited responsibilities assumed by private investors during the design and construction stages, which leave the public sector to absorb the majority of financial and operational uncertainties (Nawaz, Waqar, Shah, Sajid,

& Khalid, 2019). A key feature distinguishing PPP projects from traditional public infrastructure projects is that the contractual partnership between the public and private sectors represents a long-term commitment (typically 20–30 years) rather than a short-term one (less than 5 years). The extended duration of collaboration in both the construction and operational phases renders traditional risk management methods insufficient. Through the systematic assessment and identification of risks across the project lifecycle, stakeholders can proactively implement mitigation strategies (Valipour, Sarvari, & Tamošaitiene, 2018).

Rejda and McNamara (2014) suggest that the risk management process encompasses four distinct phases: (i) identification of potential loss exposures, (ii) quantification and examination of the identified loss exposures, (iii) selection of the most suitable combination of methodologies for addressing the loss exposures, and (iv) execution and continuous oversight of the risk management program.

In risk management terminology, techniques are generally classified into two main categories: risk control and risk financing. Risk control refers to management strategies aimed at reducing the frequency or severity of losses arising from risk exposure, including methods such as risk avoidance, loss prevention, and loss reduction. By contrast, risk financing encompasses methods designed to assume or transfer the financial risks associated with specific events. These include risk retention, contractual risk transfer, financial risk management, mergers and partnerships, conservation strategies, non-insurance transfers, and insurance-based financing and transfer mechanisms (Rejda & McNamara, 2014). These two categories are typically used complementarily, unless risk control is entirely adequate. Table 2.6 presents the risk management techniques preferred for each risk factor, evaluated according to their probability of occurrence and the potential impacts if realized.

Table 2.6 Recommended risk management methods according to risk factors (Rejda & McNamara, 2014)

	Low Probability	**High Probability**
Low Impact	Taking the Risk	Risk Avoidance, Risk Transfer
High Impact	Insurance	Risk Aversion

Likewise, Boussabaine (2014) illustrates a risk management scheme for the entire contract life of PPP projects in Figure 2.11.

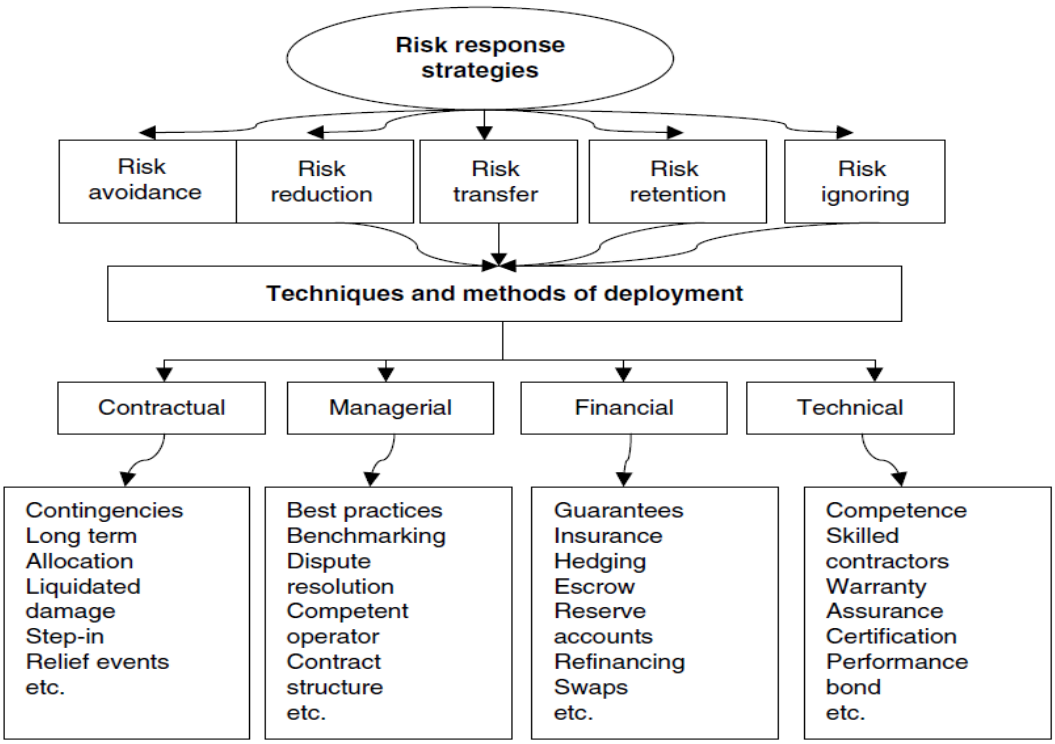

Figure 2.11. A risk management scheme (Boussabaine, 2014)

In general, for contract types in which all risk elements are clearly anticipated and explicitly included in the agreement, ex-ante risk management is considered sufficient. However, in incomplete, long-term, or complex contracts, ex-post risk management techniques are required in conjunction with ex-ante methods to effectively manage all risks (Xiong, Zhao, Yuan, & Luo, 2017). It is widely acknowledged that PPP agreements are generally characterized as incomplete contracts due to their extended duration, substantial scale, and intricate nature (Iossa & Martimort, 2016).

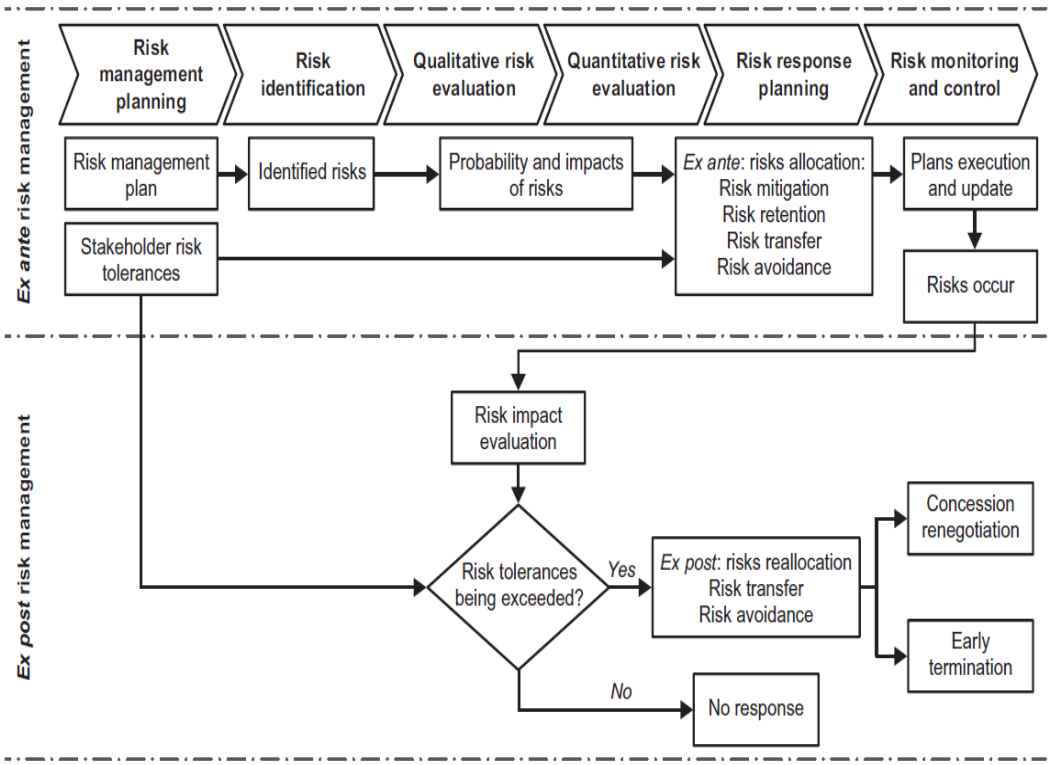

Figure 2.12. Ex-ante and ex-post risk management for public-private partnership projects (Xiong, Zhao, Yuan, & Luo, 2017)

Figure 2.12 illustrates the classical risk management mechanism, which includes the identification, valuation, allocation, and management of risks, as part of the ex-ante risk management framework. Due to the complex and long-term nature of the

contracts, the need for an additional ex-post risk management mechanism is also depicted schematically.

a) Ex-Ante Risk Management

Stakeholders in large-scale infrastructure projects who disregard the risks they assume and fail to take necessary precautions are more likely to face difficulties once those risks materialize. As mentioned by Birgönül and Dikmen (1996), it is possible to minimize financial losses and disputes between parties by conducting a systematic assessment of risks based on the project's size, complexity, and technical infrastructure.

The primary aim of risk management techniques is to eliminate risks wherever possible. In cases where it is not possible to eliminate risk factors, the primary goal of risk management becomes to assess their potential impacts on the project, support more accurate forward-looking projections, facilitate the integration of risk factors into planning and regulatory frameworks, and establish contractual provisions to minimize their adverse effects on stakeholders (Birgönül & Dikmen, 1996). In cases where both minimizing the effects and eliminating risks are not possible, another option is risk retention, whereby the institution or party acknowledges a particular risk but refrains from taking measures to mitigate, transfer, or eliminate it. This approach is typically adopted in situations where the risk is either negligible in scale or where addressing it would not be cost-effective (Boussabaine, 2014).

As a consequence of risk sharing or the transfer of risks to the private sector, the principal risks retained by the public sector typically include delays or deficiencies attributable to public authorities during construction, design errors or omissions, and quality assurance issues or operational disruptions in healthcare service delivery across both construction and operation phases (Hunt & Onderka, 2016).

Although the company is exposed to a wide range of risks, either contractually transferred or specific to the project's structure, the most critical risks it undertakes

involve completing the project within the designated timeframe and adhering to the guaranteed budget. In addition to these essential risks, the company also assumes liability for bodily injury, property damage, and environmental harm throughout the construction and operation phases of the project. Regarding the management of pure risks faced by the company, insurance is considered the most effective method for mitigating these risks. The company must cover all its liabilities during both the construction and operation phases through project-specific liability insurance policies, which are renewed annually. This provides critical protection in terms of risk management (Hunt & Onderka, 2016). The authors further assert that throughout the investment and operation phases, the sharing or transfer of risks to subcontractors through contractual agreements also constitutes a vital element of the company's risk management process.

Birgönül and Dikmen (1996) suggest some key precautions to mitigate financial risks encountered during the construction phase, including:

i. Working with financially strong contractors,
ii. Procurement of materials or equipment by the public sector,
iii. Avoiding lump-sum contracts in multi-year projects conducted in inflationary environments to minimize inflation risks,
iv. Making advance payments to contractors to mitigate the public sector's payment risks,
v. Incorporating delay penalties into the contract terms, and
vi. Structuring bid submissions to reflect the monetary value of the risks assumed by each party, thereby embedding a risk tolerance component.

Certain financial risks can be mitigated through the use of derivative instruments, forward contracts, and other hedging tools. For example, the adverse financial effects of exchange rate risk can be mitigated through swap contracts by sharing the risk with another party. Similarly, the negative financial impacts of interest rate risk and resource price risk can be addressed through derivative instruments and forward markets (World Bank Group, 2018).

Birgönül and Dikmen (1996) claim that design-related risks commonly observed in large-scale projects include flaws in the initial design, design impracticality, requests for changes to the design by the parties during the process, and changes necessitated by uncertain ground conditions. In managing design-related risk elements, it is generally recommended to opt for negotiated contracts when the design has not yet been finalized. Furthermore, contract clauses should be included to ensure that the contractor is not adversely affected by significant design changes. One of the most appropriate solutions is to review the original design for construction feasibility before submitting a bid and to revise the offer accordingly in areas where problems are identified. Cost increases resulting from unforeseen ground conditions are typically reflected in the bid prices by contractors (Birgönül & Dikmen, 1996).

a) Ex-Post Risk Management

Ex-post risk management is initiated following the realization of risks. It primarily involves renegotiating contractual provisions in cases where stakeholders' risk tolerances are exceeded. If the parties fail to reach a mutual agreement, early termination procedures are considered under this mechanism (Xiong, Zhao, Yuan, & Luo, 2017).

According to Xiong *et al.* (2017), ex-post risk response, also referred to as risk reallocation, enables the redistribution of excessive risk impacts among stakeholders. In terms of risk response strategies, risk mitigation emphasizes prevention, whereas risk retention involves taking no specific action to mitigate the risk. Consequently, the primary ex-post risk response strategies include risk avoidance and risk transfer. These are classified into two main categories by Xiong *et al.* (2017):

i. Renegotiations, in which the affected party is compensated and the risks are redistributed among stakeholders through significant adjustments – excluding standard, scheduled tariff revisions – in elements such as tariffs, investment levels and plans, exclusivity rights, guarantees, lump-sum

payments or annual fees, coverage obligations, service standards, and contract durations (Guasch, 2004); and

ii. Early terminations, where the government or a new contractor compensates the original contractor and assumes the concession rights and project assets, thus avoiding future risks by terminating the original concession (HM Treasury, 2007). Typically, stakeholders attempt to salvage the project through renegotiation as a first step, whereas early termination is considered a last resort when renegotiation efforts fail.

Guasch (2004) observed that the majority of renegotiations primarily benefited the contractor, with only a limited number resulting in favorable outcomes for the government. Similarly, Engel *et al.* (2009) reported that renegotiations lead to an increase in total investment in nearly one-third of the cases examined; however, the financial burden was predominantly shifted to future governments or passed on to end users through higher usage fees and extended contract durations.

Ex-post risk response measures implemented through concession renegotiation can help salvage projects by compensating stakeholders and reallocating excessive risks. However, some contractors may pursue opportunistic renegotiations, resulting in significant public resource losses through compensation (Albalate & Bel, 2009). Conversely, concession renegotiation may increase contract flexibility and improve the resilience of PPPs (De Brux, 2010). In any case, when a project faces severe risk scenarios, both parties should prioritize renegotiation, as early termination may entail even greater financial consequences.

To promote private sector investment in infrastructure, many governments commit to compensating investors in the event of early termination of the investment. For instance, the Spanish concession law stipulates that compensation is due in cases of premature termination. Even if the concessionaire goes bankrupt, the government must compensate the concessionaire for the portion of the work that has been completed but not yet depreciated (Vasallo, Ortega, & de los Angelas Baeza, 2011). Following compensation, Xiong *et al.* (2017) assert that the project assets and

concession rights are transferred to the government. In some instances, these assets and rights are sold to new contractors, thus removing the government's compensation obligation. Ultimately, compensation is the central mechanism in early termination cases.

In theory, all risks can be effectively managed through robust ex-ante risk management; however, the costs associated with such efforts can be substantial. While previous literature on project risk management primarily focused on risk indices across various projects and advanced risk analysis techniques, practitioners are primarily concerned with the cost–benefit trade-off of risk management. This practical concern explains the frequent occurrence of renegotiations and early terminations in PPP projects.

2.4 Characteristics of the IHC Projects Realized through the PPP Model by the MoH in Turkey

From the contractors' viewpoint, the PPP model is attractive as it offers significant advantages. Jianjun & Yakar (2021) mention the benefits of PPP-based IHC projects implemented by the Turkish MoH as:

- Payment adjustment mechanisms are applied to account for inflation and exchange rate fluctuations, with variation orders capped at 1% to 20%.
- Services are subject to value-added tax (VAT), while capital expenditures (CAPEX) benefit from exemption.
- Legal safeguards are provided against legislative changes.
- Direct agreements are signed between lenders and the Ministry of Health.
- Deductions and penalties are not subject to double counting.
- Deductions are capped at 20% for service payments and 10% for availability payments.
- The insurance risk is assumed by the Ministry of Health where market insurance coverage is unavailable.

- Disputes are resolved through International Chamber of Commerce (ICC) Arbitration.
- In the event of termination, compensation covers both loan and equity components.

In addition to these benefits, lenders also have certain advantages, as shown in Figure 2.13.

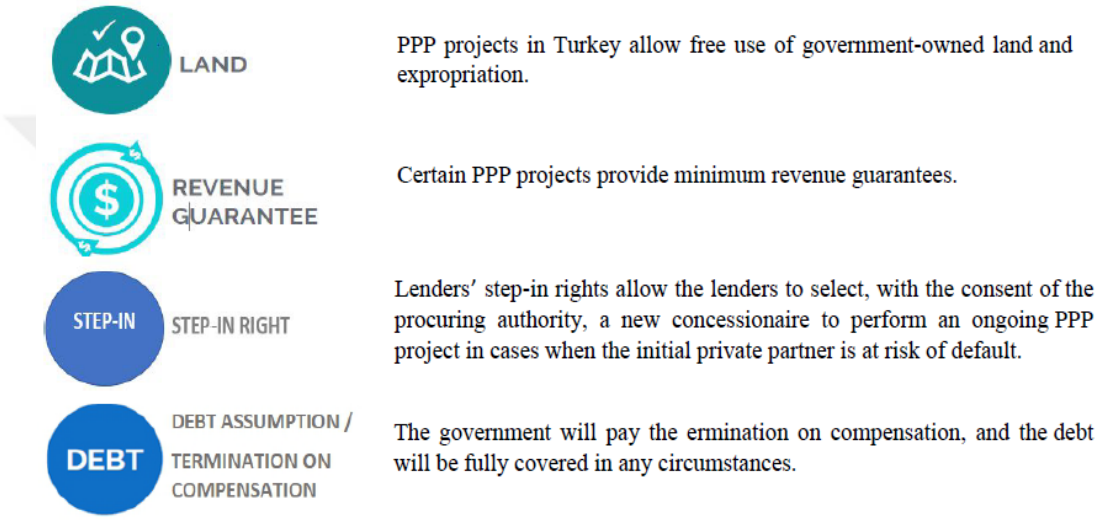

Figure 2.13. Attractions of IHC projects for the lenders in Turkey (Jianjun & Yakar, 2021)

The project structure of the PPP model utilized by the MoH for IHC projects is a typical one, as illustrated by Jianjun and Yakar (2021) in Figure 2.14.

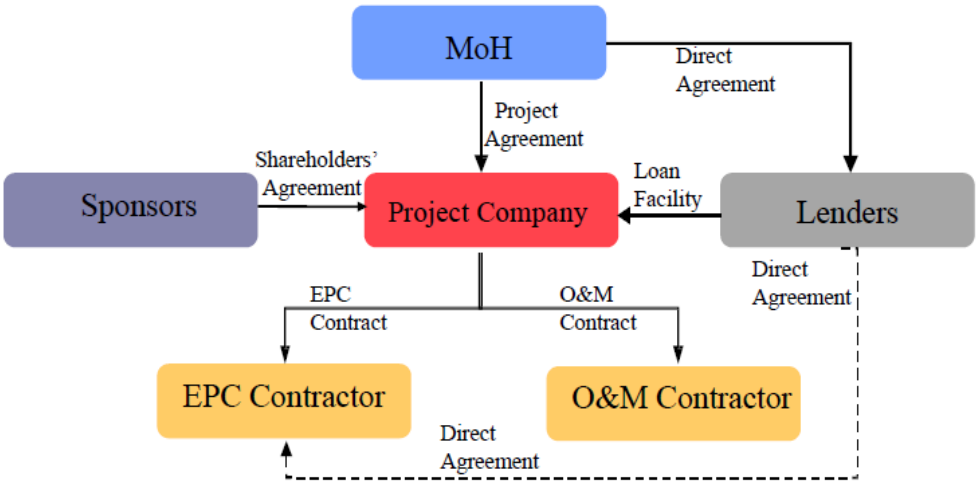

Figure 2.14. Organization scheme for PPP IHC projects (Jianjun & Yakar, 2021)

The model stipulates that, upon the commencement of the operation phase of the IHC projects, MoH (the administration) will pay the SPV (the company) availability payments (AP) and service payments (SP) for a period of 25 years.

Jianjun and Yakar (2021) summarize the mechanism of availability and service payments in the ESCAP second thematic workshop of the infrastructure financing and public-private partnership network of Asia and the Pacific held in Bangkok as follows:

- Availability Payment: Remuneration is rendered in advance by the administration to the project company at the commencement of each quarter, in exchange for the utilization of the health facilities throughout the designated timeframe.
    - Disbursements are made quarterly in advance, in Turkish Lira (TRY).
    - Revenues accrue regardless of hospital occupancy (fixed income), subject to a deduction cap of 10%.
    - Adjustments are made every quarter in line with inflation and currency devaluation.

- The correction factor (CF) serves to mitigate the impact in instances where currency devaluation surpasses inflation, ensuring that the Euro value of the accounts payable does not diminish compared to any prior period.

- Service Payment: It is defined as the maximum net sum payable to the project company in exchange for the delivery of services by the company, excluding value-added tax (VAT) and any other applicable taxes and duties.

    - The administration shall execute payments to the project company on a monthly basis.
    - Payments are disbursed on a monthly basis by MoH to the SPV in Turkish Lira and deductions are capped at 20%.
    - SPV shall provide a total of 19 support services (P1+P2), consisting of 12 non-volume and 7 volume-based services.
    - MoH guarantees a minimum demand equivalent to 70% of the potential volume-based services (EBRD, 2014).
    - Payments are adjusted annually for inflation, based on the average of the Turkish consumer price index (CPI) and producer price index (PPI), except for medical support services.
    - Medical support services, which are exclusively volume-based, are not subject to inflation adjustments. The unit pricing for these services is subject to periodic revision in accordance with nationally ratified unit prices for medical services established by the MoH.
    - A market test will be undertaken for each service every five years to ascertain and uphold the competitiveness of pricing. Should the market test be unsuccessful, MoH guarantees coverage of the SPV's overhead costs through a markup.
    - Services that are capital-intensive and specialized, such as imaging and laboratory services, are outsourced through sub-service agreements.

(Jianjun & Yakar, 2021)

During the operation period, the company is contractually obligated to provide six compulsory and thirteen optional services, if agreed by the company, including both volume-based and non-volume services, as illustrated in Figure 2.15 by the EBRD (2014).

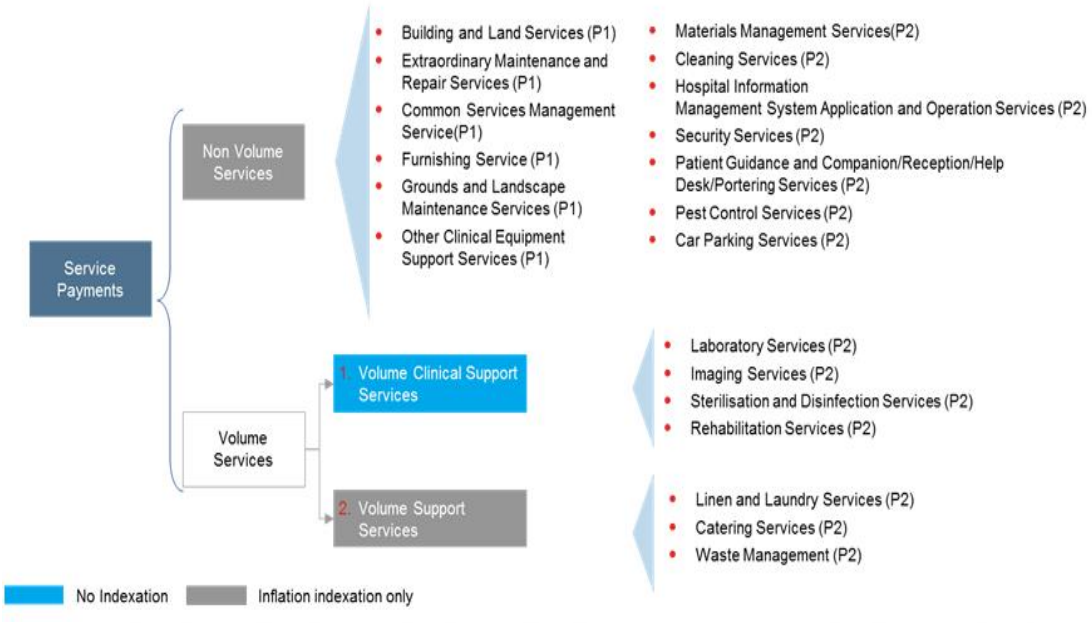

Figure 2.15. Services provided by the company in IHCs (EBRD, 2014)

As noted by Jianjun and Yakar (2021), from the private sector's perspective, the company's revenue stream in PPP projects is based solely on availability and service payments made by the MoH during a 25-year operation period, along with revenues generated from commercial areas. AP constitutes a fixed income stream for the company, although it is subject to periodic adjustments based on inflation and exchange rate fluctuations. In contrast, SP represents a variable income stream as these payments are subject to market testing every five years and are adjusted according to inflation or changes in the minimum wage. Revenues generated from commercial areas (CAR) also represent a variable income stream, and any profits or losses associated with these revenues are borne entirely by the company. All expenditures related to the construction, operation, and financing phases of the

project are borne entirely by the company under the PPP model (Jianjun & Yakar, 2021). As stipulated in '*6428 Sayılı Sağlık Bakanlığınca Kamu Özel İş Birliği Modeli ile Tesis Yaptırılması, Yenilenmesi ve Hizmet Alınmasına ile Bazı Kanun ve Kanun Hükmünde Kararnamelerde Değişiklik Yapılması Hakkında Kanun* (Law No. 6428 on the Construction, Renovation and Procurement of Services Through the Public-Private Partnership Model by the Ministry of Health and on the Amendment of Certain Laws and Legislative Decrees)', in the IHC model implemented under the PPP framework in the healthcare sector, the investment period is typically defined as thirty-six months, during which the IHC is to be completed as a fully equipped facility. The operation period is stipulated as 25 years.

