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Public-private partnerships in the real estate sector in Colombia: risk assessment matrix and risk

Alianzas público privadas en el sector inmobiliario en Colombia: una propuesta de matriz y asignación de riesgos

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- Considering the current situation in Colombia, where real estate projects are gaining strength in the field of PPPs, both an identification of the possible risks that will be incurred and an allocation of those responsible are necessary for the implementation of these projects.
- In this document, it was possible to identify those risks, classifying them into 10 variables: political, legal, economic, operational and management, technical, market, environmental and social, site, natural and others.

The implementation of Public-Private Partnerships in infrastructure projects in Colombia has proven to be an efficient and innovative opportunity in the execution and management of projects that contribute to the development of the country. As expected, the increase in the use of these associations in infrastructure encourages other sectors to carry out their projects under the same figure. Currently, in the real estate sector, some projects that seek to maximize their benefits and mitigate their risks through the experience of the public entity and the private companies are under study, or in the structuring or execution phase. However, given its recent application, the real estate sector does not have a risk matrix to guide its parties regarding the risks each must assume. In this work, a first model of this matrix is constructed for the case of Colombia. This model will be supported by research from various national and international sources and studies. Additionally, based on the found information, an identification of the most frequent risks and those responsible for their prevention and mitigation are assigned. This process allowed us to conclude that the existing matrix used in the PPPs of the real estate sector in Colombia is very general and, therefore, does not consider several evident risks like for example political, those that consider the relationship between the involved parties and the residual risk. For risk allocation, it is proposed the public sector to be responsible for political risks and at least for most of the legal risks. In the case of technical, market and general project management risks, the private sector must assume the higher percentage. Finally, social and environmental/natural risks must enter negotiation to be assigned to the party that best manage them and at a lower cost.

Public-private partnership (PPP); risk matrix; risk allocation; real estate; Colombia.

- Teniendo en cuenta la situación actual en Colombia, donde los proyectos inmobiliarios se están fortaleciendo en el campo de las PPP, es necesario identificar tanto los posibles riesgos en los que se incurrirá como la asignación de los responsables para la implementación de estos proyectos.
- En este documento, fue posible identificar esos riesgos, clasificándolos en 10 variables: políticas, legales, económicas, operativas y de gestión, técnicas, de mercado, ambientales y sociales, de sitio, naturales y otras.

La implementación de asociaciones público privadas en los proyectos de infraestructura de Colombia, ha demostrado ser una oportunidad eficiente e innovadora en la ejecución y gestión de proyectos que contribuyen al desarrollo del país. Como es de esperarse, el aumento del uso de estas asociaciones en infraestructura incentiva a otros sectores a realizar sus proyectos bajo la misma figura. En la actualidad, en el sector inmobiliario se encuentran en estudio, estructuración o ejecución algunos proyectos que buscan maximizar sus beneficios y mitigar sus riesgos, a través de la experiencia de la entidad pública y la empresa privada. Sin embargo, dada su reciente aplicación, el sector inmobiliario no cuenta con una matriz de riesgos que oriente a sus partes respecto a los riesgos que debe asumir. En este trabajo, se construye un primer modelo de dicha matriz para el caso de Colombia. Este se encontrara soportado por la investigación de diversas fuentes y estudios nacionales e internacionales. Adicionalmente, se realiza una identificación de riesgos y se asignan los responsables de la prevención y mitigación de los mismos. Este proceso permitió concluir que la matriz existente usada en las APPs del sector inmobiliario en Colombia, es muy general ya que no tiene en cuenta varios riesgos evidentes como por ejemplo los riesgos políticos, la relación entre las partes involucradas y el riesgo residual. Para la asignación de riesgos, se propone que el sector público se encargue de los riesgos políticos y al menos de la mayoría de los legales. En el caso de los riesgos técnicos, de mercado y los de gestión en general del proyecto, el sector privado debe asumir un mayor porcentaje. Finalmente, los riesgos sociales, ambientales/naturales, deben entrar en negociación con el fin de ser asignados a la parte involucrada que mejor sabe manejarlos y a un menor costo.

Alianza público privada (APP); matriz de riesgos; asignación de riesgos; sector inmobiliario; Colombia.