Under Law No. 4734 on public procurement, traditional procurements entail contractors receiving interim payments (progress payments) from the MoH in return for completed works during the construction phase. The MoH provides the design documents to the construction contractor, which were prepared by another contractor, namely the designer. To elaborate on this point, one of the primary concerns regarding the traditional project delivery model is that the separation between the construction and operation phases often offers contractors little incentive to account for lifecycle costs (*e.g.*, future maintenance and operational expenditures) beyond the minimum requirements prescribed in standard construction specifications for infrastructure projects. When combined with the tendency of governments to allocate funding primarily to new projects rather than maintaining existing infrastructure, this has resulted in a fragmented and inconsistent approach to maintenance activities, ultimately leading to increased costs and reduced quality standards (Engel, Fischer, & Galetovic, 2011). In contrast, under the PPP model, the ministry does not make any payments to the company prior to or during the construction phase. The company recovers its construction expenditures only after the temporary acceptance of the facility is completed and the ministry formally takes over the campus. At that point, healthcare service delivery begins. From that point on, APs are made to the company every three months, thereby marking the end of the investment phase, *i.e.*, the construction stage. In return for the APs and SPs

received from the MoH, the company is obligated to carry out all maintenance and repair activities of the IHC and to hand over the facility to the MoH in proper condition and complete working order at the end of the operation period (Engel, Fischer, & Galetovic, 2011).

CHAPTER 3

MATERIALS AND METHOD

Given the significant impact of key risk factors on project success criteria, the risk assessment process must be carried out in accordance with professional risk management principles. To accomplish this, the research material and methods are chosen meticulously through a thorough literature review and are presented in this chapter of the study.

3.1 Research Materials

The research materials used in this thesis are: (i) eighteen integrated health campus projects realized by the Turkish Ministry of Health across the country using the DBFOM-type PPP model, (ii) the legislation in force in Turkey regarding the realization of the PPP model for healthcare infrastructure, (iii) the typical project agreement that the Turkish MoH used while executing the PPP-based IHC projects, and (iv) a structured questionnaire survey that was conducted to assess the perceptions of construction industry professionals regarding the risks encountered during the execution of PPP-based IHC projects in Turkey. These are presented in the following sections.

3.1.1 IHCs Built with the PPP Model in Turkey

During the Health Transformation Program of the Ministry of Health of the Republic of Turkey, which was launched in 2003, a total of 18 integrated health campus projects, the first tender of which was held in 2010, have been integrated into the country's healthcare infrastructure through the utilization of the PPP model. Among all the projects with a total bed capacity of 27,322 and nearly 10 million square

meters of enclosed area, the first IHC began providing healthcare services in 2017, while the last one was inaugurated in 2024 (Turkish Ministry of Health, 2024). These hospitals are located in 17 major cities across Turkey. The list of hospital campuses named after the cities in which they were built is presented in Table 3.1, along with their bed capacity, indoor areas, and the year of completion.

Table 3.1 List of integrated health campuses built under the PPP model in Turkey (Turkish Ministry of Health, 2024)

No	City	Number of Beds	Indoor Space (m^2)	Opening Year
1	Yozgat	475	141,120	2017
2	Mersin	1,300	369,591	2017
3	Isparta	755	222,571	2017
4	Adana	1,550	539,824	2017
5	Kayseri	1,607	464,095	2018
6	Elazığ	1,038	355,752	2018
7	Eskişehir	1,085	333,303	2018
8	Manisa	558	178,204	2018
9	Bursa	1,355	459,586	2019
10	Ankara Bilkent	1,567	1,285,798	2020
11	İstanbul	2,682	1,019,693	2020
12	Tekirdağ	480	157,446	2020
13	Konya	838	416,789	2021
14	Ankara Etlik	4,050	1,114,620	2022
15	Kocaeli	1,218	383,193	2023
16	Gaziantep	1,875	638,038	2023
17	İzmir	2,060	629,445	2023
18	Kütahya	610	180,800	2024

Of these eighteen projects, the characteristics and capacity of the Adana Integrated Health Campus are illustrated in Figure 3.1, as an example of IHCs.

Medical Units	Number of Beds
General Hospital	582
Obstetrics and Gynecology	347
Cardiovascular Diseases	187
Oncology	184
Physical Therapy and Rehabilitation	150
High-Security Forensic Psychiatry	100

Characteristics of the hospital

- Qualified patient rooms (single room + toilet + bathroom + TV + refrigerator)
- Building automation system
- Trigeneration system
- Green roof system
- Rainwater harvesting system

Capacity of the hospital

- Single Room (36 m²): 474 units
- Double Room (40 m²): 239 units
- Suite Room (65 m²): 28 units
- Operating Room: 57 units
- Intensive Care Beds: 215 units
- Outpatient Clinics: 304 units
- Dialysis Center Beds: 35 units
- Parking Area (42,053 m²): 3.372 indoor + 657 outdoor

Figure 3.1. Characteristics and capacity of Adana City Hospital (Turkish Ministry of Health, 2024)

In IHC projects implemented under the DBFOM method, the MoH has envisioned several public interest benefits. Firstly, considering that the financing of IHC projects developed under the PPP model is not included in the public debt stock and that the obligation to secure financing lies with the private sector, the model supports sustainable progress toward meeting the Maastricht Criteria.

Secondly, the implementation of IHC projects under this model is expected to lead to an increase in demand for health tourism, supported by both domestic and international patients. Thirdly, the transfer of key operational risks in hospital management to the private sector is expected to allow for a greater allocation of public resources to the direct provision of healthcare services. Moreover, given the assumption that the private sector operates more efficiently than the public sector in service delivery, the model is expected to improve the cost-effectiveness of healthcare service provision.

Finally, all risks and responsibilities associated with the construction phase are undertaken by the private sector. As the work schedules are clearly defined in the project agreements, it is anticipated that projects carried out under this model will be completed within the planned timeframes and budgets. Figure 3.2 represents a project timeline for a typical IHC project implemented through the DBFOM model.

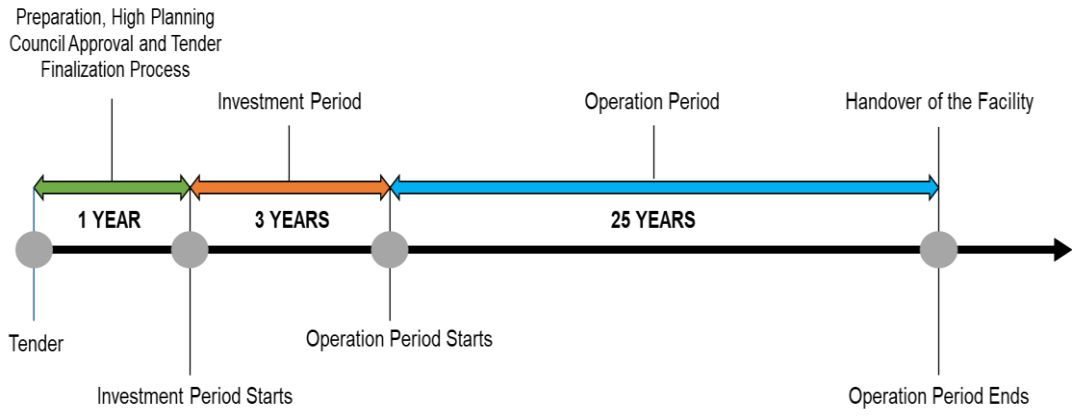

Figure 3.2. Project timeline of a typical IHC delivered by the DBFOM model (Turkish Ministry of Health, 2024)

3.1.2 Project Agreement and the Legislation

As soon as a large-scale PPP project's tender is awarded to a company, certain risks that may affect the project's total cost and schedule are borne by the company. In contrast, others are borne by the administration or shared between the parties. The company often transfers a portion of the risks it undertakes to subcontractors through contractual arrangements. In this study, the allocation of risks between the Turkish MoH and the project company (SPV) has been assessed based on the provisions of a typical project agreement together with its annexes and the applicable legislation. The risk factors identified in the risk identification step of the risk assessment procedure are examined individually through a detailed review of the agreement and its annexes to determine which party – either the MoH or the project company – holds the responsibility for managing related risks. The main body of a typical project agreement (PA) consists of 11 sections and 70 clauses. The structure of the main body of the PA reflects a detailed and integrated approach to managing the legal, financial, technical, and administrative aspects of a long-term infrastructure project implemented through the PPP model.

The contract establishes a comprehensive legal and operational framework governing the planning, financing, construction, operation, and termination of a public-private partnership project. It begins by defining the contractual relationship between the parties, outlining the scope and duration of the agreement, and identifying the general rights and obligations of each party. Additionally, it outlines procedures for the delivery and implementation of essential documents and establishes the financial monitoring framework.

Provisions concerning land-related matters are included to regulate access rights, property structures, and permitting processes. The design and construction phases are extensively covered through stipulations related to project scheduling, site access, equipment use, inspection mechanisms, and completion procedures, including preliminary acceptance and final approval.

The contract further encompasses a dedicated section on quality assurance, ensuring adherence to specified standards. Operational responsibilities encompass service provision, maintenance activities, performance monitoring systems, personnel management, site security, and resource logistics, including the management of inventory and consumables.

Financial matters are addressed through articles governing payment mechanisms, insurance requirements, the financial model, and the parties' rights to access financial data and conduct audits. The agreement also incorporates provisions for adapting to legislative changes and includes a structured procedure for implementing contractual amendments.

Potential delays and *force majeure* events are regulated under specific clauses that define the conditions under which such occurrences may affect the parties' obligations. Termination scenarios are comprehensively outlined, including the consequences of breach, compensation entitlements, settlement processes, and handover obligations.

Finally, the contract includes a range of miscellaneous provisions, including assignment and subcontracting arrangements, intellectual property rights, confidentiality obligations, fair competition, reporting duties, dispute resolution procedures, governing law, language of the contract, and other procedural and administrative matters.

The main body of the PA, namely the contract outlined above, constitutes the project agreement (PA) together with its annexes. There is a total of twenty-nine annexes, the list of which is provided in Table A.1 of Appendix A.

As mentioned previously, during the allocation process, reference was also made to the legislation that requires public authorities in Turkey to comply with in the development of healthcare infrastructure through the PPP model. The PPP legislation governing the Turkish Ministry of Health is provided in Annex B.

3.2 Research Method

The strategy of this study aligns with the procedure of the risk assessment process defined in the literature, except for the risk valuation step described in Chapter 2. This is due to the confidentiality of the financial records related to availability and service payments made by the MoH to the companies, as well as the commercial revenues generated by the companies. Therefore, in this thesis, the methodology applied for the risk assessment process of the IHC projects in Turkey comprises four main steps, namely: (i) the identification of significant risk factors, (ii) quantification of risks, (iii) allocation of the identified risk factors between the public and private parties, and (iv) risk management.

To begin with, the first step was to conduct a literature review to identify the significant risk factors that should be considered in PPP-based hospital projects. In the second step, a questionnaire survey was conducted among the target group of experts, who were white-collar professionals involved in integrated health campus projects implemented in Turkey – either on the side of the contractors, the MoH, or the consultants. The aim was to determine the significance of the probability of occurrence and the magnitude of impact of each of the thirty-six risk factors previously identified through the comprehensive literature review in the first step. To accomplish this, seventy-two experts from various disciplines and professions, all with experience in PPP and large-scale investment projects, were invited to participate in a structured questionnaire survey. Among those invited via e-mail, fifty-five completed the survey in hard copy and delivered it by hand, while five respondents submitted their completed surveys via e-mail. It is worth noting that the questionnaire survey was approved by the university's research ethics committee (METU-IAEK). The approval letter, along with the voluntary participation agreement form, is provided in Appendix C (in English) and Appendix D (in Turkish). The questionnaire survey served as a tool for quantifying risks, thus enabling the calculation of the overall risk scores. The methodology of this

quantification step is described in detail in Section 4.2 through discussions of the questionnaire survey results.

In the third step, in addition to the legislation regulating the implementation of PPP-based healthcare infrastructure projects in Turkey, a typical project agreement (PA) for integrated health campuses developed under the PPP model by the Turkish MoH is thoroughly examined together with its twenty-nine annexes (listed in Appendix A) to determine the most appropriate allocation of the identified risk factors between the public and private parties. Each risk factor is examined in isolation, and the relevant clauses in the main body (contract) of the PA, as well as its annexes, are scrutinized to identify which party to the contract should assume responsibility. Articles of both documents are reviewed systematically to determine the appropriate allocation of the identified risk factors between the public and private parties. Since the appendices contain detailed regulatory provisions regarding specific aspects of the contract, they are referred to more extensively. In this way, the allocation of all risks between the company and the MoH is completed.

In the final step, based on the literature review, appropriate risk mitigation strategies were suggested for the risk factors posing significant threats to the implementation of IHC projects by the MoH in Turkey.

CHAPTER 5

RESULTS AND DISCUSSION

The healthcare system in Turkey has achieved a high level of efficiency, in parallel with the development of healthcare infrastructure, namely the integrated health campuses (IHCs), through the DBFOM public-private-partnership (PPP) model. Such efficacy and quality of service have proven to be particularly vital in supporting the response to the COVID-19 pandemic.

The proficient implementation of the PPP model in Turkey, which was initially introduced in the late 1980s within the energy and transportation sectors and has more recently been adopted in the healthcare sector, is expected to expand into other areas such as education, municipal waste management, water resource management, and railway infrastructure in the near future. While the PPP initiatives of IHC projects in Turkey were initially designed based on the United Kingdom's PPP framework, the experience and know-how gained by both public and private parties of the projects led to the development of a distinct ‘Turkish PPP model’. The implications of the distinctive efforts exhibited in Turkey for almost fifteen years have already begun to serve as a reference framework for numerous other countries, particularly those in the developing world, where the adoption of PPP methodologies in healthcare and other sectors is being pursued.

Although the Turkish healthcare PPPs are predominantly regarded as a success narrative, various challenges and complications have arisen due to unforeseen or neglected risk factors. Therefore, it is of great importance to conduct a comprehensive risk assessment study starting from the feasibility phase and covering the tender process as well as the construction and operation periods of potential future PPP-based IHC projects.

This chapter presents the identification of risk factors compiled into a risk register. It also includes the results of the questionnaire survey, the probability–impact matrix, and discussions on the allocation of risk factors. These discussions lead to the determination of the project party responsible for managing risks in case of their materialization. Finally, the chapter provides recommendations for tailored risk mitigation tools regarding risks of high significance.

4.1 Questionnaire Survey on Risk Factors

A questionnaire survey was structured to be conducted with professional experts who have taken part in the realization of PPP-based IHC projects in Turkey. The survey aims to determine the probability of occurrence and the magnitude of impact of each identified risk factor in the literature, and ultimately to assign risk scores to each factor.

In the introduction section of the survey, brief information about the study's purpose is provided to the participants. The questionnaire is divided into two parts. In the first part, personal information of the respondents is gathered via five questions comprising (i) sector of work, (ii) occupation, (iii) title, (iv) whether the respondent has previous experience with PPP projects, and (v) whether the respondent has experience with large-scale infrastructure projects. Respondents were kept anonymous, and it was ensured that the responses would only be used for this study and would not, under any circumstances, be shared with third parties.

In the second part, entitled 'Determining the Probability and Impact of Risk Factors', thirty-six risk factors identified previously through the literature review are presented to the respondents in four main groups, namely: (i) planning and procurement risks (3 risks), (ii) design and construction risks (12 risks), (iii) operation and maintenance risks (17 risks), and (iv) post-transfer asset and termination risks (4 risks). For each group, information is provided regarding the scope of the relevant risk group and the definitions of each risk factor that falls under

that group. The questionnaire survey is based on a 5-point Likert scale, and the questions were designed accordingly. Respondents are asked to rate each risk factor in terms of both the probability of occurrence and magnitude of impacts based on their own perceptions, on a scale of 1 to 5, where 1 represents 'Very Low' significance and 5 represents 'Very High' significance. The questionnaire used in the survey is included in Appendix A.

4.2 Risk Register for the PPP-based IHC Projects

Risk prioritization aims to identify and categorize significant risks, distinguishing them from minor ones. This phase can save considerable time in the long run by preventing excessive attention to risks of minimal significance. To identify the most critical risk factors relevant to PPP-based IHC projects in Turkey, a comprehensive review of the international literature was conducted in Chapter 2. Consequently, the most frequently cited risk factors are listed in Table 4.1. It should be noted that twenty-nine risk factors are listed in this table, as the risks prevalent in both the design and construction group and the operation and maintenance group have been merged, such as subcontractor risk and legal risk.

Table 4.1 Twenty-nine risk factors identified through literature survey

Risks	Gallimore *et al.* (1997)	Salzmann & Mohamed (1999)	Kumaraswamy & Zhang (2001)	Grimsey & Lewis (2002)	Li *et al.* (2005)	Warburton & Baker (2005)	Shen *et al.* (2006)	Maslyukivska & Sohail (2007)	Ng & Loosemore (2007)	Estache *et al.* (2007)	Medda (2007)	Zou *et al.* (2008)	Liu *et al.* (2016)	Xu *et al.* (2010)	Ke *et al.* (2010)	Li & Zou (2012)	Zhang *et al.* (2020)	Gondia *et al.* (2020)	Siraj & Fayek (2019)	Beltrão & Carvalho (2019)
Licenses and Permits	✓				✓		✓		✓						✓		✓	✓	✓	✓
Financing	✓	✓			✓		✓						✓		✓	✓		✓	✓	✓
Market Demand			✓	✓	✓			✓		✓	✓	✓		✓						
Legal	✓		✓	✓	✓		✓	✓	✓	✓			✓	✓	✓	✓	✓	✓	✓	✓
Environmental	✓	✓		✓	✓			✓							✓		✓		✓	✓
Currency	✓	✓	✓						✓	✓	✓	✓	✓	✓	✓		✓		✓	✓
Variation Order			✓		✓				✓	✓	✓									
Skilled Worker			✓		✓		✓		✓	✓			✓		✓	✓	✓	✓	✓	✓
Subcontractor			✓		✓		✓		✓	✓							✓	✓	✓	
Ground Investigation	✓				✓				✓	✓					✓		✓	✓	✓	✓
Time Overrun	✓								✓	✓			✓		✓		✓			✓
Technology							✓		✓				✓	✓	✓				✓	✓
Cost Overrun	✓	✓		✓	✓		✓		✓	✓			✓		✓	✓	✓			✓
Insurance								✓				✓								
Design Change				✓			✓		✓	✓				✓			✓	✓	✓	✓

Table 4.1 (continued)

Risks	Gallimore *et al.* (1997)	Salzmann & Mohamed (1999)	Kumaraswamy & Zhang (2001)	Grimsey & Lewis (2002)	Li *et al.* (2005)	Warburton & Baker (2005)	Shen *et al.* (2006)	Maslyukivska & Sohail (2007)	Ng & Loosemore (2007)	Estache *et al.* (2007)	Medda (2007)	Zou *et al.* (2008)	Liu *et al.* (2016)	Xu *et al.* (2010)	Ke *et al.* (2010)	Li & Zou (2012)	Zhang *et al.* (2020)	Gondia *et al.* (2020)	Siraj & Fayek (2019)	Beltrão & Carvalho (2019)
Operational				✓	✓		✓		✓				✓				✓			✓
Contamination & Infection				✓	✓		✓		✓											
Waste Management	✓	✓		✓	✓			✓												
Maintenance & Repair	✓	✓		✓	✓		✓		✓	✓			✓							
Renewal	✓	✓		✓	✓		✓		✓	✓										
Performance				✓	✓		✓		✓	✓		✓	✓	✓	✓		✓			
Commercial Space Income			✓	✓	✓					✓	✓	✓	✓		✓		✓			
Energy Efficiency	✓	✓		✓	✓			✓												
Security			✓		✓	✓		✓	✓			✓								
Resource Price			✓	✓					✓				✓		✓		✓			
Scrap Value	✓				✓				✓											
Transfer Period Expiry	✓				✓				✓											
Force Majeure		✓	✓	✓	✓				✓	✓			✓	✓	✓	✓	✓		✓	✓
Termination			✓		✓	✓	✓		✓	✓	✓	✓								

Although risks are initially identified without being assigned to a specific project phase, given the differences in their allocation between the construction and operation phases, the relevant risks – *e.g.,* construction and operation period cost overrun risk – are differentiated between these two project phases. Therefore, it is worth noting that Table 4.1 lists twenty-nine items, as some risks may arise during both the construction and operation periods. Accordingly, the total number of identified risks is thirty-six, as presented in Table 4.2, which contains the final risk register.

Table 4.2 Risk register for IHC projects carried out by the PPP model in Turkey

Risk Category	Risk Factors	Definition
Planning and Procurement Risks	Licenses and Permits Risk	Licenses and Permits Risk is defined as financial losses due to failure to obtain construction-related licenses and permits from municipalities and public institutions before the start of the investment period, as of the completion of the tender process, and the risk factors that will cause difficulties in obtaining the licenses and permits that are needed for the provision of services during the operation period.
	Financing Risk	Financing Risk is defined as the risk factor related to the factors affecting the provision of funds for the implementation of the project and its costs, such as insufficient demand from financiers.
	Market Demand Risk	Market Demand Risk refers to the risk that consumers or stakeholders for the project will not create demand at a sufficient level or within the expected price range during the tender process or in the provision of services.
Design and Construction Risks	Construction Period Legal Risk	The Legal Risk that may be exposed during the project's life is defined as the emergence of unexpected results due to changes in current legislation related to the project and subsequent legislative changes.
	Environmental Risk	Environmental Risk is defined as the risk of holding the related party responsible for environmental and occupational safety-related damages that may occur during the project's investment and operational periods.
	Construction Period Currency Risk	Construction Period Currency (Exchange Rate) Risk is defined as the risk factor that affects costs in the event of depreciation of the local currency against the foreign currency or changes in interest rates related to project financing.
	Variation Order Risk	The Variation Order Risk indicates the financial impacts of the business increases that may occur above the specified proportion of the fixed investment amount or the service fee amount, upon the request of one of the parties during the investment period or operating period.

Table 4.2 (continued)

Risk Category	Risk Factors	Definition
Design and Construction Risks	Construction Period Skilled Worker Risk	The Risk of Finding Skilled Workers during the construction period is defined as the risk of not being able to find the qualified personnel required for the project's implementation.
	Construction Period Subcontractor Risk	Subcontractor Risk is defined as the risk factors related to the default or bankruptcy of subcontractor companies working as subcontractors during the investment period.
	Ground Investigation Risk	Ground Investigation Risk is defined as the inability to conduct the necessary scientific ground investigations to minimize the effects of earthquakes or natural disasters, the emergence of unexpected ground conditions, or the incurring of costs that are higher than expected.
	Construction Period Timeout Risk	Construction Period Timeout Risk is considered a risk factor for the inability of services to commence on the scheduled date due to delays in the design, tender, construction, and commissioning stages of the facilities within the project's scope.
	Construction Period Technology Risk	Technology Risk is defined as the risk that the technical inputs to be used by the contractor and service providers are not kept up to date with technological innovations.
	Construction Period Cost Overrun Risk	Construction Period Cost Overrun Risk is a risk factor that arises from the possibility that the project's cost during the design and construction period will exceed the planned cost.
	Construction Period Insurance Risk	Insurance Risk for the construction period covers the risk factors related to the occurrence of damages that may arise outside the scope of insurance policies during the construction period, as well as the associated cost increases.
	Design Change Risk	Design Change Risk is defined as the risk factor encompassing changes to the design project of the facility that may be required or desired in the physical structure of the facility during the investment and operational periods.
Operation and Maintenance Risks	Operation Period Insurance Risk	Insurance Risk for the operation period covers the risk factors related to the occurrence of damages that may arise outside the scope of insurance policies during the operation period, as well as the associated cost increases.
	Operational Risk	Operational Risk is defined as the risk factors that may be encountered in the operation of health facilities, which could prevent the hospital from operating in a manner that provides sustainable and uninterrupted health services in accordance with the terms of the project contract.
	Operation Period Skilled Worker Risk	The Risk of finding skilled workers during the operational period is defined as the risk of not being able to find the qualified workers required for the project's maintenance work.