1. INTRODUCTION

In Colombia, the implementation of the PPP model for infrastructure has promoted the development of this area in the country, thus enabling the execution and operation of projects that under another scheme would not be convenient or profitable for the public sector. This is how other sectors, such as real estate, were encouraged to carry out their projects using the model of public-private partnerships. The project that demonstrates this initiative is the remodeling of the El Campin Coliseum, located in the capital of the country. However, the lack of a base matrix or a first model of it restricts the knowledge of the risks that each involved must assume in this type of projects. This text aims to provide a guide to the risks that must be considered and those responsible. The methodology used was the research of different sources related to the study of PPPs in stadiums, buildings and social infrastructure or, in some cases, authors involved with educational entities specialized in the study of the real estate sector.

2. PUBLIC-PRIVATE PARTNERSHIPS: STATE OF THE ART

According to Engel, Fischer, & Galetovic [1], the use of Public-Private Partnerships (PPP) has become common in recent years to replace and complement the public provision of infrastructure. Additionally, it has been found that this type of association allows a government to benefit from the participation of the private sector in the management, capital contribution and innovative capacity [2]. However, even though this type of financing is increasingly used and despite its numerous benefits, there are sources that affirm that PPPs still do not have exhaustive studies from a theoretical point of view, which focus on specific aspects of its differentiation from other modalities [3]. In this document, the Public-Private Partnership will be evaluated from its definition and types of application to the distribution of the different risks that arise during the execution of projects specifically in the real estate sector.

Initially, it is important to find a complete definition of what a PPP is and its different types. It was found that a Public-Private Partnership is defined as a long-term contract between public sector agencies and private sector entities. In this contract the responsibilities of design, financing, construction, administration, and operation of public infrastructure, which originally belonged to the public sector, are now shared by contract in proportion, considering the type and quantity of risks that each sector can better manage [4]. It is relevant to highlight that this definition is the union of the different points of view that independent institutions have of PPPs; This includes cooperation between the public and private sectors and the allocation of risks, resources and rewards [5], highlights the transfer of responsibilities that initially only the government handled [6], there is a recognition of the activities involved in the project [7] and the influence of the government is evidenced through the implementation of a contract [8] . As an additional characteristic, Nelson [9] identified that in this financing method, the public-sector key role is to reduce risk, making formerly infeasible projects feasible.

2.1. PPPS IN THE UNITED KINGDOM

On the other hand, it has been found that different types of PPPs change according to its location. Therefore, the identification of these types in the literature of some countries was considered pertinent. First, in international sources, the following differentiation of PPPs was found in the United Kingdom [10]:

a. Legal

i. Public concession: Public contract where the private sector is considered for the provision of services in only the right to exploit the service or in this right with any additional payment by the public entity.

ii. Public-private contractual partnership: Relationship between the public and private sectors based solely on contractual links. This assumes that the private partner invests the capital to complete the project, while the public pays for service charges.

iii. Institutional public-private partnership: Creation of a separate legal entity to which the public and private partners belong together. The purpose of the latter is to ensure the obtaining of financing and the provision of a public service or an infrastructure project for the benefit of the public.

b. Operational

i. The private sector designs, constructs, owns, develops, operates and manages an asset without obligation to transfer ownership to the public sector. Its modalities are:

- Design-Build-Finance-Operate (DBFO)
- Build-Own-Operate (BOO)
- Build-Develop-Operate (BDO)
- Design-Construct-Manage-Finance (DCMF)

ii. The private sector manages, renovates, modernizes / expands and subsequently exploits public sector assets, without the obligation to transfer ownership to the public sector. Its modalities are:

- Buy-Build-Operate (BBO)
- Lease-Develop-Operate (LDO)
- Operate under License (OL)

iii. The private sector designs, constructs and operates the asset and subsequently, upon termination of the exploitation contract or when specified, transfers it to

the public sector. Its modalities are:

- Build-Operate-Transfer (BOT)
- Build-Own-Operate-Transfer (BOOT)
- Build-Lease-Operate-Transfer (BLOT)

Unlike the European Union, in Chile, for example, contract and organizational figures are also included in the PPP terminology, except for the public works concession. The difference comes mainly from the fact that the latter is considered in the European Union as a Private Public Association of "contractual type", where it is qualified as something different from the concession as such [11].

2.2. PPPs in Latin America and Colombia

In Latin America, between the 70s and 80s, prevailed a management model in which the supply, financing and operation, were majorly leaded by the public sector centralized in the national government. Further, in the end of the 80s, the limitations of the public sector and the fall in the quality of the services it offered, leads to the appearance of a new model, public-private partnerships, where private participation would increase propitiating deregulation of services and decentralization. [12].