Table 4.2 (continued)

Risk Category	Risk Factors	Definition
Operation and Maintenance Risks	Contamination and Infection Risk	Contamination and Infection Risk is defined as the risk of not being able to protect patients and employees from contamination and infection elements that may occur in the field and in the hospital.
	Operation Period Subcontractor Risk	Subcontractor Risk is defined as the risk factors related to the default or bankruptcy of the subcontractor companies working as its subcontractor during the operation period.
	Waste Management Risk	Waste Management Risk encompasses factors such as waste that facilitates the spread of infection, inadequate control, and the inability to comply with the delivery chain.
	Maintenance and Repair Risk	Maintenance and Repair Risk is defined as the risk factor that results in unexpectedly higher costs arising from the maintenance and repair activities of facilities.
	Renewal Risk	Renewal Risk is defined as the risks associated with delays or malfunctions that may occur during the renewal of assets during the project.
	Performance Risk	Performance Risk is defined as the risk that the operator cannot achieve the expected performance level in the services to be provided.
	Operation Period Technology Risk	Technology risk is defined as the risk that the technical inputs to be used by the contractor and service providers are not kept up to date with technological innovations.
	Commercial Space Income Risk	The Commercial Space (Area) Income (Revenue) Risk has been identified as the risk that may arise against the commercial area revenues given the right to operate, if the private sector requests it during the tender process and is deemed appropriate by the administration.
	Energy Efficiency Risk	Energy Efficiency Risk is defined as the risk of not providing uninterrupted energy required by the facility, as well as the conditions regarding energy use and efficiency stipulated in the contract and relevant legislation.
	Security Risk	Security Risk is defined as the risk of the facility not being protected against all kinds of terrorism, theft, or events that endanger the safety of customers and employees.
	Operation Period Cost Overrun Risk	Operation Period Cost Overrun Risk is defined as the risk that the actual cost incurred during the project's operation period exceeds the planned cost.
	Operation Period Legal Risk	Legal Risk regarding the operating period is defined as the risk of a change in legal legislation that will affect the operational period of the project, such as changes in tax policies, distinct from those during the investment period.

Table 4.2 (continued)

Risk Category	Risk Factors	Definition
Operation and Maintenance Risks	Operation Period Currency Risk	Operation Period Currency (Exchange Rate) Risk is defined as the risk factor that will be reflected in the costs of the parties for payments made in case the local currency depreciates against the foreign currency or interest rates change as the project starts to operate.
	Resource Price Risk	Resource Price Risk is defined as a risk factor encompassing excessive increases in expenses that may occur when costs exceed a certain amount, including raw materials used in production, electricity, water, and natural gas prices, as well as operating costs during the operating period.
Post-Transfer Asset and Termination Risks	Scrap Value Risk	Scrap Value Risk is defined as the risk factor that is used in the delivery of the facility to the investor or owner upon the expiration of the contract or due to the termination process, and that causes the facility not to be delivered clean and free from any debt.
	Transfer Period Expiry Risk	Transfer Period Expiry Risk covers the risk factors for delays in the return of the facility to the investor or owner.
	Force Majeure Risk	*Force Majeure* Risk is defined as a catastrophic risk factor that occurs outside the reasonable control of the parties, is unreasonably impossible to avoid and overcome, and makes it impossible for the parties to fulfill their obligations.
	Termination Risk	Termination Risk is considered a cost element that arises when either party fails to fulfill its obligations under the contract or the contract enters the termination process through mutual agreement.

4.3 Results of the Questionnaire Survey and the Overall Risk Scores

The risk register forms the basis of the data used in the questionnaire survey conducted to evaluate the severity of probabilities and impacts of the crucial risk factors posing a threat to the PPP-based IHC projects in Turkey. Upon retrieving the data from the survey, where the sectoral and professional distributions of the respondents are presented in Figure 4.1 and Figure 4.2, respectively, establishing a ranking scale for the risk quantification process and ensuring its international validity is essential for the accuracy and reliability of the analyses. In most studies in the literature, the impact of risks on a project is calculated through scales that consider the probability of occurrence, potential impacts, or vulnerability coefficients. The

selected scaling methods should both allow ranking and facilitate participants' prioritization. For this reason, it has been observed that the use of a five-point Likert scale yields more consistent results compared to three-point or ten-point scales.

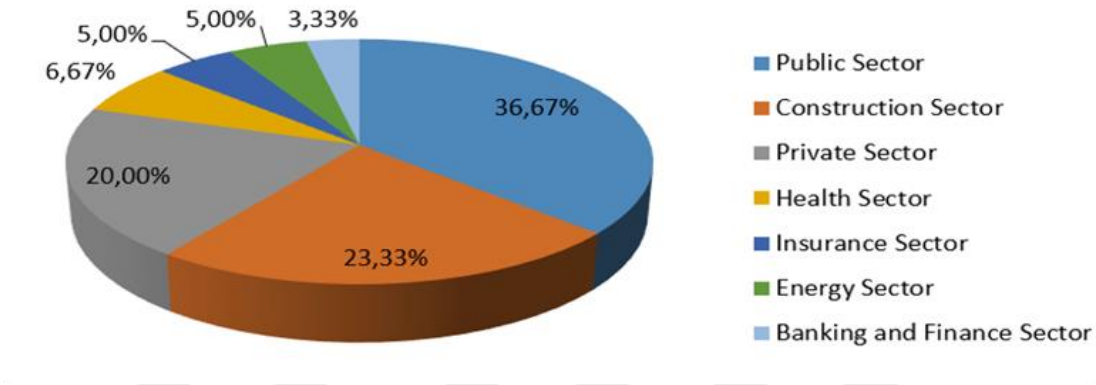

Figure 4.1. Sectoral distribution of participants in the questionnaire survey

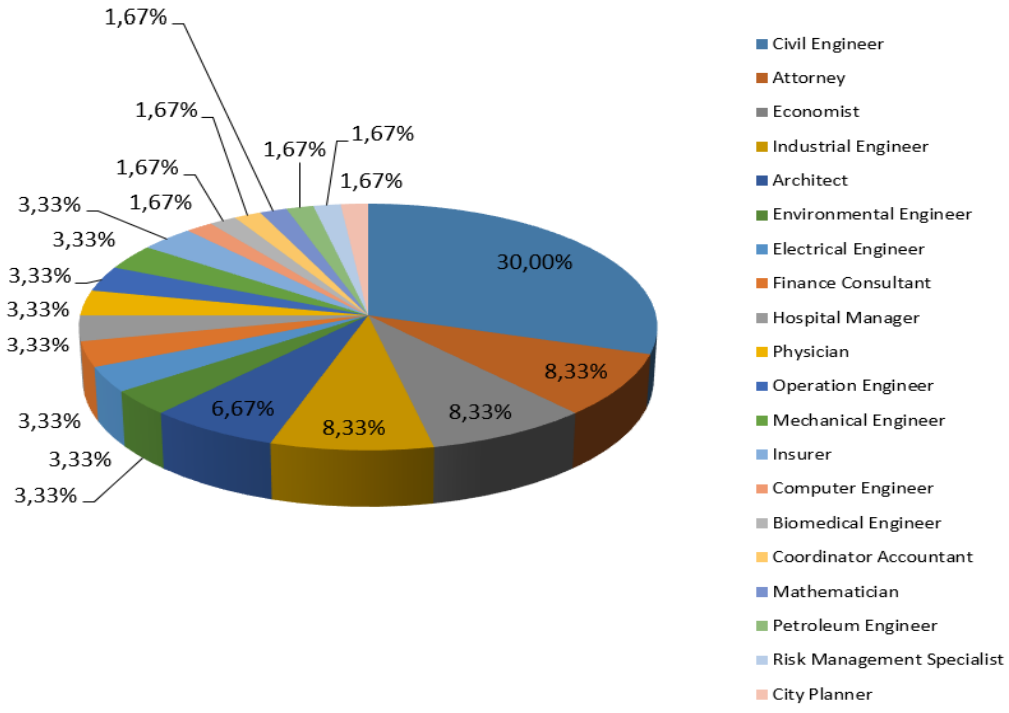

Figure 4.2. Occupational distribution of participants in the questionnaire survey

The percentages of responses regarding the probability of occurrence and magnitude of impact of the thirty-six identified risk factors are presented in Tables 4.3 to 4.6 according to their respective groups. The first row in each table, below the heading row, presents the Likert scales from 1 to 5, where 1 indicates the lowest and 5 the highest severity.

Table 4.3 Percentage distribution of responses for the probability and impact of three risk factors in the planning and procurement group

Risk Factor	No	Probability (%)					Impact (%)				
Planning and Procurement Risks		**1**	**2**	**3**	**4**	**5**	**1**	**2**	**3**	**4**	**5**
Licenses and Permits Risk	1	13.56	47.46	30.51	6.78	1.69	5.08	10.17	28.81	30.51	25.42
Financing Risk	2	0	22.41	41.38	32.76	3.45	1.72	1.72	17.24	27.59	51.72
Market Demand Risk	3	6.90	46.55	36.21	6.90	3.45	1.72	3.45	41.38	37.93	15.52

Table 4.4 Percentage distribution of responses for the probability and impact of twelve risk factors in the design and construction group

Risk Factor	No	Probability (%)					Impact (%)				
Design and Construction Risks		**1**	**2**	**3**	**4**	**5**	**1**	**2**	**3**	**4**	**5**
Construction Period Legal Risk	1	8.47	42.37	40.68	5.08	3.39	3.39	10.17	3.90	35.59	16.95
Environmental Risk	2	13.33	46.67	33.33	5.00	1.67	5.00	33.33	48.33	10.00	3.33
Construction Period Currency Risk	3	0.00	5.08	45.76	32.20	16.95	1.69	5.08	10.17	33.90	49.15
Variation Order Risk	4	1.69	13.56	44.07	18.64	22.03	1.69	10.17	16.95	45.76	25.42

Table 4.4 (continued)

Risk Factor	No	Probability (%)					Impact (%)				
Construction Period Skilled Worker Risk	5	13.33	58.33	18.33	6.67	3.33	1.67	33.33	33.33	21.67	10.00
Construction Period Subcontractor Risk	6	3.33	21.67	65.00	6.67	3.33	5.00	16.67	23.33	30.00	25.00
Ground Investigation Risk	7	11.67	60.00	21.67	5.00	1.67	3.33	20.00	28.33	31.67	16.67
Construction Period Timeout Risk	8	5.08	16.95	52.24	15.25	10.17	0.00	10.17	22.03	37.29	30.51
Construction Period Technology Risk	9	8.47	49.15	32.20	6.78	3.39	5.08	18.64	44.07	22.03	10.17
Construction Period Cost Overrun Risk	10	0.00	11.86	61.02	20.34	6.78	1.69	8.47	22.03	28.81	38.98
Construction Period Insurance Risk	11	18.97	48.28	25.86	5.17	1.72	5.17	17.24	41.38	25.86	10.34
Design Change Risk	12	3.33	26.67	41.67	16.67	11.67	0	10.00	25.00	40.00	25.00

Table 4.5 Percentage distribution of responses for the probability and impact of seventeen risk factors in the operation and maintenance group

Risk Factor	No	Probability (%)					Impact (%)				
Operation and Maintenance Risks		**1**	**2**	**3**	**4**	**5**	**1**	**2**	**3**	**4**	**5**
Operation Period Insurance Risk	1	13.79	55.17	25.86	3.45	1.72	1.72	20.69	37.93	24.14	15.52
Operational Risk	2	1.72	20.69	37.93	24.14	15.52	0.00	8.33	31.67	28.33	31.67

Table 4.5 (continued)

Risk Factor	No	Probability (%)					Impact (%)				
Operation Period Qualified Personnel Risk	3	8.47	38.98	40.68	8.47	3.39	0.00	8.47	32.20	32.20	27.12
Contamination and Infection Risk	4	6.67	58.33	26.67	5.00	3.33	6.67	10.00	28.33	36.67	18.33
Waste Management Risk	5	5.08	66.10	20.34	6.78	1.69	1.69	23.73	28.81	22.03	23.73
Maintenance and Repair Risk	6	0.00	41.67	43.33	13.33	1.67	0.00	6.67	45.00	36.67	11.67
Renewal Risk	7	1.79	39.29	35.71	19.64	3.57	1.79	7.14	44.64	33.93	12.50
Performance Risk	8	3.39	25.42	55.93	10.17	5.08	0.00	8.47	22.03	30.51	38.98
Technology Risk	9	5.08	32.20	50.85	10.17	1.69	1.69	6.78	25.42	54.24	11.86
Commercial Space Income Risk	10	11.86	44.07	32.20	10.17	1.69	6.78	20.34	40.68	18.64	13.56
Energy Efficiency Risk	11	7.02	29.82	54.39	5.26	3.51	1.75	8.77	22.81	50.88	15.79
Security Risk	12	8.33	60.00	23.33	3.33	5.00	1.67	20.00	46.67	18.33	13.33
Operation Period Cost Overrun Risk	13	1.72	12.07	62.07	17.24	6.90	0.00	8.62	31.03	25.86	34.48
Operation Period Legal Risk	14	5.08	49.15	35.59	6.78	3.39	0.00	15.25	37.29	20.34	27.12
Operation Period Currency Risk	15	0.00	6.78	38.98	33.90	20.34	0.00	1.69	13.56	33.90	50.85
Raw Material Supply and Price Risk	16	3.39	11.86	62.71	15.25	6.78	1.69	0.00	28.81	35.59	33.90
Operation Period Subcontractor Risk	17	3.39	37.29	42.37	13.56	3.39	0.00	6.78	32.20	37.29	23.73

Table 4.6 Percentage distribution of responses for the probability and impact of four risk factors in the post-transfer asset and termination group

Risk Factor	No	Probability (%)					Impact (%)				
Post-Transfer Asset & Termination Risks		**1**	**2**	**3**	**4**	**5**	**1**	**2**	**3**	**4**	**5**
Scrap Value Risk	1	5.17	46.55	27.59	12.07	8.62	1.72	6.9	32.76	39.66	18.97
Force Majeure Risk	2	8.62	31.03	39.66	18.97	1.72	1.72	12.07	15.52	37.93	32.76
Transfer Period Expiry Risk	3	10.17	32.2	49.15	6.78	1.69	0	5.08	18.64	35.59	40.68
Termination Risk	4	1.69	42.37	44.07	10.17	1.69	1.69	3.39	8.47	38.98	47.46

Table 4.7 and Table 4.8 present the scaling of risk factors derived from the questionnaire survey data, for probability of occurrence and impact, respectively. In the probability scaling presented in Table 4.7, the arithmetic mean of the responses was treated as interval-level data. Under the assumption of a uniform distribution, the probability of risk occurrence was defined within a range of 0% to 100%.

Table 4.7 Scaling the probabilities of risk factors

Degree of Risk	Risk Level	Definition
5	Very High [80% - 100%]	It is the probability category in which the probability of occurrence of the relevant risk factor is determined to be higher than 80% during the life cycle of the health facility.
4	High [60% - 80%]	It is the probability category in which the probability of occurrence of the relevant risk factor is between 60% and 80% during the life cycle of the health facility.
3	Medium [40% - 60%]	It is the probability category in which the probability of occurrence of the relevant risk factor is between 40% and 60% during the life cycle of the health facility.
2	Low [20% - 40%]	It is the probability category in which the probability of occurrence of the relevant risk factor is between 20% and 40% during the life cycle of the health facility.
1	Very Low [0% - 20%]	It is a probability category in which the probability of the relevant risk factor occurring is determined to be less than 20% during the health facility's life cycle.

In Table 4.8, the negative impacts of risk factors upon their occurrence are scaled. The maximum possible impact is defined as a scenario in which the entire value of the project becomes a sunk cost, and accordingly, the impact data were scaled within a range of 0% to 100%. In this scaling process, not only are the potential financial losses arising from risk realization considered, but also other consequences such as changes in public perception of the project, physical harm to healthcare facility staff or service users, and adverse effects from potential legal proceedings.

Table 4.8 Scaling the impact of risk factors

Degree of Risk	Risk Level	Definition
5	Very High [80% - 100%]	• Irreversible financial loss of 80% of the project's value • Long-term negative impression on the international public opinion • Significant prosecution and fines, legal sanctions • Serious injury or death to employees or third parties
4	High [60% - 80%]	• High financial loss of between 60% and 80% of the project value • Long-term negative impression on the national public • Need to implement large-scale projects for corrective action • Workers or third-party injuries
3	Medium [40% - 60%]	• Moderate financial loss of between 40% and 60% of the project value • Short-term negative impression on the national public • The need for immediate corrective actions to be implemented • Limited injuries of workers or third parties requiring outpatient treatment
2	Low [20% - 40%]	• Financial loss corresponding to between 20% and 40% of the project value • Loss of local reputation • The necessity to intervene without the need for follow-up • Minor injuries of third parties • Increase in the level of dissatisfaction of employees and third parties
1	Very low [0% - 20%]	• Low-grade financial loss incurred up to 20% of the project value • The necessity of evaluating the usual solution options without the need for case reporting • Limited employee dissatisfaction

In the probability-impact matrix (Table 4.9), the vertical axis represents the probability of risk occurrence. In contrast, the horizontal axis represents the magnitude of financial loss that would occur if the risk materializes. The probability of occurrence is rated on a five-point Likert scale, ranging from 'very high' to 'very low' likelihood, with each level assigned a corresponding numerical value. Similarly, the potential impact of each risk is rated on a 5-point Likert scale, ranging from 'very high' to 'very low' severity of loss, and is also represented numerically.

Table 4.9 Probability-impact matrix

		IMPACT				
PROBABILITY	**DEGREE OF PROBABILITY / IMPACT**	**1 VERY LOW**	**2 LOW**	**3 MEDIUM**	**4 HIGH**	**5 VERY HIGH**
	1 VERY LOW	1 Insignificant	2 Low	3 Low	4 Low	5 Low
	2 LOW	2 Low	4 Low	6 Low	8 Medium	10 Medium
	3 MEDIUM	3 Low	6 Low	9 Medium	12 Medium	15 High
	4 HIGH	4 Low	8 Medium	12 Medium	16 High	20 High
	5 VERY HIGH	5 Low	10 Medium	15 High	20 High	25 Intolerable

The product of the probability and impact factors defines risk levels ranging from very low (insignificant) to very high (intolerable), on a scale from 1 to 25, as shown in Table 4.9. This product also forms the basis of the 'risk score', and is calculated using the following formula:

In the next step, the overall risk scores for each risk factor are calculated using Equation [1] below.

$$RS_i = P(r_i) \times I(r_i) \qquad i = 1,2,\ldots,36 \qquad [1]$$

where;

RS_i: Risk score for the i th risk factor**.**

$P(r_i)$: Mean value of the probability of occurrence of the i th risk factor.

$I(r_i)$: Mean value of the magnitude of impact of the i th risk factor.

Information regarding the degrees of risk based on overall risk scores is presented in Table 4.10. As outlined in the table, risks falling within zone 1 correspond to scores greater than 17.01 and are considered extremely high-risk activities within projects. The realization of risks in this category is expected to cause extremely costly and potentially catastrophic damage. Zone 2 encompasses risks with scores ranging from 13.01 to 17.00. This zone is considered a high-risk area, where the occurrence of risks can lead to significant financial losses. Zone 3 comprises risk scores ranging from 9.01 to 13.00, representing medium-risk factors with limited financial consequences. Zone 4 includes risks with scores between 5.01 and 9.00, which are considered low-level threats to the project. Such risks can generally be mitigated relatively easily through insurance at a certain cost. Finally, zone 5 contains risks with a score less than 5.00, representing very low-risk threats. These are considered inherent, like the work itself, and negligible for risk management purposes, making them acceptable without mitigation.

Table 4.10 Degrees of risk levels

Risk Zones	Color of the Zone	Risk Score Range	Risk Level
Zone 1		> 17.01	Very High Risk
Zone 2		$13.01 - 17.00$	High Risk
Zone 3		$9.01 - 13.00$	Medium Risk
Zone 4		$5.01 - 9.00$	Low Risk
Zone 5		$1.00 - 5.00$	Very Low Risk

As a preliminary step in evaluating the consistency of responses from the questionnaire survey, a reliability analysis was conducted based on the type of scale used. Following the reliability test applied to the entire dataset, the Cronbach's Alpha value was found to be 0.944, statistically confirming that the scale possesses high reliability. Descriptive statistics derived from the survey results are introduced in Appendix G in Table A.2 to Table A.5.

When reviewing the total statistics based on individual variables, an analysis was conducted to determine whether removing any item from the scale would result in a significant increase in Cronbach's Alpha value. The analysis revealed that removing any individual question does not lead to a notable increase in the Alpha coefficient, indicating a homogeneous distribution and a high degree of internal consistency among the items. Upon examining the item-total correlation values, it was observed that all items had correlation values below 0.80. However, as no negative correlations were identified, it was concluded that none of the items needed to be removed from the scale. In conclusion, the reliability analysis of the scale demonstrated that all items exhibit high consistency and that the scale is statistically highly significant.

The mean values of each risk factor's probability of occurrence, magnitude of impact, and the resulting risk scores, calculated using Equation 1, are presented in Table 4.11, arranged in descending order of risk scores.

Table 4.11 Overall risk scores for thirty-six risk factors identified for IHC projects realized by the Turkish MoH using the PPP model

Risk Factor	Mean Value of Probability of Occurrence	Mean Value of Magnitude of Impact	Risk Score
Operation Period Currency Risk	3.67	4.33	15.89
Construction Period Currency Risk	3.61	4.23	15.27
Financing Risk	3.17	4.25	13.47

Table 4.11 (continued)

Risk Factor	Mean Value of Probability of Occurrence	Mean Value of Magnitude of Impact	Risk Score
Variation Order Risk	3.45	3.83	13.21
Construction Period Cost Overrun Risk	3.22	3.94	12.69
Resource Price Risk	3.10	4.00	12.40
Construction Period Legal Risk	3.52	3.52	12.39
Operation Period Cost Overrun Risk	3.15	3.86	12.16
Construction Period Timeout Risk	3.08	3.88	11.95
Design Change Risk	3.06	3.80	11.63
Performance Risk	2.88	4.00	11.52
Termination Risk	2.67	4.27	11.40
Operational Risk	2.88	3.83	11.03
Transfer Period Expiry Risk	2.74	3.87	10.60
Force Majeure Risk	2.57	4.11	10.56
Operation Period Subcontractor Risk	2.76	3.77	10.41
Construction Period Subcontractor Risk	2.85	3.53	10.06
Scrap Value Risk	2.72	3.67	9.98
Operation Period Technology Risk	2.71	3.67	9.95
Energy Efficiency Risk	2.68	3.70	9.92
Renewal Risk	2.83	3.48	9.85
Operation Period Qualified Personnel Risk	2.59	3.77	9.76
Maintenance and Repair Risk	2.75	3.53	9.71
Market Demand Risk	2.53	3.62	9.16
Operation Period Legal Risk	2.54	3.59	9.12
Licenses and Permits Risk	2.35	3.61	8.48
Contamination and Infection Risk	2.40	3.50	8.40
Operation Period Insurance Risk	2.41	3.31	7.98
Waste Management Risk	2.33	3.42	7.97
Construction Period Technology Risk	2.47	3.13	7.73
Commercial Space Income Risk	2.45	3.11	7.62

Table 4.11 (continued)

Risk Factor	Mean Value of Probability of Occurrence	Mean Value of Magnitude of Impact	Risk Score
Ground Investigation Risk	2.25	3.38	7.61
Security Risk	2.36	3.21	7.58
Construction Period Insurance Risk	2.22	3.18	7.06
Construction Period Skilled Worker Risk	2.28	3.05	6.95
Environmental Risk	2.35	2.73	6.42

As a result, the probability-impact matrix specific to the IHC projects realized by the Turkish MoH is illustrated in Table 4.12.

Table 4.12 Probability-impact matrix for IHC projects in Turkey

Risk Zone	Color of Risk Zone	Risk Factor	Risk Score Range	Risk Score	Risk Level
Zone 1		–	$RS > 17.01$	–	Very High Risk
Zone 2		Operation Period Currency Risk	$13.01 \leq RS \leq 17.00$	15.89	High Risk
		Construction Period Currency Risk		15.27	
		Financing Risk		13.47	
		Variation Order Risk		13.21	
Zone 3		Construction Period Cost Overrun Risk	$9.01 \leq RS \leq 13.00$	12.69	Medium Risk
		Resource Price Risk		12.40	
		Construction Period Legal Risk		12.39	
		Operation Period Cost Overrun Risk		12.16	
		Construction Period Timeout Risk		11.95	

Table 4.12 (continued)

Risk Zone	Color of Risk Zone	Risk Factor	Risk Score Range	Risk Score	Risk Level
Zone 3		Design Change Risk	$9.01 \leq RS \leq 13.00$	11.63	Medium Risk
		Performance Risk		11.52	
		Termination Risk		11.40	
		Operational Risk		11.03	
		Transfer Period Expiry Risk		10.60	
		Force Majeure Risk		10.56	
		Operation Period Subcontractor Risk		10.41	
		Construction Period Subcontractor Risk		10.06	
		Scrap Value Risk		9.98	
		Operation Period Technology Risk		9.95	
		Energy Efficiency Risk		9.92	
		Renewal Risk		9.85	
		Operation Period Qualified Personnel Risk		9.76	
		Maintenance and Repair Risk		9.71	
		Market Demand Risk		9.16	
		Operation Period Legal Risk		9.12	
Zone 4		Licenses and Permits Risk	$5.01 \leq RS \leq 9.00$	8.48	Low Risk
		Contamination and Infection Risk		8.40	
		Operation Period Insurance Risk		7.98	
		Waste Management Risk		7.97	
		Construction Period Technology Risk		7.73	

Table 4.12 (continued)

Risk Zone	Color of Risk Zone	Risk Factor	Risk Score Range	Risk Score	Risk Level
Zone 4		Commercial Space Income Risk	$5.01 \leq RS \leq 9.00$	7.62	Low Risk
		Ground Investigation Risk		7.61	
		Security Risk		7.58	
		Construction Period Insurance Risk		7.06	
		Construction Period Skilled Worker Risk		6.95	
		Environmental Risk		6.42	
Zone 5		–	$1 \leq RS \leq 5.00$	–	Very Low Risk

When evaluating the risk factors by their level of importance, it was observed that the majority of risks associated with integrated health campus projects implemented under the public-private partnership model in Turkey fall within the category of 'Medium Risk' with a total number of twenty-one out of thirty-six risk factors and with a percentage of 58.3%. No risk factors were identified under the categories of 'Very Low Risk' or 'Very High Risk'. In contrast, a total of eleven risks are classified under the 'Low Risk' category, accounting for 30.6% of the total. On the other hand, four risks, namely, operation period currency risk, construction period currency risk, construction period cost overrun risk, and financing risk, are categorized as falling into the 'High Risk' group, which constitutes 11.1% of the total.

This ranking clearly indicates that financial and currency-related risks are perceived as highly critical by the respondents, underscoring their significant influence on project performance. The recurrence of currency risk in both the construction and operation periods as one of the highest-ranked risks emphasizes the severity with which exchange rate fluctuations are perceived across the entire project lifecycle.

This strong emphasis on currency-related risks reflects the financial fragility that arises when project expenditures are predominantly in foreign currencies. At the same time, revenues are collected in local currency – a common characteristic of PPP projects implemented in economies with high exchange rate volatility. The differentiation between construction and operation period currency risks also suggests that stakeholders view these as separate concerns, each presenting unique exposure and management challenges during their respective phases. Given that IHC projects require substantial investments and that contractor companies need significant financing, coupled with the fact that the MoH does not make any payments during the investment period, it is significant that financing risk ranks as the third-highest-scoring risk.

Furthermore, the presence of variation order risk among the high-level risks highlights the critical role of scope definition, change control mechanisms, and contractual clarity in project delivery. Changes in project scope can lead to significant cost escalations and delays, particularly in large-scale infrastructure projects where technical complexity and stakeholder coordination are particularly demanding. The prominence of this risk points to the importance of robust contract administration practices, comprehensive initial planning, and effective communication between the public authority and the private sector partner.

Overall, the prioritization of financial and contractual risks in the assessment indicates that macroeconomic conditions and project governance frameworks are central to the perceived risk landscape in PPP implementations. This requires carefully designed risk allocation models and the inclusion of responsive contractual provisions, such as currency hedging mechanisms and clearly articulated variation order procedures, to enhance the resilience and performance of PPP projects in practice.

On the other hand, the study's findings indicate that ground investigation, security, construction period insurance, construction period skilled worker, and environmental risks were assessed as the five lowest-ranked among the thirty-six

identified risk factors. This result implies that experts involved in integrated health campus projects delivered through the PPP model in Turkey perceive these specific risks as relatively well-managed, limited in occurrence, or having a comparatively minor impact on project outcomes.

In particular, the low prioritization of ground investigation risk may reflect the adequacy of preliminary geotechnical surveys and the standardization of site preparation procedures in recent PPP healthcare projects. Similarly, the low rating of security risk may be attributed to the urban locations of most city hospitals and the effective enforcement of public safety protocols during both construction and operation phases. The minimal concern surrounding construction period insurance risk is likely due to the availability of mature insurance markets in Turkey and the widespread incorporation of standard insurance requirements in PPP contracts.

Furthermore, the relatively low score of construction period skilled worker risk may indicate that the Turkish construction sector has sufficient access to qualified labor resources, especially in major metropolitan areas where most IHC projects have been implemented. Lastly, environmental risk receiving one of the lowest scores could reflect well-established environmental impact assessment (EIA) procedures and regulatory compliance frameworks that reduce uncertainty regarding environmental approvals and obligations.

Taken together, these findings suggest that while certain systematic and financial risks dominate stakeholder concerns, some technical and operational risks are perceived as sufficiently mitigated through established practices, sectoral capacity, and regulatory mechanisms within the Turkish healthcare PPP context.

4.4 Allocation of Risks for the PPP-based IHC Projects in Turkey

A rigorous risk allocation was carried out for all thirty-six risk factors included in the risk register (Table 4.2), using the methodology presented in Section 3.2. Detailed discussions on the allocation of each risk factor are provided in Appendix

H. Accordingly, Table 4.13 presents the risk factors that fall under the responsibility of the MoH, those borne by the company, and those shared between both parties. The risk levels are also illustrated in the table, ranked from highest to lowest, to provide an overall insight into the outcome of the three significant steps in the risk assessment procedure: identification, quantification, and allocation.

Table 4.13 Allocation of risk factors for IHC projects in Turkey, according to related clauses of a typical PPP agreement and its twenty-nine annexes

Risk Factor	Level of Risk	Risk Allocation
Operation Period Currency Risk	High-Risk	Risk Sharing
Construction Period Currency Risk		Company
Financing Risk		Company
Variation Order Risk		Ministry of Health
Construction Period Cost Overrun Risk	Medium-Risk	Company
Resource Price Risk		Risk Sharing
Construction Period Legal Risk		Ministry of Health
Operation Period Cost Overrun Risk		Company
Construction Period Timeout Risk		Risk Sharing
Design Change Risk		Company
Performance Risk		Company
Termination Risk		Risk Sharing
Operational Risk		Company
Transfer Period Expiry Risk		Company
Force Majeure Risk		Risk Sharing
Operation Period Subcontractor Risk		Company
Construction Period Subcontractor Risk		Company
Scrap Value Risk		Company
Operation Period Technology Risk		Risk Sharing
Energy Efficiency Risk		Company
Renewal Risk		Company

Table 4.13 (continued)

Risk Factor	Level of Risk	Risk Allocation
Operation Period Qualified Personnel Risk	Medium-Risk	Company
Maintenance and Repair Risk		Company
Market Demand Risk		Ministry of Health
Operation Period Legal Risk		Ministry of Health
Licenses and Permits Risk	Low-Risk	Risk Sharing
Contamination and Infection Risk		Company
Operation Period Insurance Risk		Ministry of Health
Waste Management Risk		Company
Construction Period Technology Risk		Company
Commercial Space Income Risk		Company
Ground Investigation Risk		Ministry of Health
Security Risk		Company
Construction Period Insurance Risk		Ministry of Health
Construction Period Skilled Worker Risk		Company
Environmental Risk		Company

The results show that the MoH transfers twenty-one risks to the company while retaining seven risks, a pattern similar to that observed in traditional procurement methods. Within the PPP scheme, eight risks are shared between the MoH and the company.

4.5 Recommendations for Risk Mitigation in PPP-based IHC Projects

One of the stakeholders in the PPP model – the public sector – is entrusted with providing uninterrupted and comprehensive healthcare services to citizens, which constitutes a fundamental duty of the state. Unlike other stakeholders, the public sector is bound by public budgeting and financial regulations, as well as legislative

frameworks governing healthcare delivery and the PPP model. Furthermore, whereas the private sector and financiers aim to maximize profit, the objective of the public sector is to maximize social welfare. As a result, the public sector's use of risk management tools is subject to a wide range of legal and structural constraints that are not encountered by private entities. Therefore, under the PPP model, the public sector seeks to minimize the impacts of the risks it bears by transferring many of them – particularly those related to financing, design, and construction – to the private sector through contractual risk-sharing and transfer mechanisms.

From a risk management perspective, the private sector's practice of defining its risk tolerances and incorporating specific tolerance indicators into contract terms may be considered an indication that it conducts a more effective risk management process compared to the public sector. Therefore, it is recommended that the public sector also determine its risk tolerances with a view to maximizing both financial returns and social benefits, and revise contract provisions accordingly based on these established tolerances. Risk prevention or mitigation strategies concerning all risk factors defined for the investment phase are embedded within contracts in order to impose various obligations and sanctions on the parties.

In accordance with the conclusions drawn from the literature review, the following section provides risk management recommendations for the four risk factors classified as high-risk in integrated health campus projects implemented through the public-private partnership model by the Turkish Ministry of Health.

4.5.1 Operation Period Currency Risk

The currency (exchange rate) risk specific to the operation period constitutes a significant cost factor, particularly as availability payments are made in Turkish Lira. At the same time, financing is provided in a foreign currency, and some operational expenses are also incurred in foreign currency.

As this risk is considered one of the primary macroeconomic elements among the identified risk factors, it is classified under the systematic risk category within the framework of the risk assessment methodology. In this regard, the public sector's assumption of a substantial portion of the exchange rate risk is crucial for ensuring the project's financial sustainability, as part of the overall risk management and allocation approach.

In fact, suggestions on effectively managing this risk are identical to those made for construction period currency risk in Section 4.5.2. However, as the operation phase is a much more extended period – usually set at 25 years – it may be necessary to establish an additional joint monitoring mechanism to track macroeconomic indicators throughout this stage. Such a mechanism could facilitate timely dialogue and renegotiation if severe currency devaluations jeopardize project continuity.

4.5.2 Construction Period Currency Risk

In projects implemented under the PPP model, the construction phase represents a period during which the contractor assumes significant financial risks without receiving any income from the public sector. Since availability payments do not commence during this stage, all capital expenditures (CAPEX), financing costs, and construction-related expenses are borne solely by the contractor (company). Currency (exchange rate) risk becomes particularly prominent at this point due to the use of foreign currency-denominated loans, imported materials and equipment used in construction activities, and subcontracting services denominated or indexed to foreign exchange rates. Within the risk assessment methodology, this risk is considered a systematic factor that is exogenous to the project – one that cannot be controlled but whose effects can be managed.

The primary strategy available to the company for managing this risk is the use of financial derivatives for risk transfer, commonly referred to as hedging. Often imposed as a contractual obligation by project lenders, this approach involves the

use of instruments such as forwards, swaps, or options to mitigate the impact of future currency fluctuations and cost overruns during the construction period.

However, since currency risk is not transferred to the public sector during the construction period, it is crucial for the contractor to conduct detailed financial modeling prior to contract signing, based on realistic currency assumptions, and to incorporate risk premiums into cost estimates accurately. In this respect, construction period currency risk is a contractor-specific burden that must be treated as a high-priority issue due to its direct impact on the project's financial feasibility.

The following outlines possible strategies for managing currency risk during the construction period.

i. Currency Hedging Instruments

The project company may utilize derivative financial instruments, such as forward contracts, currency options, and swaps, to hedge against adverse currency fluctuations. This is particularly relevant in the Turkish economic context, where the Turkish Lira has generally exhibited a depreciation trend against foreign currencies. These instruments help stabilize exchange rates and minimize the financial impact of unexpected fluctuations.

ii. Contractual Currency Adjustment Mechanisms

Project agreements may include currency adjustment clauses that permit modifications in payment terms if exchange rate fluctuations exceed a predefined threshold during the construction phase. This mechanism ensures a more balanced distribution of currency risk between the public and private parties. In fact, such a mechanism has already been incorporated into the typical project agreements executed for IHC projects in Turkey. The mechanism is detailed in the section '6) Construction and Operation Period Currency Risk' under the allocation and sharing discussions in Appendix C.

iii. Localization of Inputs

Sourcing a greater share of construction materials and equipment domestically can reduce the project's dependence on foreign currencies, thus structurally mitigating exposure to exchange rate risk.

iv. Foreign Currency Financing

When construction costs are denominated in a foreign currency, securing financing in the same currency (*e.g.*, through eurobonds or external loans) can create a natural hedge and help align liabilities with project costs, even if it does not eliminate the risk.

v. Pre-construction Fixed-Rate Procurement

The company may secure critical imported inputs through early procurement at fixed exchange rates prior to financial close. This approach effectively eliminates short-term currency exposure for those specific cost items.

vi. Public Sector Risk Sharing

Within the framework of risk allocation, mechanisms may be designed whereby the MoH absorbs part of the currency losses if fluctuations exceed a predefined threshold. Such arrangements promote a more equitable distribution of financial burdens.

4.5.3 Financing Risk

Financing risk is a critical macro-level risk that arises when a project fails to secure the financial resources required to carry out its planned activities and ensure sustainability in a timely, sufficient, and cost-effective manner. This risk is particularly significant in capital-intensive, long-term infrastructure projects and investments implemented under the DBFOM model.

Financing risk is evaluated in terms of factors such as the inability to secure capital, restricted access to credit, fluctuations in interest rates, and the need for refinancing

at elevated costs. Such projects are generally financed with a fixed margin over EURIBOR. The fixed margin may vary, reflecting the risk premiums of the country, the project, and the contractor. To mitigate cost volatility arising from variable interest rates, EURIBOR fluctuations are typically managed through derivative instruments, most commonly interest rate swaps.

If financing risk materializes, it may weaken the project's financial structure, lead to budget deviations, and delay financial close. In PPP projects, financing risk is typically borne by the private sector contractor. However, uncertainties in financial markets or systemic crises may also create indirect impacts on the public sector. Therefore, public authorities may implement supportive mechanisms involving partial risk-sharing arrangements. These mechanisms may include:

i. Government Guarantees and Credit Enhancements

The provision of sovereign guarantees, minimum revenue guarantees, or other credit enhancement instruments by the public authority significantly improves the project's creditworthiness and enhances its attractiveness to private financing. In fact, several guarantees have already been provided by the government for PPP-based healthcare infrastructure investments in Turkey. One such mechanism was introduced in 2020 under the 'Floor-Ceiling Availability Payment Mechanism,' pursuant to Presidential Decree No. 2049. In this mechanism, a minimum payment threshold is set based on the exchange rate used for debt financing in the relevant project, thereby enhancing predictability for the contractor during the lengthy operational period. Another government guarantee concerns volume-based services, under which the Company receives a minimum service payment (SP) from the MoH based on predefined occupancy percentages specified in the PA. In addition, Treasury debt assumption – also implemented in other PPP models – has been adopted for the city hospital model. Under this mechanism, the Treasury assumes responsibility for the loans obtained by the private-sector entity constructing the facility, excluding its equity contribution. Pursuant to Article 8/A of Law No. 4749 on the Regulation of Public

Finance and Debt Management (March 28, 2002), if implementation contracts relating to certain investments or services undertaken by general or special budget administrations are terminated before maturity and the facility is taken over by the relevant administration, the Ministry of Treasury and Finance of the Republic of Turkey may assume the financial obligations arising from external financing, including those stemming from derivative instruments used to secure such financing.

ii. Viability Gap Funding

A partial capital grant provided by the government helps bridge the funding gap. This mechanism reduces the overall debt requirement and improves project bankability. This option is already available to companies in PPP-based IHC projects through bridge loans, which they are permitted to use in the early stages of the projects until formal loan agreements are concluded with lenders shortly before financial close.

iii. Early Financial Structuring

Conducting detailed financial modelling and engaging with potential lenders and investors at early stages of project development enhances transparency and feasibility.

iv. Diversification of Funding Sources and Financial Insurance

Reducing reliance on a single funding channel by combining different financial instruments – such as commercial loans, multilateral development bank financing, export credit agency support, and capital markets (*e.g.*, project bonds) – increases resilience to market fluctuations and funding delays. Obtaining guarantees or insurance coverage against political and regulatory risks (*e.g.*, expropriation, breach of contract, currency inconvertibility) from institutions such as the Multilateral Investment Guarantee Agency (MIGA) or national export credit agencies may enhance investor confidence and unlock long-term financing. It is known that MIGA

has shown interest in MoH-led IHC projects in Turkey. Bidders for future tenders of PPP IHC projects may consider engaging with institutions such as MIGA.

v. Transparent Procurement and Risk Allocation Frameworks

A well-defined legal, regulatory, and institutional environment with clear risk allocation principles increases predictability for investors and reduces perceived financing risk. In addition, the MoH should conduct transparent tender processes.

vi. Selecting Companies with Strong Financial Capabilities:

In managing financing risk, partnering with contractors that have a solid financial structure is crucial. This not only ensures compliance with minimum equity requirements but also strengthens the contractor's bargaining power in international financial markets. Consequently, legislation and tender documents should impose strict qualification requirements, with detailed criteria concerning financial capacity.

4.5.4 Variation Order Risk

The risk associated with variation orders denotes potential deviations in project costs and timelines resulting from modifications or additional works requested by the public authority during the construction phase. In large-scale infrastructure projects, such requests may arise due to design revisions, capacity expansions, updates to technical standards, or regulatory requirements. From the contractor's perspective, these variations may lead to cost escalations and disruptions in the construction schedule. Variation orders are among the most common sources of cost overruns in PPP projects, underscoring the need for well-structured contractual mechanisms to mitigate such risks effectively. The following instruments are recommended for managing this risk:

i. A Comprehensive and Well-Defined Project Scope

Clearly articulating the project's technical requirements, performance standards, and design parameters at the tendering stage reduces ambiguities and minimizes the likelihood of future changes. Detailed feasibility studies and preliminary designs are essential in this context.

ii. Standardized Design and Technical Specifications

Adopting standardized, pre-approved technical guidelines and specifications can reduce inconsistencies between the public authority's expectations and the contractor's deliverables, thereby reducing the frequency of change orders.

iii. Robust Change Management Procedures

The inclusion of a formal change management process in the contract, including specific steps for initiating, evaluating, approving, and implementing variation orders, ensures that changes are systematically assessed with respect to their cost, time, and risk implications.

iv. Risk Allocation Clauses for Scope Changes

Contracts should clearly define which party bears the financial and operational consequences of changes initiated by either party. Mechanisms such as variation thresholds, equitable adjustment provisions, and compensation event clauses ensure fair risk distribution.

v. Effective Stakeholder Communication and Coordination

Regular communication and coordination among stakeholders – including MoH, the SPV, and lenders – help prevent misinterpretations and facilitate the timely resolution of technical issues before they evolve into significant changes. The MoH holds coordination meetings with the participation of the aforementioned parties; however, the effectiveness of these meetings should be monitored.

vi. Capacity Building of Public Sector Institutions

Strengthening the technical and managerial capacities of the MoH enhances its ability to define, monitor, and control project scope, thereby reducing reactive changes during the project lifecycle. Coordination between the ministry, its consultant agency, and the company should be improved, particularly during both the design and construction periods.

vii. Thresholds for the Variation Orders

It is a well-known fact that continuous demands from the MoH, even during the construction period, pose significant challenges for the company and its subcontractors. To address these recurrent demands, a threshold-based risk-sharing mechanism may be introduced, whereby the public authority assumes full financial responsibility if cumulative variation orders exceed a specified limit. Within this framework, the contractor's obligations to accommodate design-related adjustments and the financial liabilities associated with variation orders must be explicitly articulated in the contract to ensure clarity and enforceability.

CHAPTER 6

CONCLUSION

Although various types of public-private partnership (PPP) models are employed globally to implement infrastructure projects, Turkey has adopted the design-build-finance-operate-maintain (DBFOM) model – the most comprehensive and complex form among PPP models – to realize integrated health campus projects in the healthcare sector. First implemented by the Ministry of Health (MoH) in Turkey, the DBFOM model has led to the development of 18 city hospitals over the past fifteen years, adding approximately 10 million square meters of enclosed area and around 27,000 hospital beds to the national healthcare infrastructure.

The public sector's inclination towards the PPP model can be explained by the advantages it offers. In addition to facilitating access to finance for large-scale projects, the model enables the use of private sector expertise during both the construction and operation phases. The profit-driven nature of the private sector encourages timely project completion within planned budgets. Furthermore, it facilitates rapid access to technological advancements and allows public institutions to transfer many of the risks typically borne under conventional procurement methods to the private sector. Although risk transfer may appear appealing to governments, the opportunities presented by the model may be lost if a technically sound and comprehensive risk assessment methodology is not in place.

Since the early 2000s, the increasing adoption of the DBFOM model by governments has led to a growing body of literature focused on identifying the risk factors inherent in such partnerships, analyzing their likelihood and impact, determining appropriate risk pricing, and identifying suitable risk management tools. In line with this trend, the present study undertakes the risk identification phase, the core of the research, based on a comprehensive review of the literature. It then sequentially implements

the subsequent stages of an effective risk assessment process, namely risk quantification, risk allocation, and risk management.

Through the literature review conducted in this study, and by considering both academic contributions and the practical insights of industry professionals, a total of thirty-six risk factors highly relevant to integrated health campus projects delivered through the PPP model have been identified and presented in the form of a risk register. These risk factors were initially used in a structured questionnaire survey administered to a group of sixty technical experts who had participated in large-scale infrastructure projects, primarily in IHC projects in Turkey. Using a Likert scale, the likelihood of occurrence and magnitude of impact of the identified risks were quantified, revealing the overall risk scores.

Subsequently, the thirty-six risk factors were evaluated individually through the lens of a typical project agreement and its annexes used by the Turkish MoH in IHC projects, as well as the relevant PPP legislation in Turkey. Based on this evaluation, the party responsible for bearing the adverse consequences of each risk factor has been identified – whether such consequences are assumed by the MoH, by the Company, or jointly shared by both stakeholders.

The findings derived from this study's analyses indicate that the top ten risk factors with the highest risk scores are as follows: (i) operation period currency risk, (ii) construction period currency risk, (iii) financing risk, (iv) variation order risk, (v) construction period cost overrun risk, (vi) resource price risk, (vii) construction period legal risk, (viii) operation period cost overrun risk, (ix) construction period timeout risk, and (x) design change risk. The prominence of these risk factors aligns directly with the technical foundations of project management, construction management, and project finance as academic disciplines. Within the theoretical frameworks of project and construction management, time, cost, and scope control are considered key criteria for project success. Risks such as construction period cost overruns, construction period timeouts, variation orders, design changes, and resource price risks fall into the category of project-specific, unsystematic risks, as

they are inherent to the construction industry, to some extent foreseeable, and manageable at the project level. In particular, variation order risk necessitates direct intervention in both schedule and budget due to changes in the work program and the consequent need for rescheduling. Similarly, since fluctuations in resource prices constitute a predictable area of volatility in the construction sector, they can be mitigated through appropriate management strategies, as outlined in the section on risk mitigation recommendations of this study.

On the other hand, operation period currency risk, construction period currency risk, financing risk, and legal risks associated with both phases are categorized as systematic risks due to their external causes, high uncertainty levels, and frequent changes beyond the control of the project company. In particular, currency (exchange rate) risk poses a significant threat in projects where revenues are generated in local currency. At the same time, debt obligations are denominated in foreign currency, leading to potential distortions in cash flows. This directly affects the internal rate of return (IRR), lowering the investment's profitability and weakening the project's bankability. In parallel, key indicators such as the debt service coverage ratio (DSCR), which measures debt repayment capacity, are susceptible to such macroeconomic risks. When the DSCR drops below 1.0, the project's debt service capacity deteriorates, prompting lenders to demand refinancing or additional guarantees. Similarly, legal risks arising from changes in regulatory frameworks can alter contractual terms, affecting payment mechanisms, liability structures, and the overall project model. Such changes may necessitate the restructuring of the financial model and the revision of the risk allocation framework. In PPP projects, such uncertainties are of critical importance for project bankability.

In conclusion, the top ten risk factors with the highest overall risk scores identified in this study represent a balanced set of risks that encompass both project-specific, unsystematic risks and systematic risks. These findings highlight the operational control areas in project management, the technical challenges in construction management, and the financial equilibrium points that underpin the fundamentals of project finance. That survey respondents assessed these risks as the most critical

elements not only reflects empirical observation but also indicates a rational risk perception grounded in theoretical principles. In this respect, the findings provide a fundamental reference framework for developing risk management strategies and allocating responsibilities among project stakeholders in PPP-based integrated health campus projects carried out by the Ministry of Health of the Republic of Turkey.

Building upon the findings and limitations of this study, several directions for future research and policy development are proposed. First and foremost, the development and application of a comprehensive risk valuation methodology, supported by transparent and accessible financial data, remain essential areas for further exploration. As this study highlights, the lack of access to confidential financial records related to availability payments and service fees hinders the comprehensive implementation of risk pricing models. In future research, establishing data-sharing protocols between public institutions and academic researchers may help overcome this challenge, thereby enabling a more accurate quantification of risk-related financial exposure for each stakeholder.

Additionally, future research could focus on developing dynamic risk management models that are responsive to evolving macroeconomic conditions, regulatory changes, and variations across the project lifecycle. This could involve integrating scenario analysis, Monte Carlo simulations, and Real Options Theory to enhance the adaptability of PPP risk frameworks in highly volatile environments such as Turkey. Another important area of focus is investigating the institutional and behavioral dimensions of risk perception among PPP stakeholders. Comparative studies across countries or sectors could evaluate how risk perception and allocation practices vary according to legal frameworks, political stability, or cultural norms. Such insights could inform the standardization and localization of risk management tools, contributing to more context-specific PPP policies.

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APPENDICES

A. List of Annexes of a Typical Project Agreement

Table A.1 List of annexes of a typical project agreement

Number and Name of the Annex
Annex 1: Definitions
Annex 2: Completion Documents
Annex 3: Project Document Regime
Annex 4: Key Technical Personnel
Annex 5: Works Supervisor
Annex 6: Direct Agreement with Financiers
Annex 7: Land Issues
Annex 8: Construction Issues
Annex 9: Schedule
Annex 10: Inspection Procedure
Annex 11: Side Agreement with Service Providers
Annex 12: Acceptance Schedule
Annex 13: Equipment
Annex 14: Service Requirements
Annex 15: Administration Representative
Annex 16: Company Representative
Annex 17: Market Test Procedure
Annex 18: Payment Mechanism
Annex 19: Financial Model
Annex 20: Operation Period Management Plan
Annex 21: Insurance
Annex 22: Variation Procedure
Annex 23: Termination Compensation

Table A.1 (continued)

Number and Name of the Annex
Annex 24: Handover Procedure
Annex 25: Right of Superficies
Annex 26: Dispute Resolution Procedure
Annex 27: Financial Statements
Annex 28: Activity Reports
Annex 29: Refinancing

B. The Legislation in Force Governing the IHC Projects Realized by the PPP Model in Turkey

i. 2005 – '*3359 Sayılı Sağlık Hizmetleri Temel Kanunu'* (Fundamental Law on Health Services No. 3359): The implementation of health facilities through the public-private partnership model is initiated by the addition of Article 7 to the supplementary provisions of the Fundamental Law on Health Services No. 3359.

ii. 2006 – Implementation regulation of the 7th additional Clause to the Law No. 3359 titled '*Sağlık Tesislerinin, Kiralama Karşılığı Yaptırılması ile Tesislerdeki Tıbbi Hizmet Alanları Dışındaki Hizmet ve Alanların İşletilmesi Karşılığında Yenilenmesine Dair Yönetmelik'* (Regulation on the Construction of Health Facilities through Leasing and the Renovation of Such Facilities in Return for the Operation of Non-Clinical Service Areas and Services).

iii. 2013 – *'6428 Sayılı Sağlık Bakanlığınca Kamu Özel İş Birliği Modeli ile Tesis Yaptırılması, Yenilenmesi ve Hizmet Alınmasına ile Bazı Kanun ve Kanun Hükmünde Kararnamelerde Değişiklik Yapılması Hakkında Kanun'* (Law No. 6428 on the Construction, Renovation and Procurement of Services Through the Public-Private Partnership Model by the Ministry of Health and on the Amendment of Certain Laws and Legislative Decrees).

iv. 2014 – '*Sağlık Bakanlığınca Kamu Özel İş Birliği Modeli ile Tesis Yaptırılması, Yenilenmesi ve Hizmet Alınmasına Dair Uygulama Yönetmeliği'* (Implementation Regulation for Law No. 6428).

v. 2016 – The provisions concerning the supervision of works are revised through an amendment to Law No. 6428, enabling the MoH to appoint a consultant to inspect and manage the works on site.

vi. 2020 – In accordance with the Presidential Decree No. 2049, the 'Floor-Ceiling Availability Payment Mechanism' is put into effect.

C. Questionnaire Survey (in English)

Expert Opinion Compilation Research

This survey study has been prepared for use in the graduate thesis titled 'Risk Assessment of the Integrated Health Campus Projects Carried out with the Public-Private Partnership (PPP) Model in Turkey' for the Building Science Program in the Department of Architecture, METU.

The risk factors that integrated health campus projects, carried out with the public-private partnership model, are exposed to during the investment and operation periods are collected under four main headings as follows: (i) planning and procurement risks, (ii) design and construction risks, (iii) operation and maintenance risks, and (iv) post-transfer asset and termination risks. Under each heading, the scope of the relevant general risk category and the definitions of the risk factors are included. The measurement tools and risk types used in the risk assessment process are coded, and detailed explanations corresponding to each code are provided. For use in analyses, the expected probability of occurrence and the predicted impact level for each risk factor, whose definitions are given, should be marked in the boxes following the relevant risk. Sharing your expert opinions will make a very valuable contribution to the study.

We guarantee that your personal information and the information you provide cannot be used for any other purpose or given to third parties.

Thank you for your valuable time and important contributions.

PART 1

Personal Information

1. Sector of Work

……..

2. Occupation

……...

3. Title

……

4. Do you have professional experience in Public-Private Partnership projects? If so, please specify.

…….

5. Do you have professional experience in large-scale infrastructure projects? If so, please specify.

……..

PART 2

Determining the Probability and Impact of Risk Factors

1. Planning and Procurement Risks

Scope

• Approval required from the government at the beginning of the project.

• Extension of license and permit periods.

• Encountering price offers above the budget anticipated for the project.

• Lack of a sufficient number of contractors in the tender who meet the necessary criteria for participation in the project.

• Lack of financial resources.

• Deficiencies and delays in supplies and supply processes.

Definitions of Risk Factors

1) **Licenses and Permits Risk:** Licenses and Permits Risk is defined as financial losses due to failure to obtain construction-related licenses and permits from municipalities and public institutions before the start of the investment period as of the completion of the tender process and the risk factors that will cause difficulties in obtaining the licenses and permits that need to be obtained for the provision of services during the operation period.

2) **Financing Risk:** Financing Risk is defined as the risk factor related to factors affecting the provision of funds for the project's implementation and its associated costs, such as insufficient demand from financiers.

3) **Market Demand Risk:** Market Demand Risk refers to the risk that consumers or stakeholders for the project will not create demand at a sufficient level or within the expected price range during the tender process or in the provision of services.

Risk Factor		Probability					Impact				
		1	2	3	4	5	1	2	3	4	5
Licenses and Permits Risk	1										
Financing Risk	2										
Market Demand Risk	3										

1: Very Low	2: Low	3: Medium	4: High	5: Very High

2. Design and Construction Risks

Scope

• Hospital design does not comply with standards.

• Very complex or costly applications that may cause problems in implementation.

• Hospital design that cannot meet service standards.

• Design that will shorten or affect the lifespan of the hospital.

• Lack of qualified personnel and/or subcontractors during the construction period.

• Failure to make progress in accordance with the work schedule during the construction period.

• Failure to maintain the construction process in accordance with the prescribed quality standards.

• Lack of coordination during the transition to implementation of the project.

• Geographical and geotechnical obstacles that may occur during the construction period.

• Experiencing financial and legal problems.

• Changes that may be required/desired in the physical structure of the hospital during the operation period.

• Changes in project scale and scope.

Definition of Risk Factors

1) **Construction Period Legal Risk:** The Legal Risk that may be exposed during the construction period is defined as the emergence of unexpected results due to changes in current legislation related to the project and subsequent legislative changes.

2) **Environmental Risk:** Environmental Risk refers to the possibility that the relevant party may be held responsible for environmental damages and occupational safety issues that may occur during the investment and operation periods of the project.

3) **Construction Period Currency Risk:** Construction Period Currency (Exchange Rate) Risk is defined as the risk factor that will affect the costs in case of depreciation of local currency against foreign currency or changes in the interest rates related to the financing of the project.

4) **Variation Order Risk:** The Variation Order Risk indicates the financial impacts of the business increases that may occur above the specified proportion of the fixed investment amount or the service fee amount, upon the request of one of the parties during the investment period.

5) **Construction Period Skilled Worker Risk:** The Risk of Finding Qualified Workers / Personnel during the construction period is defined as the risk of not finding the qualified worker / personnel required for the implementation of the project.

6) **Construction Period Subcontractor Risk:** Subcontractor Risk is defined as the risk factor related to the default or bankruptcy of the subcontractor companies working as the company's subcontractor during the investment period.

7) **Ground Investigation Risk:** Ground Investigation Risk is defined as not being able to do the necessary scientific ground investigations to minimize the effects from earthquakes or natural disasters, the emergence of unexpected ground conditions, or the incurring of costs higher than expected.

8) **Construction Period Timeout Risk:** Construction Period Timeout Risk is considered a risk factor for the inability of services to start on the foreseen date

due to delays in the design, tender, construction, and commissioning stages of the facilities within the scope of the project.

9) **Construction Period Technology Risk:** Technology Risk is defined as the risk that the technical inputs to be used by the contractor and service providers are not kept up to date with technological innovations.

10) **Construction Period Cost Overrun Risk:** Construction Period Cost Overrun Risk is a risk factor that arises from the possibility that the project's cost during the design and construction period will exceed the planned cost.

11) **Construction Period Insurance Risk:** Insurance Risk for the construction period covers the risk factors related to the occurrence of damages that may occur outside the scope of insurance policies to be made during the construction period, and the cost increases related to them.

12) **Design Change Risk:** Design Change Risk is defined as the risk factor encompassing the changes to the design project of the facility that may be required or desired in the physical structure of the facility during the investment and operation periods.

Risk Factor		Probability					Impact				
		1	2	3	4	5	1	2	3	4	5
Construction Period Legal Risk	1										
Environmental Risk	2										
Construction Period Currency Risk	3										
Variation Order Risk	4										
Construction Period Skilled Worker Risk	5										
Construction Period Subcontractor Risk	6										

Table (continued)

Risk Factor		Probability					Impact				
		1	2	3	4	5	1	2	3	4	5
Ground Investigation Risk	7										
Construction Period Timeout Risk	8										
Construction Period Technology Risk	9										
Construction Period Cost Overrun Risk	10										
Construction Period Insurance Risk	11										
Design Change Risk	12										

1: Very Low	2: Low	3: Medium	4: High	5: Very High

3. Operation, Maintenance and Repair Risks

Scope

• Lack of qualified personnel and materials to be assigned during the operation period.

• Possible cost overruns.

• Technology changes that may affect the operation process and maintenance/repair processes.

• Problems related to commercial spaces and their revenue stream.

• Problems related to allied health services and support services.

Definition of Risk Factors

1) **Operation Period Insurance Risk:** Insurance Risk for the operation period covers the risk factors related to the occurrence of damages that may arise outside the scope of insurance policies to be made during the operation periods and the cost increases related to them.

2) **Operational Risk:** Operational Risk is defined as the risk factor that may be encountered during the operation of health facilities, preventing the hospital from operating in a manner that provides sustainable and uninterrupted health services in accordance with the terms of the project contract.

3) **Operation Period Qualified Personnel Risk:** The Risk of Finding Qualified Workers / Personnel during the operation period is defined as the risk of not finding the qualified workers / personnel required for the maintenance works of the project.

4) **Contamination and Infection Risk:** Contamination and Infection Risk is defined as the risk of not being able to protect patients and employees from contamination and infection elements that may occur in the field and in the hospital.

5) **Waste Management Risk:** Waste Management Risk encompasses factors such as waste causing the spread of infection, improper control, and inability to comply with the delivery chain.

6) **Maintenance and Repair Risk:** Maintenance and Repair Risk is defined as the risk factor that results in unexpectedly higher costs arising from the maintenance and repair activities of facilities.

7) **Renewal Risk:** Renewal Risk refers to the risks associated with delays or malfunctions that may occur during the asset renewal process within the project.

8) **Performance Risk:** Performance Risk is defined as the risk that the operator will be unable to achieve the expected performance level in the services to be provided.

9) **Operation Period Technology Risk:** Technology Risk is defined as the risk that the technical inputs to be used by the contractor and service providers are not kept up to date with technological innovations.

10) **Commercial Space Income Risk:** The commercial space revenue risk refers to the potential risk to revenues arising from the right to operate commercial areas, if requested by the private sector during the tender process and approved by the administration.

11) **Energy Efficiency Risk:** Energy Efficiency Risk is defined as the risk of not providing uninterrupted energy required by the facility, as well as the conditions regarding energy use and efficiency stipulated in the contract and relevant legislation.

12) **Security Risk:** Security Risk is defined as the risk that the facility will not be adequately protected against all forms of terrorism, theft, or events that endanger the safety of patients and employees.

13) **Operation Period Cost Overrun Risk:** Operation Period Cost Overrun Risk is defined as the risk that the actual cost incurred during the project's operation period exceeds the planned cost.

14) **Operation Period Legal Risk:** Legal Risk regarding the operation period is defined as the risk of a change in the legal legislation that will affect the operation period of the project, such as the change in tax policies, different from the investment period.

15) **Operation Period Currency Risk:** Operation Period Currency (Exchange Rate) Risk is defined as the risk factor that will be reflected in the costs of the parties for payments made in case the local currency depreciates against the foreign currency or changes in interest rates occur as the project starts to operate.

16) **Raw Material Supply and Price Risk:** Raw Material Supply and Price (Resource Price) Risk is defined as a risk factor covering excessive increases that may occur for expenses above a certain amount of raw materials used in production, electricity, water, and natural gas prices, and operating costs during the operation period.

17) **Operation Period Subcontractor Risk:** Subcontractor risk refers to the risk arising from the default or bankruptcy of subcontractor companies during the operation period.

Risk Factor		Probability					Impact				
		1	2	3	4	5	1	2	3	4	5
Operation Period Insurance Risk	1										
Operational Risk	2										
Operation Period Qualified Personnel Risk	3										
Contamination and Infection Risk	4										
Waste Management Risk	5										
Maintenance and Repair Risk	6										
Renewal Risk	7										
Performance Risk	8										
Operation Period Technology Risk	9										
Commercial Space Income Risk	10										
Energy Efficiency Risk	11										
Security Risk	12										
Operation Period Cost Overrun Risk	13										

Table (continued)

Risk Factor		Probability					Impact				
		1	2	3	4	5	1	2	3	4	5
Operation Period Legal Risk	14										
Operation Period Currency Risk	15										
Raw Material Supply and Price Risk	16										
Operation Period Subcontractor Risk	17										

1: Very Low	2: Low	3: Medium	4: High	5: Very High

4. Post-Transfer Asset and Termination Risks

Scope

- Delays in investment spending that could lead to a decrease in asset value.
- Lack of coordination in improvement activities to prevent disruptions in the operation process.
- Access to materials such as spare parts that may be needed during the operation period.
- Risks arising from the termination of the contract.

Definition of Risk Factors

1) **Scrap Value Risk:** Scrap Value Risk is defined as the risk factor that is used in the delivery of the facility to the investor or owner upon the expiration of the contract or due to the termination process, and that causes the facility not to be delivered clean and free from any debt.

2) **Transfer Period Expiry Risk:** Transfer Period Expiry Risk covers the factors that may lead to delays in the return of the facility to the investor or owner.

3) ***Force Majeure* Risk:** *Force Majeure* Risk is defined as a catastrophic risk factor that occurs outside the reasonable control of the parties, is unreasonably impossible to avoid and overcome, and makes it impossible for the parties to fulfill their obligations.

4) **Termination Risk:** Termination Risk is considered a cost element that arises when either party fails to fulfill its obligations in the contract or the contract enters the termination process through mutual agreement.

Risk Factor		Probability					Impact				
		1	2	3	4	5	1	2	3	4	5
Scrap Value Risk	1										
Transfer Period Expiry Risk	2										
Force Majeure Risk	3										
Termination Risk	4										

1: Very Low	2: Low	3: Medium	4: High	5: Very High

D. Questionnaire Survey (in Turkish)

Uzman Görüşü Derleme Çalışması

Bu anket çalışması, Orta Doğu Teknik Üniversitesi Mimarlık Bölümü Yapı Bilimleri Programı kapsamında yürütülen "Türkiye'de Kamu Özel İş Birliği (PPP) Modeli ile Yürütülen Entegre Sağlık Kampüsü Projelerinde Risk Değerlendirmesi" başlıklı yüksek lisans tezi için hazırlanmıştır.

Kamu-özel iş birliği modeliyle yürütülen entegre sağlık kampüsü projelerinin yatırım ve işletme dönemlerinde maruz kaldığı risk faktörleri, dört ana başlık altında toplanmıştır: (i) planlama ve tedarik riskleri, (ii) tasarım ve inşaat riskleri, (iii) işletme ve bakım-onarım riskleri, ve (iv) devir sonrası varlık ve sözleşme feshi riskleri. Her bir başlık altında ilgili genel risk kategorisinin kapsamı ile altındaki risk faktörlerinin tanımları yer almaktadır. Risk değerlendirme sürecinde kullanılan ölçüm araçları ve risk türleri kodlanmış olup, her bir koda karşılık gelen açıklamalar ayrıntılı şekilde verilmiştir. Analizlerde kullanılmak üzere, tanımı verilen her bir risk faktörünün beklenen gerçekleşme olasılığı ve öngörülen etkisinin, ilgili riskin karşısındaki kutucuklardan işaretlenerek belirtilmesi beklenmektedir. Uzman görüşlerinizi paylaşmanız, çalışmaya çok değerli katkılar sağlayacaktır.

Kişisel verileriniz ve vereceğiniz bilgiler hiçbir suretle başka bir amaç için kullanılmayacak ve üçüncü şahıslarla paylaşılmayacaktır.

Kıymetli vaktiniz ve değerli katkılarınız için teşekkür ederiz.

BÖLÜM 1

Kişisel Bilgiler

1. Çalıştığınız Sektör

……..

2. Mesleğiniz

……...

3. Unvanınız

……

4. Kamu-Özel İşbirliği projelerinde mesleki deneyiminiz bulunuyor mu? Varsa lütfen belirtiniz.

…….

5. Büyük ölçekli altyapı projelerinde mesleki deneyiminiz bulunuyor mu? Varsa lütfen belirtiniz.

…….

BÖLÜM 2

Risk Faktörlerinin Olasılık ve Etkilerinin Belirlenmesi

1. Planlama ve Tedarik Riskleri

Kapsam

• Projenin başlangıcında hükümetten onay alınması gerekliliği.

• Lisans ve izin sürelerinin uzaması.

• Proje için öngörülen bütçenin üzerinde fiyat teklifleriyle karşılaşılması.

• İhalede, projeye katılım için gerekli kriterleri karşılayan yeterli sayıda isteklinin bulunmaması.

• Finansal kaynakların yetersizliği.

• Tedarik süreçlerinde ve malzeme temininde yaşanan eksiklikler ve gecikmeler.

Risk Faktörlerinin Tanımları

1) **Lisans ve İzinler Riski:** Lisans ve İzinler Riski; ihale sürecinin tamamlanmasını takiben yatırım dönemi başlamadan önce belediyeler ve kamu kuruluşlarından inşaatla ilgili gerekli lisans ve izinlerin alınamaması ve işletme dönemi boyunca hizmetlerin sunulması için alınması gereken lisans ve izinlerin temininde güçlük yaratacak risk faktörleri nedeniyle oluşabilecek finansal kayıplar olarak tanımlanmaktadır.

2) **Finansman Riski:** Finansman Riski, finansörlerden gelen talebin yetersiz olması gibi projenin hayata geçirilmesi için gerekli fonların sağlanmasını ve bunların maliyetlerini etkileyen faktörlere ilişkin risk unsuru olarak tanımlanmaktadır.

3) **Piyasa Talebi Riski:** Piyasa Talebi Riski, ihale sürecinde veya hizmetlerin sunumu sırasında tüketicilerin ya da proje paydaşlarının yeterli düzeyde veya beklenen fiyat teklifleri aralığında talep oluşturmaması riskini ifade etmektedir.

Risk Faktörü		Olasılık					Etki				
		1	2	3	4	5	1	2	3	4	5
Lisans ve İzinler Riski	1										
Finansman Riski	2										
Piyasa Talebi Riski	3										

1: Çok Düşük	2: Düşük	3: Orta	4: Yüksek	5: Çok Yüksek

2. Tasarım ve İnşaat Riskleri

Kapsam

- Hastane tasarımının standartlara uygun olmaması.
- Uygulama sırasında sorun yaratabilecek aşırı karmaşık veya maliyetli uygulamalar.
- Hizmet standartlarını karşılayamayan hastane tasarımı.
- Hastanenin kullanım ömrünü kısaltacak veya olumsuz etkileyecek tasarım.
- İnşaat döneminde nitelikli personel ve/veya alt yüklenici eksikliği.
- İnşaat döneminde iş programına uygun şekilde ilerleme sağlanamaması.
- İnşaat sürecinin belirlenen kalite standartlarına uygun olarak yürütülememesi.
- Projenin uygulamaya geçişinde koordinasyon eksikliği.
- İnşaat döneminde ortaya çıkabilecek coğrafi ve jeoteknik engeller.
- Finansal ve hukuki sorunlarla karşılaşılması.
- İşletme döneminde hastanenin fiziksel yapısında talep edilebilecek/değişiklik gerektirebilecek durumlar.
- Proje ölçeği ve kapsamındaki değişiklikler.

Risk Faktörlerinin Tanımları

1) **İnşaat Dönemi Hukuki Risk:** İnşaat dönemi boyunca maruz kalınabilecek Hukuki Risk, projeyle ilgili mevcut mevzuatın değişmesi ve yeni düzenlemelerin yürürlüğe girmesi sonucunda beklenmeyen sonuçların ortaya çıkması olarak tanımlanmaktadır.

2) **Çevresel Risk:** Çevresel Risk, projenin yatırım ve işletme dönemlerinde oluşabilecek çevre ve iş güvenliği ile ilgili zararlardan dolayı ilgili tarafın sorumlu tutulması riski olarak tanımlanmaktadır.

3) **İnşaat Dönemi Kur Riski:** İnşaat Dönemi Kur Riski, yerel para biriminin yabancı para birimi karşısında değer kaybetmesi veya proje finansmanıyla ilgili faiz oranlarının değişmesi durumunda maliyetleri etkileyecek risk faktörü olarak tanımlanmaktadır.

4) **İş Değişikliği Riski:** İş Değişikliği Riski, yatırım dönemi boyunca taraflardan birinin talebi üzerine sabit yatırım tutarının veya hizmet bedelinin belirlenmiş oranını aşan iş artışlarının yaratacağı finansal etkileri ifade etmektedir.

5) **İnşaat Dönemi Nitelikli İş Gücü Riski:** İnşaat dönemi boyunca projenin uygulanması için gerekli olan nitelikli işçi/personelin temin edilememesi riski, Nitelikli İş Gücü Riski olarak tanımlanmaktadır.

6) **İnşaat Dönemi Alt Yüklenici Riski:** Alt Yüklenici Riski, yatırım dönemi boyunca şirketin alt yüklenicisi olarak görev yapan şirketlerin temerrüde düşmesi veya iflas etmesine ilişkin risk faktörleri olarak tanımlanmaktadır.

7) **Zemin Etüdü Riski:** Zemin Etüdü Riski, depremler veya doğal afetlerden kaynaklanabilecek etkilerin en aza indirilmesi amacıyla gerekli bilimsel zemin araştırmalarının yapılamaması, beklenmeyen zemin koşullarının ortaya çıkması ya da bu araştırmaların öngörülenden daha maliyetli olması durumu olarak tanımlanmaktadır.

8) **İnşaat Dönemi Süre Aşımı Riski:** İnşaat Dönemi Süre Aşımı Riski, proje kapsamında yer alan tesislerin tasarım, ihale, inşaat ve devreye alma aşamalarındaki gecikmeler nedeniyle hizmetlerin öngörülen tarihte başlayamaması durumu için bir risk faktörü olarak değerlendirilmektedir.

9) **İnşaat Dönemi Teknoloji Riski:** Teknoloji Riski, yüklenici ve hizmet sağlayıcılar tarafından kullanılacak teknik girdilerin teknolojik yeniliklere uygun şekilde güncel tutulmaması riski olarak tanımlanmaktadır.

10) **İnşaat Dönemi Maliyet Aşımı Riski:** İnşaat Dönemi Maliyet Aşımı Riski, tasarım ve inşaat sürecinde projenin maliyetinin planlanan bütçeyi aşma ihtimali sonucunda ortaya çıkabilecek bir risk faktörüdür.

11) **İnşaat Dönemi Sigorta Riski:** İnşaat Dönemi Sigorta Riski, inşaat süresince yapılacak sigorta poliçelerinin kapsamı dışında meydana gelebilecek hasarların ve bunlara ilişkin maliyet artışlarının oluşturduğu risk faktörlerini kapsamaktadır.

12) **Tasarım Değişikliği Riski:** Tasarım Değişikliği Riski, yatırım ve işletme dönemlerinde tesisin fiziksel yapısında gerekebilecek veya talep edilebilecek değişiklikler nedeniyle tesisin tasarım projesinde yapılacak değişiklikleri kapsayan risk faktörü olarak tanımlanmaktadır.

Risk Faktörü		Olasılık					Etki				
		1	2	3	4	5	1	2	3	4	5
İnşaat Dönemi Hukuki Risk	1										
Çevresel Risk	2										
İnşaat Dönemi Kur Riski	3										
İş Değişikliği Riski	4										
İnşaat Dönemi Nitelikli İş Gücü Riski	5										
İnşaat Dönemi Alt Yüklenici Riski	6										
Zemin Etüdü Riski	7										
İnşaat Dönemi Süre Aşımı Riski	8										
İnşaat Dönemi Teknoloji Riski	9										
İnşaat Dönemi Maliyet Aşımı Riski	10										
İnşaat Dönemi Sigorta Riski	11										
Tasarım Değişikliği Riski	12										

1: Çok Düşük	2: Düşük	3: Orta	4: Yüksek	5: Çok Yüksek

3. İşletme ve Bakım/Onarım Riskleri

Kapsam

- İşletme döneminde görevlendirilecek nitelikli personel ve malzeme eksikliği.
- Olası maliyet aşımı durumları.

- İşletme sürecini ve bakım/onarım işlemlerini etkileyebilecek teknoloji değişiklikleri.
- Ticari alanlar ve bu alanlardan elde edilecek gelir akışıyla ilgili sorunlar.
- Yardımcı sağlık hizmetleri ve destek hizmetleriyle ilgili problemler.

Risk Faktörlerinin Tanımları

1) **İşletme Dönemi Sigorta Riski:** İşletme Dönemi Sigorta Riski, işletme süresince yapılacak sigorta poliçelerinin kapsamı dışında meydana gelebilecek hasarların ve bunlara ilişkin maliyet artışlarının oluşturduğu risk faktörlerini kapsamaktadır.

2) **İşletme Riski:** İşletme Riski, sağlık tesislerinin işletilmesi sürecinde hastanenin proje sözleşmesinin koşullarına uygun şekilde sürdürülebilir ve kesintisiz sağlık hizmeti sunmasını engelleyebilecek risk faktörleri olarak tanımlanmaktadır.

3) **İşletme Dönemi Nitelikli Personel Riski:** İşletme Dönemi Nitelikli Personel Riski, projenin bakım çalışmaları için gerekli olan nitelikli işçi/personelin temin edilememesi riski olarak tanımlanmaktadır.

4) **Kontaminasyon ve Enfeksiyon Riski:** Kontaminasyon ve Enfeksiyon Riski, sahada ve hastane içinde meydana gelebilecek bulaş/kirlilik ve enfeksiyon unsurlarından hastaların ve çalışanların korunamaması riski olarak tanımlanmaktadır.

5) **Atık Yönetimi Riski:** Atık Yönetimi Riski, atıkların enfeksiyon yayılmasına neden olması, yeterli şekilde kontrol edilememesi ve teslim zincirine uyum sağlanamaması gibi risk faktörlerini içermektedir.

6) **Bakım ve Onarım Riski:** Bakım ve Onarım Riski, tesislerin bakım ve onarım faaliyetlerinden kaynaklanan beklenmedik şekilde yüksek maliyetlerin ortaya çıkmasıyla oluşan risk faktörü olarak tanımlanmaktadır.

7) **Yenileme Riski:** Yenileme Riski, proje süresince varlıkların yenilenmesi sırasında meydana gelebilecek gecikmeler veya aksaklıklarla ilgili riskleri ifade etmektedir.

8) **Performans Riski:** Performans Riski, işletmecinin sunacağı hizmetlerde beklenen performans seviyesini sağlayamaması riski olarak tanımlanmaktadır.

9) **İşletme Dönemi Teknoloji Riski:** İşletme Dönemi Teknoloji Riski, yüklenici ve hizmet sağlayıcılar tarafından kullanılacak teknik girdilerin teknolojik yeniliklere uygun şekilde güncel tutulmaması riski olarak tanımlanmaktadır.

10) **Ticari Alan Geliri Riski:** Ticari Alan Geliri Riski, ihale sürecinde özel sektör tarafından talep edilmesi ve idare tarafından uygun bulunması halinde işletme hakkı verilen ticari alanlardan elde edilecek gelirlere karşılık ortaya çıkabilecek risk olarak tanımlanmaktadır.

11) **Enerji Verimliliği Riski:** Enerji Verimliliği Riski, tesisin ihtiyaç duyduğu kesintisiz enerjinin sağlanamaması ile sözleşmede ve ilgili mevzuatta öngörülen enerji kullanımı ve verimliliğine ilişkin koşulların yerine getirilememesi riski olarak tanımlanmaktadır.

12) **Güvenlik Riski:** Güvenlik Riski, tesisin her türlü terör, hırsızlık ya da hasta ve çalışanların güvenliğini tehlikeye atabilecek olaylara karşı korunamaması riski olarak tanımlanmaktadır.

13) **İşletme Dönemi Maliyet Aşımı Riski:** İşletme Dönemi Maliyet Aşımı Riski, projenin işletme döneminde gerçekleşen maliyetinin planlanan maliyeti aşması durumu olarak tanımlanmaktadır.

14) **İşletme Dönemi Hukuki Risk:** İşletme Dönemi Hukuki Risk, yatırım döneminden farklı olarak, vergi politikalarındaki değişiklik gibi projenin işletme sürecini etkileyecek yasal mevzuat değişiklikleri riski olarak tanımlanmaktadır.

15) **İşletme Dönemi Kur Riski:** İşletme Dönemi Kur Riski, projenin işletmeye alınmasıyla birlikte, yerel para biriminin yabancı para birimi karşısında değer kaybetmesi veya faiz oranlarında meydana gelebilecek değişiklikler durumunda, yapılacak ödemelerin tarafların maliyetlerine yansımasıyla oluşacak risk faktörü olarak tanımlanmaktadır

16) **Hammadde ve Kaynak Fiyatı Riski:** Hammadde ve Kaynak Fiyatı Riski, üretimde kullanılan belirli miktarın üzerindeki hammadde giderleri ile elektrik, su ve doğalgaz fiyatları ve işletme dönemi boyunca oluşabilecek işletme maliyetlerinde meydana gelebilecek aşırı artışları kapsayan bir risk faktörü olarak tanımlanmaktadır.

17) **İşletme Dönemi Alt Yüklenici Riski:** İşletme Dönemi Alt Yüklenici Riski, işletme dönemi boyunca ana yüklenicinin alt yüklenicisi olarak görev yapan şirketlerin temerrüde düşmesi veya iflas etmesine ilişkin risk faktörleri olarak tanımlanmaktadır

Risk Faktörü		Olasılık					Etki				
		1	2	3	4	5	1	2	3	4	5
İşletme Dönemi Sigorta Riski	1										
İşletme Riski	2										
İşletme Dönemi Nitelikli Personel Riski	3										
Kontaminasyon ve Enfeksiyon Riski	4										
Atık Yönetimi Riski	5										
Bakım ve Onarım Riski	6										
Yenileme Riski	7										
Performans Riski	8										
İşletme Dönemi Teknoloji Riski	9										
Ticari Alan Geliri Riski	10										
Enerji Verimliliği Riski	11										
Güvenlik Riski	12										
İşletme Dönemi Maliyet Aşımı Riski	13										

Tablo (devam)

Risk Faktörü		Olasılık					Etki				
		1	2	3	4	5	1	2	3	4	5
İşletme Dönemi Hukuki Risk	14										
İşletme Dönemi Kur Riski	15										
Hammadde ve Kaynak Fiyatı Riski	16										
İşletme Dönemi Alt Yüklenici Riski	17										

1: Çok Düşük	2: Düşük	3: Orta	4: Yüksek	5: Çok Yüksek

4. Devir Sonrası Varlık ve Sözleşme Feshi Riski

Kapsam

- Varlık değerinde azalmaya yol açabilecek yatırım harcamalarındaki gecikmeler.
- İşletme sürecinde aksaklıkları önlemek amacıyla yapılacak iyileştirme faaliyetlerinde koordinasyon eksikliği.
- İşletme döneminde ihtiyaç duyulabilecek yedek parça gibi malzemelere erişim.
- Sözleşmenin sona ermesinden kaynaklanabilecek riskler.

Risk Faktörlerinin Tanımları

1) **Hurda Değeri Riski:** Hurda Değeri Riski, sözleşmenin sona ermesi veya fesih süreci nedeniyle tesisin yatırımcıya ya da mülkiyet sahibine devri sırasında kullanılan ve tesisin borçlardan arındırılmış, temiz şekilde teslim edilememesi durumunu ifade eden risk faktörü olarak tanımlanmaktadır.

2) **Devir Dönemi Süre Aşımı Riski:** Devir Dönemi Süre Aşımı Riski, tesisin yatırımcıya veya mülkiyet sahibine iadesinde yaşanabilecek gecikmelere ilişkin risk faktörlerini kapsamaktadır.

3) **Mücbir Sebep Riski:** Mücbir Sebep Riski, tarafların kontrolü dışında meydana gelen, kaçınılması ve üstesinden gelinmesi makul olmayan ölçüde mümkün olmayan ve tarafların yükümlülüklerini yerine getirmesini imkânsız hale getiren felaket niteliğindeki bir risk faktörü olarak tanımlanmaktadır.

4) **Fesih Riski:** Fesih Riski, taraflardan birinin sözleşmedeki yükümlülüklerini yerine getirememesi ya da sözleşmenin karşılıklı mutabakat yoluyla fesih sürecine girmesi durumunda ortaya çıkan maliyet unsurları olarak değerlendirilmektedir.

Risk Faktörü		Olasılık					Etki				
		1	2	3	4	5	1	2	3	4	5
Hurda Değeri Riski	1										
Devir Dönemi Süre Aşımı Riski	2										
Mücbir Sebep Riski	3										
Fesih Riski	4										

1: Çok Düşük	2: Düşük	3: Orta	4: Yüksek	5: Çok Yüksek

E. Voluntary Participation Agreement Form for the Questionnaire Survey

ARAŞTIRMAYA GÖNÜLLÜ KATILIM FORMU

Bu araştırma, ODTÜ Mimarlık Bölümü Yapı Bilimleri Yüksek Lisans Programı öğrencisi Sertaç ARSLAN tarafından Prof. Dr. Soofia Tahira ELIAS-OZKAN danışmanlığında yüksek lisans tez çalışmaları kapsamında yürütülmektedir. Bu form sizi araştırma koşulları hakkında bilgilendirmek için hazırlanmıştır.

Çalışmanın Amacı Nedir?

Çalışmanın amacı, Türkiye Cumhuriyeti Sağlık Bakanlığı tarafından Kamu-Özel İşbirliği modeli ile inşa edilen entegre sağlık kampüsü projelerinde karşılaşılan risk faktörlerinin değerlendirilmesi için veri toplamaktır.

Bize Nasıl Yardımcı Olmanızı İsteyeceğiz?

Araştırmaya katılmayı kabul ederseniz, sizden 4 bölümden oluşan risk kategorileri altında listelenen toplam 36 adet risk faktörünü önem sırasına göre puanlayarak derecelendirmeniz beklenmektedir. Anketi tamamlamanızın yaklaşık olarak yarım saat sürmesi beklenmektedir.

Sizden Topladığımız Bilgileri Nasıl Kullanacağız?

Araştırmaya katılımınız tamamen gönüllülük temelinde olmalıdır. Çalışmada sizden kimlik veya kurum belirleyici hiçbir bilgi istenmemektedir. Cevaplarınız tamamıyla gizli tutulacak ve sadece araştırmacılar tarafından değerlendirilecektir. Katılımcılardan elde edilecek bilgiler toplu halde değerlendirilecek ve bilimsel yayımlarda kullanılacaktır.

Katılımınızla ilgili bilmeniz gerekenler:

Anket, genel olarak kişisel rahatsızlık verecek sorular veya uygulamalar içermemektedir. Ancak, katılım sırasında sorulardan ya da herhangi başka bir nedenden ötürü kendinizi rahatsız hissederseniz anketi yarıda bırakmakta serbestsiniz. Böyle bir durumda anketi uygulayan kişiye anketi sonlandırmak istediğinizi söylemeniz yeterli olacaktır.

Araştırmayla ilgili daha fazla bilgi almak isterseniz:

Anket sonunda, bu çalışmayla ilgili sorularınız cevaplanacaktır. Bu çalışmaya katıldığınız için şimdiden teşekkür ederiz. Çalışma hakkında daha fazla bilgi almak için Mimarlık Bölümü öğretim üyelerinden Prof.Dr.Soofia Tahira ELIAS-OZKAN (E-posta: ...@metu.edu.tr) ya da yüksek lisans öğrencisi Sertaç ARSLAN (E-posta: ...@metu.edu.tr) ile iletişim kurabilirsiniz.

Yukarıdaki bilgileri okudum ve bu çalışmaya tamamen gönüllü olarak katılıyorum.

(Formu doldurup imzaladıktan sonra uygulayıcıya geri veriniz).

İsim Soyad Tarih İmza

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F. Approval Letter from METU-IAEK for the Questionnaire Survey

UYGULAMALI ETİK ARAŞTIRMA MERKEZİ
APPLIED ETHICS RESEARCH CENTER

ORTA DOĞU TEKNİK ÜNİVERSİTESİ
MIDDLE EAST TECHNICAL UNIVERSITY

22 Kasım 2024

Konu: Değerlendirme Sonucu

Gönderen: ODTÜ İnsan Araştırmaları Etik Kurulu (İAEK)

İlgi: İnsan Araştırmaları Etik Kurulu Başvurusu

Sayın Sofia Tahira Elias Ozkan

Danışmanlığını yürüttüğünüz Sertaç Arslan'ın "***Türkiye'de Kamu Özel İşbirliği (KÖİ) Modeliyle İnşa Edilen Şehir Hastaneleri Projelerinde Risk Faktörlerinin Değerlendirilmesi***" başlıklı araştırmanız İnsan Araştırmaları Etik Kurulu tarafından uygun görülerek 0623-**ODTÜİAEK-2024** protokol numarası ile onaylanmıştır.

Bilgilerinize saygılarımla sunarım.

Prof. Dr. Ş. Halil TURAN
Başkan

Prof.Dr. İ. Semih AKÇOMAK
Üye

Doç. Dr. Ali Emre Turgut
Üye

İZİNLİ

Doç. Dr. Serife SEVİNÇ
Üye

Doç.Dr. Murat Perit ÇAKIR
Üye

Dr. Öğretim Üyesi Süreyya ÖZCAN KABASAKAL
Üye

Dr. Öğretim Üyesi Müge GÜNDÜZ
Üye

G. Descriptive Statistics and Research Data Tabulation of Risk Factors

Table A.2 Descriptive statistics of planning and procurement risks

Risk	Data	Mean	Mode	Standard Deviation	Number of Observations
Licenses and Permits Risk	Probability	2.35	2	0.86	59
	Impact	3.61	4	1.12	59
Financing Risk	Probability	3.17	3	0.81	58
	Impact	4.25	5	0.92	58
Market Demand Risk	Probability	2.53	2	0.86	58
	Impact	3.62	3	0.85	58

Table A.3 Descriptive statistics of design and construction risks

Risk	Data	Mean	Mode	Standard Deviation	Number of Observations
Construction Period Legal Risk	Probability	3.52	2	0.85	59
	Impact	3.52	4	1.00	59
Environmental Risk	Probability	2.35	2	0.84	60
	Impact	2.73	3	0.84	60
Construction Period Currency Risk	Probability	3.61	3	0.83	59
	Impact	4.23	5	0.95	59
Variation Order Risk	Probability	3.45	3	1.03	59
	Impact	3.83	4	0.98	59
Construction Period Skilled Worker Risk	Probability	2.28	2	0.90	60
	Impact	3.05	3	1.01	60
Construction Period Subcontractor Risk	Probability	2.85	3	0.73	60
	Impact	3.53	4	1.18	60

Table A.3 (continued)

Risk	Data	Mean	Mode	Standard Deviation	Number of Observations
Ground Investigation Risk	Probability	2.25	2	0.79	60
	Impact	3.38	4	1.09	60
Construction Period Timeout Risk	Probability	3.08	3	0.97	59
	Impact	3.88	4	0.96	59
Construction Period Technology Risk	Probability	2.47	2	0.87	59
	Impact	3.13	3	1.00	59
Construction Period Cost Overrun Risk	Probability	3.22	3	0.74	59
	Impact	3.94	5	1.05	59
Construction Period Insurance Risk	Probability	2.22	2	0.87	58
	Impact	3.18	3	1.01	58
Design Change Risk	Probability	3.06	3	1.02	60
	Impact	3.80	4	0.93	60

Table A.4 Descriptive statistics of maintenance and repair risks

Risk	Data	Mean	Mode	Standard Deviation	Number of Observations
Operation Period Insurance Risk	Probability	2.41	2	0.80	58
	Impact	3.31	3	1.02	58
Operational Risk	Probability	2.88	3	0.92	60
	Impact	3.83	5	0.97	60
Operation Period Qualified Personnel Risk	Probability	2.59	3	0.89	59
	Impact	3.77	4	0.94	59
Contamination and Infection Risk	Probability	2.40	2	0.82	60
	Impact	3.50	4	1.11	60

Table A.4 (continued)

Risk	Data	Mean	Mode	Standard Deviation	Number of Observations
Operation Period Subcontractor Risk	Probability	2.76	3	0.85	59
	Impact	3.77	4	0.89	59
Waste Management Risk	Probability	2.33	2	0.75	59
	Impact	3.42	3	1.14	59
Maintenance and Repair Risk	Probability	2.75	3	0.75	60
	Impact	3.53	3	0.79	60
Renewal Risk	Probability	2.83	2	0.88	56
	Impact	3.48	3	0.87	56
Performance Risk	Probability	2.88	3	0.83	59
	Impact	4.00	5	0.98	59
Operation Period Technology Risk	Probability	2.71	3	0.78	59
	Impact	3.67	4	0.83	59
Commercial Space Income Risk	Probability	2.45	2	0.89	59
	Impact	3.11	3	1.09	59
Energy Efficiency Risk	Probability	2.68	3	0.82	57
	Impact	3.70	4	0.90	57
Security Risk	Probability	2.36	2	0.88	60
	Impact	3.21	3	0.97	60
Construction Period Cost Overrun Risk	Probability	3.15	3	0.79	58
	Impact	3.86	5	0.99	58
Operation Period Legal Risk	Probability	2.54	2	0.83	59
	Impact	3.59	3	1.05	59
Operation Period Currency Risk	Probability	3.67	3	0.87	59
	Impact	4.33	5	0.77	59
Resource Price Risk	Probability	3.10	3	0.82	59
	Impact	4.00	4	0.89	59

Table A.5 Descriptive statistics of post-transfer asset and termination risks

Risk	Data	Mean	Mode	Standard Deviation	Number of Observations
Scrap Value Risk	Probability	2.72	2	1.03	58
	Impact	3.67	4	0.92	58
Transfer Period Expiry Risk	Probability	2.74	3	0.92	58
	Impact	3.87	4	1.06	58
Force Majeure Risk	Probability	2.57	3	0.83	59
	Impact	4.11	5	0.89	59
Termination Risk	Probability	2.67	3	0.75	59
	Impact	4.27	5	0.88	59

H. Allocation and Sharing of Risk Factors Attributable to PPP-based IHC Projects in Turkey

The allocation and sharing of all thirty-six risks – the definitions of which are provided in the risk register table in Chapter 4.1 – unique to integrated health campus projects implemented through the public-private partnership model in Turkey, based on the typical project agreement, are discussed in detail below. It should be noted that twenty-nine items are discussed; however, as some risks may occur during both construction and operation periods (*e.g.,* construction and operation period cost overrun risk), the total number of risks allocated is thirty-six.

1. Licenses and Permits Risk

According to the article titled ‘Permits’ of the project agreement, the company is responsible for securing all permits except those listed in Annex 8 (Construction Issues) and Annex 14 (Service Requirements), which are to be obtained by the administration. The company also bears all related expenses, except for the permits the administration must obtain for medical services. The relevant sub-clause further obliges the administration to provide reasonable assistance in obtaining permits.

If the failure to obtain permits results from the company's fault, the contract may be terminated at the option of the other party. However, if the delay is due to the administration, remedies such as time extensions or compensation for delay costs are stipulated. The sub-clause titled ‘Permits Required for the Provision of Services’ requires the company to assist the administration in securing permits related to medical service delivery, while sub-clause (b) mandates that the company obtain all permits for medical support and ancillary services before operations commence.

2. Financing Risk

According to the project agreement, the article titled ‘Financing’ assigns full responsibility for project financing to the company, which must obtain all required funds – covering the total fixed investment amount and service provision – within a specific period from the contract’s signing, and repay all related financial obligations. The sub-clause titled ‘Breach of the Agreement by the Company’ reiterates that a failure to meet this obligation constitutes a contractual breach, justifying potential termination.

Article 6 of the ‘Construction, Renovation and Procurement of Services Through the Public-Private Partnership Model by the Ministry of Health and on the Amendment of Certain Laws and Legislative Decrees’, titled ‘Minimum Equity’, establishes that the contractor is legally required to finance the project and contribute an equity amounting to at least 20% of the periodic investment. This obligation is further clarified in Article 54 of the ‘Regulation on the Implementation of the Procurement of Facilities Through Public-Private Partnership Model by the Ministry of Health’, which authorizes the administration to request documentation to verify the contractor’s equity commitment. Should the company fail to allocate the necessary equity in full and on time, the provisions regarding default will apply.

3. Market Demand Risk

Since market demand risk concerns the possibility of failing to generate sufficient and cost-effective demand for project implementation during the tender stage, the project agreement does not include any specific provisions regarding the allocation of this risk. Given that the authority to make decisions related to the realization of this risk lies with the administration, it is considered that the public sector in PPP projects assumes the risk of market demand.

Although market demand risk generally refers to the demand for the project during the tender phase, the market testing process applied to service delivery can also be

regarded as a subcategory of this risk. In IHC projects implemented under the PPP model in Turkey, the services that the company is obligated to deliver, whose pricing is determined during the tender phase, must undergo a market testing process every five years. The administration primarily carries out the market testing process; however, it also forms the basis of a sub-subcontract to be executed between the company, the service provider, and the sub-subcontractor. The main objective of the market testing process is to ensure the sustainability of service delivery by achieving the highest benefit at the lowest possible cost.

The market test is essentially conducted to review service specifications and update service prices cost-effectively. The administration also carries it out in cases where the sub-subcontractor is changed. While the contractor has a right of first refusal in the market testing process, it is observed that, considering the risk of failing to achieve cost-effective pricing during the bidding phase, the risks stemming from the market testing process are also borne by the MoH.

4. Construction and Operation Period Legal Risk

Under the article titled ‘General Obligations of the Company’ in the project agreement, the company is required to comply with all applicable legislation. Additionally, the article ‘Change in Legislation’ stipulates that, in the event of any legal amendment, the company must take necessary steps to fulfill its contractual responsibilities.

The agreement distinguishes between legislative changes that directly affect the contract and those considered general in nature. In cases where a legal amendment impacts the provisions of the agreement, the administration may revise the company's payments to offset increases in costs or reductions in service payments. Although this may suggest that the public sector absorbs legal risk, further analysis reveals a cost-sharing mechanism in place. According to the relevant sub-clause, the company is responsible for a portion of the cost increase, adjusted for inflation, up

to a defined percentage of the availability payment. Another sub-clause requires the company to make reasonable efforts to mitigate adverse effects, control cost escalations, and implement cost-reducing measures.

Overall, although the company bears some degree of exposure, particularly within a capped cost threshold, the public sector assumes the predominant share of legal risk, especially in relation to unforeseeable legislative changes.

5. Environmental Risk

Under the articles titled ‘Termination’ and ‘Breach of Contract by the Company’ in the project agreement, if an administrative investigation or final court ruling determines that the company violates environmental or occupational safety regulations, such breach is contractually attributed to the company.

Although hospitals were excluded from the scope of the ‘Environmental Impact Assessment Regulation’ as of its 25.11.2014 version, the preparation of an Environmental Impact Assessment (EIA) report remains a prerequisite for securing international financing. As such, IHC projects implemented under the public-private partnership model in Turkey still require EIA reports in compliance with World Bank and IFC standards. These reports help mitigate environmental risks by evaluating project impacts on ecosystems and proposing control measures.

The article titled ‘Land’ specifies that the company must ensure site cleanliness from the date of handover and prevent contamination-related damage to the administration. According to the clause ‘Environmental Management’ in Annex 14 (Service Requirements), the company is also required to implement an ISO 14001-compliant environmental management system. Additionally, Annex 14 requires the company to adopt a comprehensive sustainability policy that encompasses a wide range of environmental and resource protection issues.

The article ‘Stocks, Consumables, Materials, and Equipment’ prohibits the use or storage of materials that may harm the premises or neighboring areas, placing full responsibility on the company for managing hazardous substances. Occupational health and safety risks, considered a subset of environmental risk, are governed by the article titled ‘Employment Principles’, which mandates compliance with labor and safety legislation and holds the company fully accountable for protecting its personnel.

Furthermore, the article ‘General Obligations of the Company’ reaffirms that, from the site handover date onward, the company is liable for the safety of all individuals on-site and must adhere to health and safety regulations. In light of these provisions, it is concluded that environmental risk, including occupational safety components, is contractually assumed by the company throughout both the investment and operation periods.

6. Construction and Operation Period Currency Risk

Construction period currency risk can be defined as a risk factor that could impact project costs in the event of a depreciation of the Turkish Lira against foreign currencies, particularly in relation to the project's financing. Operation period currency risk, on the other hand, refers to the risk factor that may impact the costs borne by the parties with respect to payments made during the operation period if the Turkish Lira depreciates against foreign currencies once the project becomes operational.

The fundamental provisions regarding the reflection of currency risk on payments and the allocation of this risk between the parties are regulated in Annex 18 (Payment Mechanism) of the contracts. According to the annex, rental payments to be made by the administration are referred to as the ‘Availability Payment (AP)’. AP is defined as the amount determined on the date of the final offer, which corresponds to the date of the contract's signature, and is paid in periodic installments starting from the commencement of the project's operational period. This amount is updated

in accordance with the formula specified in the same annex, taking into account changes in inflation and exchange rates.

As described in Law No. 6428, titled *'Sağlık Bakanlığınca Kamu Özel İşbirliği Modeli ile Tesis Yaptırılması, Yenilenmesi ve Hizmet Alınması ile Bazı Kanun ve Kanun Hükmünde Kararnamelerde Değişiklik Yapılması Hakkında Kanun'* (Law on the Construction, Renovation and Procurement of Services Through the Public-Private Partnership Model by the Ministry of Health and on the Amendment of Certain Laws and Legislative Decrees), on each relevant payment date, the AP amount to be made is calculated using the formula provided in the law. The formula demonstrates that AP is updated based on the inflation differential.

In accordance with the Presidential Decree No. 2049 dated January 24th, 2020, and Article 10 of Law No. 6428, an amendment is introduced to the 'Regulation on the Construction, Renovation and Provision of Services through Public-Private Partnership Model by the Ministry of Health, resulting in a new arrangement in the payment mechanism. Due to the absence of limits on inflation and foreign exchange rate increases in the availability payment adjustment formula outlined in the PPP regulation, and the resulting multiplier effect of such increases on payments, creating a burden on the public budget, this new regulatory amendment has implemented the floor-ceiling availability payment mechanism.

The provision in the current regulation, which sets the floor condition as "The availability payment to be made shall not be less than the foreign currency equivalent of the availability payment paid in the previous period," has been repealed. Instead, two separate floor conditions have been introduced, under which the availability payment shall not fall below the following thresholds:

i. The availability payment to be made shall not be less than the foreign currency equivalent of the availability payment determined as of the final proposal date.

ii. The availability payment to be made shall not be less than the product of the debt service payment due in the relevant period and the minimum debt service coverage ratio.

If, due to the application of these floor conditions, the calculated availability payment exceeds the actual payable amount, the excess payments shall be offset either through a reduction in future availability payments or by shortening the contract term.

The ceiling amount is calculated as follows:

i. The foreign currency equivalent of the availability payment made in the previous period is first determined.

ii. For the inflation projection of the Eurozone, a ten-year cumulative inflation rate is calculated, which is then converted into a periodic growth rate. Based on this, a fixed Eurozone inflation rate is established for the remaining operation periods.

iii. The foreign currency equivalent of the availability payment determined as of the final proposal date is updated using the Eurozone inflation rate. The net present value in Euro is then calculated by applying the discount rate to be announced by the Ministry of Treasury and Finance.

iv. A fixed ceiling value that yields the relevant net present value is determined through an annuity calculation.

The calculated ceiling value indicates that the availability payment amount, along with foreign exchange rate increases, shall not exceed the updated amount based on Eurozone inflation, rather than Turkish Lira inflation. The application of this condition prevents exponential growth in the availability payment in scenarios where exchange rate increases and inflation occur at pessimistic levels.

Considering that the company is not entitled to receive payments prior to the commencement of the campus' operation period, and that the availability payment

and service payments begin upon operational commencement as stipulated in Annex 18, it is assessed that during the construction phase – except for the potential realization of risk factors related to termination risk – the construction period currency risk on the other hand is undertaken by the company through hedging agreements entered into with the financier. However, upon entering the operation period, the exchange rate risk is shared between the public and private sectors.

7. Variation Order Risk

In hospital projects implemented under the public-private partnership model in Turkey, the procedures regarding variations are regulated by Article 44, titled 'Variation Procedure', and Annex 22 of the project agreement. The contract categorizes variations into administrative scope changes, administrative additional works changes, and administrative service changes. Importantly, only variations requested by the administration are covered by the agreement, while no provisions are made for those initiated by the company.

According to the contractual clauses, the total variation orders permitted during the construction period must not exceed a particular portion of the total fixed investment amount (FIA). Similarly, any variation to services must remain within a set percentage increase or decrease in the service payments (SP). These restrictions are intended to limit the financial exposure associated with variation order risk.

A related sub-clause stipulates that if the cumulative cost of a variation, calculated in accordance with Annex 22, falls below a defined threshold, the company must bear the associated costs. The financial model submitted at the time of contract signing and updated at financial close is used to assess the cost impact. The key principle is that the variation should not alter the company's financial position; thus, the model must be adjusted without affecting its structure. Where applicable, the administration covers additional costs to maintain the same internal rate of return and debt service coverage ratio.

In conclusion, the contract provisions indicate that only administrative variation requests are addressed and cost limitations are clearly defined. When the cost of a variation remains below the threshold, it is borne by the company; for higher-cost changes, the administration assumes responsibility. Therefore, under the PPP model, variation order risk is largely assumed by the MoH.

8. Construction Period Skilled Worker / Operation Period Qualified Personnel Risk

Skilled worker / qualified personnel risks are defined as the risk of failing to employ sufficiently qualified personnel during both the investment and operation phases of the project. Under Article 4, Paragraph 2 of Law No. 6428, the contractor is assigned comprehensive responsibilities, including design, financing, construction, maintenance, and service delivery, and is required to return the facility to the MoH in fully operational condition at the end of the contract term.

According to the clause titled ‘Schedule and Dates for the Completion of the Works’, the company must submit a list of key technical personnel and their roles prior to the commencement of construction. The absence of these individuals is contractually considered the company’s responsibility. In the article titled ‘Assignment, Subcontracting, and Changes in Shareholding Control’, it is stated that the administration has the right to approve subcontractors and their contracts. If a subcontractor withdraws, the company is obliged to appoint a replacement without delay.

The clause under the section ‘Land Security and Personnel Matters’ mandates that disciplinary actions be taken against personnel found to be incompetent, negligent, or disruptive upon the administration’s request. Under the clause titled ‘Design Responsibility’, the company commits to employing competent and experienced designers. In the article ‘Quality Assurance, it is implied that hiring qualified personnel is essential for compliance with design and construction quality standards.

Personnel requirements for the operation phase are outlined in the clause ‘Resources and Training’, which obliges the company to employ sufficient and qualified staff, provide them with necessary training, and ensure compliance with health and safety regulations. Similarly, Annex 14 (Service Requirements) includes detailed obligations under several clauses. The clause titled ‘Personnel and Their Development’ requires the company to employ and maintain a workforce – including radiology technicians, drivers, and administrative personnel – and ensure operational continuity during staff absences. The clause ‘Training and Orientation’ requires pre-service training on operational procedures, legal compliance, energy efficiency, and other mandatory topics.

Additionally, the clause ‘Laboratory Services’ mandates that the company provide necessary laboratory personnel in accordance with relevant health regulations. Under the sub-clause ‘Sterilization and Disinfection Services’, the company must deploy qualified personnel for sterilization duties, and the sub-clause ‘Personnel Qualifications’ under ‘Building and Land Services’ obligates continuous availability of trained staff for 24/7 maintenance and repair services.

In light of these legal and contractual provisions, it is evident that the company is fully responsible for employing and retaining qualified personnel throughout both the construction and operation phases. Thus, the skilled worker / qualified personnel risk is contractually allocated to the company.

9. Construction and Operation Period Subcontractor Risk

The clause titled ‘Subcontractor’ of the PA stipulates that in the event any subcontractor suspends or terminates its work at any time, the company shall be responsible for promptly appointing a replacement subcontractor. Another clause of the same article further implies that, in the case of a subcontractor replacement, the contracts and agreements executed with the new subcontractors must contain terms and conditions that are identical or substantially similar to those concluded with the replaced subcontractors.

Within the scope of the contract, subcontractors involved in delivering services during the operation period are referred to as ‘Service Providers’. Sub-clause of Annex 14, titled ‘Approved List of Service Providers’ specifies that the company is obliged to prepare a list of qualified service providers with adequate financial, managerial, and operational experience, submit this list to the administration for approval, and monitor the performance of these service providers.

In brief, the company assumes both construction and operation phase risks associated with subcontractors in the PPP-based IHC projects in Turkey.

10. Ground Investigation Risk

A clause under the section ‘General Rights and Obligations of the Parties’ and the subsection ‘General Obligations of the Administration’ of the PA states that all responsibilities related to the land prior to the land handover date shall lie with the administration. Conversely, the sub-clause of the same section, titled ‘General Obligations of the Company’ stipulates that following the land handover, the company is obligated to carry out or commission a comprehensive geotechnical survey and submit the resulting soil investigation report to the administration. Accordingly, it is understood that the non-systematic portion of the ground investigation risk is mitigated through the company's responsibility to conduct proper geotechnical assessments after the land has been transferred.

The article titled ‘Land’ outlines the respective responsibilities of the parties regarding land conditions both before and after land delivery. In particular, the clause of the same article, titled ‘Specific Provisions on Responsibilities Related to Soil Conditions and Contamination’, addresses situations where unforeseen ground conditions or contamination are discovered beneath existing buildings or in any part of the site after land handover. This article specifies that if such risks could not have been identified or inspected during the tender process, are not listed in Annex 8 (Construction Issues), or could not have been discovered despite accurate physical and geophysical ground investigations, the company shall not be held responsible

for the occurrence of such risks. Furthermore, in such cases, the responsibility is transferred to the administration.

Therefore, while unforeseen ground conditions and contamination are assessed as risks under the administration's responsibility, the related sub-clause implies that if such issues arise during the construction period, all necessary activities to remedy the situation shall be treated as a variation. If the issue arises during the operation period, the measures and modifications required to address the problem shall be considered a service variation. Regarding contamination, another sub-clause of the contract provides that, in the event of any contamination during either the construction or operational phase, the administration shall relieve the company from the obligation of site remediation and from any adverse impacts arising from such activities, and shall compensate the company for all direct losses incurred due to the contamination.

Another element of the ground investigation risk addressed in the contract pertains to the discovery of cultural and natural assets on the project land. The clause under the article titled 'Cultural and Natural Assets' and the clause 'Ownership' state that all fossils, historical artifacts, and other items of cultural, historical, or monetary value, as well as human remains found or discovered later on the site, shall be the property of the administration. The clause entitled 'Survey' stipulates that if any such elements are discovered during the works, the company must immediately notify the administrative representative and take all necessary precautions to prevent damage to the findings. The clause entitled 'Activities' provides that the company shall carry out routine procedures regarding such discoveries at its own cost. Moreover, another clause indicates that while ordinary procedures related to such findings must comply with the administration's instructions, applicable legislation, and the mutual agreement of the parties, any additional work involving alterations, additions, demolitions, or extensions to the campus, beyond standard procedures, shall be treated as a variation.

In conclusion, the risk factors related to ground investigation identified in the contract include unforeseen soil conditions, contamination, and the discovery of cultural and natural assets. While routine costs arising from these situations are assumed within the scope of the parties' responsibilities under the relevant legislation, any extraordinary costs or delays resulting from such risks are to be borne by the administration.

11. Construction Period Timeout Risk

The article of the PA, titled 'Commencement and Duration of the Contract', clearly sets out the duration of the contract, starting from the date of land delivery, excluding time extensions granted due to suspension of works, delays, or *force majeure* events that are beyond the company's fault.

Annex 9 (Schedule) of the contract outlines the stages of the construction period, including the stage completion dates, the process for carrying out design and construction works until completion, and the dates on which acceptance procedures will be conducted. The clause entitled 'Inspection of the Works by the Administration's Observer' states that the works observer, appointed by the administration and identified in Annex 5, is responsible for inspecting the design and construction activities carried out by the company on behalf of the administration. As further stated in the same article, the observer is also responsible for notifying the administration of any delays related to the construction schedule. Hence, any schedule delays are monitored through regular reporting.

The clause under the article titled 'Schedule and Dates for the Completion of the Works' specifies that the company is required to complete each stage of construction on or before the relevant stage completion date indicated in the schedule. If a delay of more than a pre-defined number of days occurs in completing a stage, a penalty equivalent to a certain percentage of the total value of that stage is imposed on the company for each day of delay. The company is also required to provide a financial guarantee to cover this penalty. The maximum amount of penalty applicable for each

stage is capped at a pre-set percentage of the total value of that stage. If the company subsequently compensates for the delay and brings the project back on schedule, the administration shall return the guarantee previously collected.

The article of PA, titled ‘Causes of Delay,’ sets forth the approach to be taken in cases where construction disruptions in the healthcare facility are not attributable to the company. A clause in the same article lists specific circumstances that may cause or are likely to result in delays in completing the facility. Sub-clauses (a) to (d) of the same clause define the situations where the occurrence of delays arises from the administration:

a. Administration’s failure to approve a proposed variation order,
b. Administration’s failure to fulfill any of its explicit obligations or its obstruction of the works,
c. Administration’s execution of non-contractual works on the site,
d. Legislative changes beyond the company’s control.

Another clause further provides that if any cause of delay arises, the administration shall grant an extension equal to the period of delay or obstruction and determine a new completion date.

The sub-clause under the section of the contract addressing termination, titled ‘Breach of Contract by the Company’ states that the company shall be considered in breach if it fails to complete the works by the completion date and also fails to complete them within an additional period determined by the administration.

In conclusion, it is considered that in the event of the realization of risk factors attributable to the administration, particularly those that cannot be resolved within the ‘Causes of Delay’ provisions, the administration assumes such risks. On the other hand, risks associated with the timely completion of construction works are borne by the company. Therefore, the construction period timeout risk is considered to be shared between the parties.

12. Construction and Operation Period Technology Risk

The article of PA titled ‘Quality Assurance’ requires the company to execute all contractual obligations in accordance with up-to-date quality standards, supported by quality plans aligned with ISO 9001, ISO 9002, or equivalent standards. The company is also obligated to prepare specific quality plans for design, construction, and services, and to implement them throughout the project lifecycle. In addition, the clause ‘Inspection of the Works by the Administration’s Observer’ states that the works observer shall monitor material compliance with the specifications in Annex 8 and report deviations to the administration.

For medical equipment, the article ‘Equipment’ enables the administration to request updates to the equipment list prior to stage completion, provided these reflect technological advancements since bid submission. However, if changes lead to additional costs, they are considered variations governed by Annex 22. Similarly, the article ‘Stocks, Consumables, Materials, and Equipment’ mandates compliance with the service specifications in Annex 14 for all equipment and consumables used during operations.

Annex 13 (Equipment) further specifies the company’s obligation to procure furnishings in line with Annex 8 and the tender documents, ensuring no decrease in quality or standards. Medical equipment details are included in the Annex 8 and Annex 13 tables. Additionally, Annex 14 requires the company to implement an ISO 9001-equivalent quality management system and provide consultancy services in the biomedical and technical healthcare fields.

Under Annex 14’s clause ‘Partnerships and Resources’, the service provider must supply and maintain necessary equipment at its own cost. Additional sub-clauses under ‘Laboratory Services’ stipulate strict adherence to validated protocols, manufacturer instructions, and participation in internationally recognized external quality control programs.

The contract also affirms that equipment-related changes resulting in extra costs are classified as variations, unless they are due to the company's failure to procure what is specified. In such cases, responsibility lies entirely with the company. However, mutually agreed updates with the administration are allowed.

In conclusion, technological risks related to construction inputs, equipment, and furnishings are contractually assigned to the company, unless the administration specifically initiates the modifications.

13. Construction and Operation Period Cost Overrun Risk

The initial clause of the PA, referred to as 'General Principles' under the article 'General Rights and Obligations of the Parties' specifies that unless otherwise expressly indicated in the Agreement, the company assumes full responsibility for all costs and risks related to the campus's design and construction, the provision of services, and the conduct of commercial operations, and must fulfill its contractual duties without requesting any payment or assistance from the administration.

In addition, the clause entitled 'General Obligations of the Company' also states that the company shall carry out all activities under the contract at its own cost. These provisions clearly indicate that the company bears the risk of construction cost overruns.

When evaluating the cost overrun risk related to the provision of services during the operation period, considering the indirect impact of a potential increase in service delivery costs due to a sudden rise in demand, it appears that the administration does not make payments exceeding the annual guaranteed amount, and the resulting cost overrun risk is ultimately borne by the company.

Sub-clause titled 'Equipment and Consumables' of Annex 14 stipulates that the company is responsible for procuring the equipment and consumable materials necessary to meet the service requirements at its own cost, as well as for ensuring proper maintenance and replacement of equipment when necessary.

Accordingly, except for the specific cases explicitly regulated under the contract, it is concluded that the company assumes the risk of cost overruns related to both the construction and operation periods.

14. Construction and Operation Period Insurance Risk

In integrated health campus (IHC) projects implemented under the PPP model by the Turkish MoH, insurance-related provisions are detailed in the article titled ‘Insurance’ and Annex 21 (Insurance) of the PA. As per the first clause, the company is required to obtain general all-risk insurance policies separately for both the construction and operation phases, and is solely responsible for the premium payments. The company acts as both policyholder and insured, and in the event of damage, must allocate compensation exclusively to restoring the facility. If the company fails to procure the required policies despite the existence of insurable risks in the market, the administration may terminate the contract. Furthermore, any damages resulting from false declarations or omissions by the company in insurance documentation shall be compensated by the company.

Annex 21 outlines minimum coverage requirements, including protection against events such as earthquakes, terrorism, floods, fires, strikes, and accidents, as well as third-party liability and employer’s liability insurance. These policies must also cover claims from workplace accidents, traffic incidents, and occupational diseases. The clause ‘Insurance of the Contracted Works and Construction Insurance’ specifies that the company must insure all construction-related activities, materials, and machinery under an all-risk policy and obtain additional coverage for various risks, including design defects, extended maintenance, off-site storage, nuclear medicine, and warranty coverage.

During the operation phase, the ‘Hospital Package Insurance’ clause obliges the company to insure the facility's entire infrastructure and operational equipment against damage or loss resulting from natural disasters, fire, theft, and other specified

risks. This insurance must also cover third-party claims related to non-medical services.

However, some risks may not be insurable. As stated under the article ‘Uninsurable Risks’ in Annex 21, risks are deemed uninsurable when adequate coverage is not available from at least three reputable insurers, or when the premium costs are unaffordable. In such cases, the administration is responsible for any resulting direct or indirect damages. The company is also obligated to periodically monitor the insurance market to assess whether previously uninsurable risks have become insurable and to report findings to the administration. Lastly, the article ‘Compensation and Liability’ defines the company’s indemnification obligations for damages that occur without a contractual breach or fault by either party.

In conclusion, while most project-related risks are covered through comprehensive insurance policies, insurance risk persists in the form of uninsurable events. These residual risks are contractually allocated to the administration.

15. Design Change Risk

Pursuant to the first clause entitled ‘General Principles’ of ‘General Rights and Obligations of the Parties’ article of the PA, it is stipulated that the company shall undertake, at its own cost and risk, the design and construction of the campus, the provision of the services, and the performance of commercial activities, and shall fulfill its obligations under the PA without recourse to the administration.

In addition, sub-clause entitled ‘General Obligations of the Company’ prescribes that the company is responsible for preparing the final project and application project in accordance with the preliminary design, technical specifications, relevant parts of the tender documentation, the tender proposal, Annex 8 (Construction Issues), and based on its own expertise and experience in compliance with all applicable technical and professional standards.

Under the article titled ‘Design, Construction and Approval’, the first clause, namely ‘General Responsibility’, it is stated that the company shall carry out the works and undertakings under the PA in accordance with Annex 8 (Construction Issues), zoning approvals, the approved application project, and construction quality plans. Additionally, under a sub-clause of the same article, it is indicated that the company declares, acknowledges and, Administration undertakes that it shall perform all works in full compliance with the details of the approved application project, free from any defect or deficiency, and in accordance with the diligence expected from a prudent merchant pursuant to the provisions of the Turkish Commercial Code, and consistent with the work experience documented during the pre-qualification phase of the tender. Furthermore, the same article states that the company shall be liable for any potential deficiency or error in the construction quality plans outlined in Annex 8 and shall also be responsible for any damage that may arise as a result of its breach of obligations.

Responsibility for risk allocation varies depending on the underlying cause of the design change. If the modification stems from a deficiency in the original design, the risk is typically borne by the company. As explicitly stated in the related clause of the project agreement, the responsibility for designing the IHC projects rests with the company. The company undertakes to exercise the level of care, skill, and diligence expected of a designer who has performed design work in projects similar in nature, scope, and complexity to the relevant project during the design phase of the project. However, if MoH mandates the alteration, the associated risk may be transferred to the Administration.

Pursuant to the clause titled ‘Administration Design Approval’, the company shall, upon the entry into force of the PA, confirm that it has reviewed its tender proposal, the tender documents, and the preliminary project annexed to Annex 8 (Construction Issues), and that these documents comply with Annex 8. Following this, the company shall prepare the final project in accordance with its tender proposal and Annex 8, and submit it to the administration for review within a specified number of business days from the date of land transfer. The administration shall then review the final

project in accordance with Annex 10 (Review Procedure) and notify the company with a report containing its comments or proposed changes. The company shall incorporate the comments and proposed changes into the final project and resubmit it to the administration for approval. According to the same clause, no additional payment shall be made by the administration for the drawing work carried out to incorporate such changes into the final project if the changes are required due to non-compliance with applicable laws, other regulations, or Annex 8. However, design changes requested at the discretion of the administration, which are not related to legal or regulatory non-compliance, shall be considered as a variation (change order).

In conclusion, the risk allocation in the case of a design change depends on the reason for the change. If the original design is deficient, the company will retain the risk; however, if the MoH requires a change to the design, it may become a contracting authority risk.

16. Operational Risk

Operational risk refers to uncertainties in the project's ongoing functionality, including unexpected costs arising from labor shortages, technological shortcomings, failed market testing, or adverse environmental conditions. Under the clause titled 'Subject and Scope of the Agreement', the company is responsible for providing all non-medical services from the start of the operation period.

As stated in clause 7.1, 'General Principles', the company bears full financial and operational responsibility for the design, construction, service provision, and commercial activities, without any claim for compensation from the administration. According to the clause 'General Obligations of the Company', the company must install and maintain the equipment specified in Annex 13, ensure continuous maintenance and repair of the facility, and deliver all services defined in Annex 14 (Service Requirements).

Quality management responsibilities are detailed under an article of the PA, requiring the company to develop service plans for each activity and implement them

in accordance with relevant standards. These responsibilities also include ensuring that subcontractors comply with applicable service quality plans.

The article titled ‘Services’ outlines the company's obligations during the operation period, including both medical support services (*e.g.*, laboratory, imaging, sterilization) and support services (*e.g.*, cleaning, security, catering, pest control, landscaping). The company retains exclusive service delivery rights during the operation period, except where market testing under Annex 17 applies.

Further details are found in Annex 20 (Operation Period Management Plan), which outlines the company’s responsibilities for operating non-medical areas. The company must obtain necessary permits, comply with legislation, protect service integrity, notify the administration of major maintenance, and maintain quality standards. These obligations are reinforced by clauses prescribing the continuous delivery of services and coordination with administrative functions.

The article ‘Activity Reports’ obligates the company to submit monthly and annual reports to the administration, as detailed in Annex 28. Annex 14 also outlines performance standards and defines ‘Good Operating Practices’ as the benchmark for service delivery. In addition, the clause titled ‘Leadership’ requires regular updates on management structure and service performance.

The company is fully responsible for the implementation and operation of the Hospital Information Management System (HIMS), which is described as the operational core of the facility. According to Annex 14, HIMS integrates hardware, software, and data systems to support efficient hospital management and ensure continuity of service. Its development and management are contractually considered a company risk.

Other clauses in Annex 14 assign direct responsibility to the company for services such as rehabilitation, landscaping, pest control, parking, laundry, and catering. The clause ‘Procedure to be Applied in Case of Service Disruption’ establishes that

service interruptions are subject to sanctions in line with Annex 18 (Payment Mechanism).

Annex 18 introduces a deduction mechanism for underperformance during the operation period, comprising two types of penalties:

- Availability failure deductions for when parts of the facility cannot support medical services,
- Service failure deductions for failure to meet quality standards as defined in Annex 14.

Taken together, these provisions indicate that all risks associated with service continuity, performance, and operational quality—including resulting penalties—are assumed by the company. Therefore, operational risk in integrated health campuses is contractually allocated to the company.

17. Contamination and Infection Risk

According to the article ‘Breach of Contract by the Company’ under the section ‘Termination’ of the PA, if surgical services become inoperable due to the company’s failure to deliver sterilization services or implement safety measures, the administration is entitled to carry out remedial works on behalf of the company and recover the related costs by deducting them from the company’s payments.

Annex 14 (Service Requirements) defines ‘Contamination’ broadly as exposure to chemical, biological, or hazardous substances. Under the clause ‘Sterilization and Disinfection Services’, the company is responsible for providing uninterrupted 24/7 sterilization in accordance with the MoH’s service standards. This includes disinfection of surgical areas and reusable medical devices, package preparation, linen processing, and adherence to ISO 13485 and medical device regulation standards. The company must also store disinfected materials properly and avoid introducing new materials without prior approval and compliance checks.

Sub-clause 1.3.2 titled ‘Disinfection Services’ further specifies that the company must disinfect all designated areas, including operating theatres and related equipment, in accordance with the definitions and expectations set by the administration.

The clause under ‘Cleaning Services’ in Annex 14 sets out that the company is responsible for delivering the highest level of cleaning services throughout the facility. This includes scheduled, periodic, reactive, and barrier cleaning, as well as compliance with infection control and waste management procedures. Sub-clauses define the company’s obligation to ensure 24/7 service continuity, adhere to the rules of the infection control committee, and maintain optimal hygiene for patients, staff, and visitors. Moreover, the company is required to clean all clinical materials designated in the contract in accordance with infection control guidelines and to implement a recognized risk assessment and management system to detect and resolve performance deficiencies.

In light of these contractual obligations, the risk of contamination and infection is assigned to the company. The responsibility for managing this risk is clearly delineated under the clauses regulating ‘Cleaning Service’ and ‘Sterilization and Disinfection Service’ in Annex 14, making it a contractual duty of the company throughout the operation period.

18. Waste Management Risk

According to the sub-clause of the clause titled ‘Leadership’ in Annex 14 of the project agreement, the company is responsible for collecting waste generated within the healthcare facility and delivering it to authorized disposal facilities through coordination with administrative bodies. The clause ‘Waste Management Service’ in Annex 14 further regulates the company’s obligations in this context. Under the sub-clause ‘Key Objectives’, the company is required to implement a comprehensive waste management system that includes the segregation, processing, and transportation of waste, in line with applicable legislation and administrative

procedures. This system must minimize health and environmental risks and be operated continuously, 24/7. The company is responsible for managing various types of waste, including medical, pharmaceutical, toxic, radioactive, confidential, domestic, and packaging waste.

Further sub-clauses specify that the company must ensure proper scheduling, storage, and transport of waste, using routes approved by the administration and avoiding contact with patients or visitors. The company must also meet specific performance standards related to response and rectification times, disinfect waste containers after each use, and provide all necessary equipment and vehicles for transporting waste to licensed facilities.

Additionally, waste management procedures must be based on a risk assessment and align with the administration's segregation protocols while aiming to reduce manual handling and overall waste volume.

In conclusion, the company bears full responsibility for executing waste management activities in accordance with all applicable legal and administrative requirements.

19. Maintenance and Repair Risk

According to a sub-clause under the heading ‘General Obligations of the Company’ in the project agreement, the company is fully responsible for executing all maintenance and repair activities across the entire campus. These responsibilities are primarily governed under the clause ‘Building and Land Services’ within the support services section of Annex 14, which requires the company to maintain infrastructure, systems, and equipment in compliance with technical and operational standards. This includes ensuring environmental safety, implementing performance monitoring, and maintaining a recognized risk management system.

A separate sub-clause in Annex 14 outlines the specific tasks the company must perform, including refurbishment, internal and external repairs, drainage, heating,

electricity, air conditioning, fire prevention, renewable energy systems, medical gas infrastructure, and building automation. The scope of these services is comprehensive, encompassing over 30 distinct infrastructure systems.

For medical devices, the company is responsible under the ‘Imaging Service’ and ‘Laboratory Services’ clauses in Annex 14 for maintenance, repair, and spare part provision. Devices used in laboratories must be brand new at commissioning, and their maintenance and insurance costs are entirely the responsibility of the company. In addition, the clause ‘Other Medical Equipment Support Service’ mandates planned maintenance aligned with manufacturer standards to prevent unplanned failures. This includes verifying equipment performance using original parts and ensuring post-repair reliability within acceptable tolerances.

According to Annex 13 (Equipment), the maintenance of medical devices must be documented, validated, and compliant with relevant regulations and international safety standards. Similarly, under the clause ‘Furnishing Services’ in Annex 14, the company is tasked with maintaining all furnishings in a safe and uninterrupted condition. Sub-clauses require planned preventive maintenance for furniture, post-repair performance checks, and continuous delivery of these services.

In conclusion, based on the contract and the detailed provisions in Annex 14 of the PA, the company assumes all risks related to the maintenance and repair of healthcare facilities, infrastructure, furnishings, and equipment for the entire contract duration.

20. Renewal Risk

As stated in the clause titled ‘Extraordinary Maintenance and Repair Service (Lifecycle Replacement)’ of the second section named ‘Support Services’ of Annex 14 (Service Requirements), the content and special service conditions of the ‘Extraordinary Maintenance and Repair Services’ – which include the replacement of systems which have reached the end of their service life, have become unusable

during the service period based on monitoring, and require replacement – are explained in detail.

Sub-clause titled ‘Demarcation Matrix’, under the clause bearing the title ‘Extraordinary Maintenance and Repair Service (Lifecycle Replacement)’ of Annex 14, enumerates the service items for which extraordinary maintenance and repair activities are to be carried out. Accordingly, the company is expected to perform extraordinary maintenance and repair activities.

In accordance with the work items listed in the aforementioned demarcation matrix, the company assumes contractual responsibility for carrying out any extraordinary maintenance and repair activities that may be required throughout the campus. Therefore, it is concluded that the company shall manage all factors related to the renewal risk.

21. Performance Risk

Performance risk refers to the possibility that the O&M company, established by the SPV and responsible for the operation and maintenance of the integrated health campus, may fail to meet the expected service standards during the operation period. This risk is addressed comprehensively in the contract and Annex 14 (Service Requirements) of the PA. According to the article ‘Performance Monitoring’ of the agreement, the company must ensure that its own operations and those of its subcontractors comply with Annex 14, without compromising the specified performance score. The agreement also grants the administration the right to audit service compliance during the operation period.

The ‘Performance Monitoring’ section of Annex 14 defines how performance parameters are established, measured, and evaluated. Each service requirement includes a specific parameter with associated response times, rectification periods, monitoring intervals, and evaluation methods. Service success or failure is determined by comparing actual service delivery against these predefined metrics.

The section ‘Performance Score’ in Annex 14 describes the cumulative performance score based on regular evaluations. As per Law No. 6428, if the company’s performance falls below the contractual threshold, the administration is entitled to terminate the agreement. Annex 14 further emphasizes that performance evaluations will be based on the MoH’s criteria, and failing to meet a certain score percentage will grant the administration the right to terminate the contract. Additionally, the article titled ‘Service Failure Points’ authorizes the administration to assign penalty points based on monthly performance outcomes. If these points exceed the thresholds defined in Annex 14, a formal notice is issued to the company.

The article ‘Help Desk Services’ in Annex 14 sets forth detailed provisions for a 24/7 information system that supports facility management and monitors service performance. The help desk must be fully integrated with the administration’s operations and meet objectives such as timely incident tracking, emergency coordination, and efficient resource allocation. All requests and incidents must be categorized, archived, and reported every month. Monthly reports from the help desk include summaries of service requests, deficiencies, affected functional areas, unresolved failures, deduction amounts from service payments, and daily failure point records.

In conclusion, based on the main contract and the framework outlined in Annex 14 of the PA, including the mandatory help desk system, performance risk is entirely assumed by the company throughout the operation period.

22. Commercial Space Income Risk

According to the article titled ‘Subject and Scope of the Agreement’, the company is responsible for providing non-medical services and conducting commercial activities within the health campus. Under the article ‘General Rights and Obligations of the Parties’, the clause ‘General Principles’ affirms that the company assumes full financial and operational responsibility for the design, construction,

service delivery, and commercial activities without seeking compensation from the administration for any associated costs or risks, unless otherwise stated in the agreement.

The clause ‘Permits Required for the Provision of Services’ places the obligation of securing all necessary permits for commercial operations on the company prior to initiating such activities.

The article ‘Commercial Activities and Operation Period Management Plan’ states that all commercial operations must be carried out in accordance with the provisions of Annex 20, and in full compliance with applicable legislation. The company assumes all risks, costs, and responsibilities for these activities and retains sole discretion over their execution.

Furthermore, the same article stipulates that any revenues and profits projected in the financial model for commercial activities are entirely at the company’s risk. Unless these revenues are adversely affected by a tort, fault, or negligence attributable to the administration, the company cannot claim compensation for any failure to achieve the internal rate of return or other projected financial outcomes.

In conclusion, based on the contractual framework, all risks associated with the operation and financial performance of commercial areas within the campus are borne solely by the company, contingent upon its proposal to operate such areas during the tender process.

23. Energy Efficiency Risk

The PA requires the company to obtain and maintain a BREEAM (Building Research Establishment Environmental Assessment Method) certificate prior to and throughout the operation period. This internationally recognized certification system evaluates buildings across various categories, including energy, management, indoor environmental quality, transport, water, materials, waste, land use, ecology, and

innovation. The minimum contractual requirement is to obtain a BREEAM ‘Excellent’ rating, reinforcing the alignment with international energy efficiency standards.

Further obligations are stipulated in Annex 14, particularly under the clause ‘Common Services Management’ in the support services section. In this clause, ‘Common Services’ are defined to include utilities such as electricity, gas, water, sewage, and communication systems. The company is required to provide and manage these services continuously, with uninterrupted delivery throughout the contract term. Energy, within this context, is defined as any utility derived from electricity, fossil fuels, or water resources necessary for delivering standard services.

The company’s responsibilities include ensuring the efficient use of energy and other resources, adopting environmentally sustainable practices whenever economically feasible, and promoting operational continuity across all infrastructure systems.

Under the clause ‘Training and Orientation’ in the article ‘Personnel and Development’ of Annex 14, the company is also responsible for fostering energy awareness and resource-efficient practices among staff, in line with mandatory standards.

In conclusion, both the contractual requirement to obtain international certification and the specific service obligations outlined in Annex 14 clearly indicate that the company assumes all risks and cost liabilities associated with energy efficiency throughout the project's duration.

24. Security Risk

In the article ‘Land Security and Personnel Matters’ of the PA, the company is obligated to ensure campus security during the construction period in accordance with relevant legislation and the security protocol. Comprehensive provisions regarding operational security obligations are detailed in the article ‘Security

Services' of Annex 14. The clause 'Definitions' describes security services as those provided in line with Law No. 5188 on 'Private Security Services' and relevant regulations, aiming to safeguard individuals on campus, regulate internal traffic, guide visitors, and protect fixed assets and buildings from acts that may endanger life, property, or public order.

The company is responsible for supplying and maintaining all necessary security equipment and for securing private security liability insurance for its personnel as mandated by law. According to the sub-clause 'Key Objectives', the company must deliver continuous, 24/7 security services across the campus to ensure the safety of all individuals and property.

The sub-clause 'Scope' further outlines specific requirements, including the verification and training of security staff, rapid response to incidents, patrolling, dedicated security for high-risk zones, the use of surveillance systems and lighting, escorting, emergency response, access control, crime prevention, incident reporting, and managing lost property.

In conclusion, excluding events classified as *force majeure*, the company bears full responsibility for managing and mitigating security risks.

25. Resource Price Risk

As outlined in Annex 18 (Payment Mechanism), the administration's payments to the company during the operation period consist of an availability payment (AP) and a service payment (SP), both of which are subject to inflation-based adjustments. However, no clause in the project agreement entitles the company to receive additional price escalation adjustments during either the construction or operation phases.

The article of the PA 'General Obligations of the Administration' states that utility connections such as electricity, water, and gas up to the site boundary, along with

subscription and usage costs, are to be arranged by the administration unless otherwise noted in the tender documents. For the construction period, the company is responsible for all related utility costs. During the operation phase, although subscriptions remain under the administration's purview, Annex 18 specifies that the company shall bear the cost of utility consumption for services such as laundry, catering, laboratory, imaging, and sterilization. These consumption-based deductions are made directly from the relevant service payments.

In conclusion, while specific components of the resource price risk – particularly those related to inflation – are addressed through AP and SP adjustments, the contract also establishes cost responsibilities for specific utilities and services in Annex 18, resulting in a shared risk allocation between the administration and the company depending on the nature of the resource and service.

26. Scrap Value Risk

Under the provision captioned 'Subject and Scope of the Contract', it is stated that, at the end of the contract term, the company shall transfer and deliver the facility to the administration in accordance with the contractual provisions, free of any debts and encumbrances, well-maintained, operational, and usable, without any compensation. In the section titled 'Performance Bond and Its Form', it is stipulated that the company shall provide separate irrevocable performance bonds for the investment period and the operation period. It is further indicated that the performance bond for the operation period shall be returned to the company upon the expiration of the contract term, provided that the company has no outstanding debts to the administration and no disputes with the administration in this regard, and submits documents from the relevant tax office and the Social Security Institution certifying, in accordance with the applicable legislation, that it has no tax or premium debts. However, it is also provided that, in the event the company fails to pay any receivables arising from the investment or operation period, such receivables shall be covered from the performance bond.

The section of the contract under the heading ‘Handover Procedure’ implies that, upon the termination of the contract, the provisions of Annex 24 (Handover Procedure) shall be applied in the return of the campus to the administration. This section implies that in the event of the ordinary expiration of the contract term, the health campus shall be transferred to the administration in accordance with the return conditions. The relevant return conditions are defined as follows:

i. With respect to the facility, the company must have fulfilled the expected performance standards under the service level requirements and method statements regarding maintenance and repair services;
ii. With respect to the facility, the campus and each of its components must be in good condition, having been designed and constructed in accordance with the applicable design life requirements specified in the technical specifications;
iii. Regarding the commercial activity areas, the facilities must be maintained in good condition – excluding normal wear and tear due to use during the contract term – through adherence to good industry practices and in accordance with the prudent merchant principles of the Turkish Commercial Code.

‘Handover Procedure’ also requires that, in the event of the ordinary expiration of the contract term without any fault or termination circumstance, the campus shall be transferred to the administration free of any encumbrances, obligations, annotations, debts, and commitments, in a well-maintained, operational, and usable condition, without compensation and excluding normal wear and tear.

Therefore, considering the provisions of the project agreement and Annex 24, it is understood that the company is responsible for transferring the healthcare facility to the administration at the end of the contract term in a suitable and usable condition, and that the company shall bear any additional costs arising from the return conditions.

27. Transfer Period Expiry Risk

The steps and timelines related to transferring the healthcare facility to the administration upon expiration of the contract term are described in detail in Annex 24. According to the clause of Annex 24 titled ‘Handover Procedure’, it is implied that, at least a certain number of years before the expiration date, representatives of both the company and the administration shall jointly inspect the healthcare campus. Following the completion of the inspection process, it is stated that, within a pre-set timeframe, if it is determined that any component of the campus does not meet the return conditions, the company shall be obliged to submit, in accordance with Annex 10 (Inspection Procedure), the maintenance works required to bring the campus into conformity with the return conditions by the expiration date, including the company’s proposal, its cost estimate for the handover-related works, and the work schedule to be implemented during the remaining contract period.

Annex 24 stipulates that the company undertakes to carry out the handover-related works in line with good industry practices and the nature of the return program, in a manner acceptable to the representative of the administration, ensuring that its efforts meet the return conditions. It is further stated that, no later than a pre-set date before the expiration date, the company’s representative and the handover commission shall jointly inspect the campus to determine whether it complies with the return conditions.

According to the same annex, it is also provided that, on the expiration date or within a certain number of business days thereafter, the handover commission shall issue a return certificate indicating the condition of the campus and return the handover guarantee; alternatively, notify the company of the reasons for its decision not to issue such a certificate. The annex further stipulates that, if on the expiration date it is mutually acknowledged by the parties, or determined in accordance with the provisions of Annex 26 (Dispute Resolution Procedure), that the campus does not fully comply with the return conditions, the company is committed to pay the

administration an amount equal to the estimated cost of completing the works necessary to meet those conditions.

Therefore, considering the timelines outlined in the return process under Annex 24, along with the financial sanctions to be imposed on the company in the event of a failure to complete the return in a timely and proper manner, it is determined that the transfer Period expiry risk is a risk factor undertaken by the company.

28. *Force Majeure* Risk

Under the section of the contract titled *'Force Majeure'*, it is stated that circumstances which may be considered as force majeure include: natural disasters, legal strikes, widespread epidemics, declaration of partial or general mobilization or war, and other circumstances that render performance impossible. For such events to be recognized as *force majeure* by the administration, the following conditions shall be met:

i. The event must not have resulted from a fault attributable to the company;
ii. There must be an obstacle to the fulfillment of the contractual obligation;
iii. The company must not have been able to eliminate this obstacle despite acting reasonably and prudently;
iv. The force majeure must be documented by the competent authorities.

Under the section titled *'Force Majeure'*, it is stated that, in the event the company invokes a *force majeure* situation, it shall be exempt from liabilities limited to the obligations that cannot be fulfilled under the contract, and the contract term shall be extended by the administration accordingly. It is further stated that if the company's work schedule is delayed due to *force majeure* or another justified excuse, the period for fulfilling the work schedule – or any part thereof – shall be deemed extended by a duration equal to the delay caused by the *force majeure* or excuse, either as mutually agreed by the parties or as determined in accordance with Annex 26 (Dispute Resolution Procedure).

In addition, the contract sets forth that, if affected by a *force majeure* event and should the company wish to continue execution of the contract, it shall take all reasonable steps to mitigate the effects of the event related to its contractual obligations, resume performance as soon as reasonably possible, and make every reasonable effort – within the framework of objective standards – to remedy any consequences arising from the failure to perform.

The contract also stipulates that, in the event of a force majeure occurrence, the company shall continue to perform all unaffected works and services. This provision is reiterated in the section addressing service continuity, which states that, in the event of *force majeure*, the company is expected to continue delivering all non-medical services not affected by the *force majeure* event without interruption, while maintaining the required service quality levels.

The PA implies that if a *force majeure* event occurs after the actual completion date, Annex 18 (Payment Mechanism) shall be applied to determine the payment to be made to the company for the duration of the *force majeure* event. It is also stated that the adverse consequences arising from such an event shall not be considered as low performance in the performance monitoring system and shall not be deemed a service failure.

Ultimately, in light of these contractual provisions, it is determined that, given the severe financial and non-financial consequences that may arise from *force majeure* events, it would not be feasible and reasonable for such risks to be assumed by only one party. Therefore, *the force majeure risk is considered a shared risk factor between the company and the* MoH.

29. Termination Risk

Termination Risk encompasses the financial implications that may arise from a party's failure to comply with its contractual obligations or from mutual termination. The contract identifies multiple breach scenarios attributable to the company,

including but not limited to: payment default, prolonged delays in completion, unauthorized refinancing, failure to deliver required services, violation of health and safety laws, and unapproved changes in shareholding or control. Additionally, failure to secure required permits, insurance coverage, equity contributions, or full financing by specified deadlines also constitutes a breach.

The contract also links service quality to termination thresholds by referencing Annex 14 and Annex 18, wherein exceeding defined error point levels or falling below performance scores may result in subcontractor-level consequences, although not immediate termination of the main contract. However, inevitable severe breaches – such as failure to pay undisputed amounts or renew performance bonds – grant the administration the right to terminate the agreement directly.

Conversely, the contract outlines administrative breaches, including failure to fulfill obligations regarding permits, delays in issuing completion certificates, or non-payment of undisputed financial obligations. In such cases, the company may either suspend its obligations or terminate the agreement if no remedial action is taken after formal notification.

The financial consequences of termination, governed by Annex 23 and Annex 24, vary depending on whether the breach is attributable to the company or the administration. Therefore, termination risk is contractually allocated as a shared responsibility between the public and private parties.