In recent decades, many Latin American countries have used

General PPP Schemes in Latin America	**Service contracts** Allow the private sector to perform specific tasks, such as billing or maintenance, while the public sector is responsible for their coordination. They are usually associated with long periods of time and their main advantage is that they benefit from the experience that the private sector has in technical tasks, opening these activities to the competition.
	Administration contract Is an agreement whereby private companies are responsible for the development of the State's own services, being contracted in the name of a public entity.
	Lease contract The private sector manages the infrastructure according to the decisions made by the public sector. The private sector, for its part, does not receive any tariff from the government, but its profits depend directly on the benefits of the management of the company, fully assuming the operational risk.
	Concession Gives responsibility to the private sector for the operation, maintenance of the assets of a public utility and investments. However, most of the time, the public sector grants a series of guarantees or subsidies so that the private sector sees the project as profitable despite the existing risks. The concession contract has been the PPP formula that has had the most development in Latin America.

Table 1: PPP schemes in Latin America .

public-private partnership models for the construction, conservation and operation of public infrastructures. Initially, these models were based on the concession of public works for road construction; However, over the years, they have been refined and their use has been extended to other types of infrastructures and public services such as railways, ports, airports, mass transport systems, hospitals, prisons and public buildings, among others.

Through experience, continuous legislative reforms and changes in contracts have been generated that have contributed to improving PPP schemes over the years. This can be confirmed by the fact that, nowadays, Latin America is one of the regions in the world with the most activity in public-private partnership processes. Additionally, in general terms, Public-private partnership schemes can occur through of different schemes as shown in the table1 [13].

In the Colombian case, the first participation of the private sector in infrastructure projects and public services took place in the 90s. In the country, the PPP model is relatively new since it was initially proposed by the National Council of Economic and Social Policy (CONPES, by its initials in Spanish) in 2009 through the document "CONPES 3615: INITIATIVE FOR THE MODERNIZATION AND MANAGEMENT OF PUBLIC FIXED ASSETS". This document exposed the following problems, which impeded the improvement of public infrastructure in the country, a) restriction of the expenditure of the Central National Government and of the budget that would be invested in the modernization of fixed assets for the development of public management, b) lack of strategic projection in terms of infrastructure development and c) the low level of integration to the real estate market of the fixed assets of public entities [14].

Subsequently, the legal system was made through the issuance of Law 1508 of 2012. This Law specifies the legal margin for PPPs, within which the following general points stand out:

a. There are no advances.

b. Payment is made according to the fulfillment of the service.

c. Additions of maximum 20% of the value of the contract.

d. Remuneration of the activity with the right to economic exploitation of the asset.

e. A maximum period of exploitation of assets of 30 years (can only be extended according to the CONPES guidelines).

Therefore, this law was designed so that the PPP model is only applied in the case that its greater and better value is previously and technically demonstrated compared to the existing public procurement alternatives [15]. Following the previous idea and considering that the PPP schemes in Colombia coincide with those of Latin America, in Colombia, there are two ways to start a PPP. With the help of the document ABC Public-Private Associations [16], issued by the Colombian government in association with institutions such as the National Planning Department and the Ministry of Finance and Public Credit of Colombia, it was found that the discrimination of PPPs in the country was made according to the sector that took the initiative to propose the project:

a. By public initiative: It is characterized because the idea of the project is structured by the public entity with participation of the private sector, in this case, there are three different types of sources of payment:

   i. Through public resources

   ii. Economic exploitation of the PPP

   iii. A combination of the previous two

b. By private initiative: In this initiative, both the idea of the project and its proposal, are in charge of the private entity. On the other hand, it is the private sector responsibility to carry out the structuring of the project, without the obligation of the public entity to recognize the costs associated with it. Furthermore, the sources of payment in this type are:

   i. Maximum 20% of the investment is in the public sector: The selection of the contractor is made through public bidding.

   ii. Economic exploitation of the project: The selection of the contractor will be by means of abbreviated selection of smaller amount.

   iii. Once both definition and types of this kind of associations have been specified, it is considered necessary to recognize the advantages and disadvantages of the use of these (Table 2) exposed by different sources and authors who have delved into the subject:

ADVANTAGES	DISADVANTAGES
♦ Savings between 6 and 40% in project costs [17]. ♦ Time reduction of about 50% [17]. ♦ Acceleration of activities and pre-development, reducing the general calendar and therefore also the interest payable [17]. ♦ Innovation in the management of projects that allow the privatization of certain administrative functions [17]. ♦ It allows the parties to assign the risk to the most appropriate side for their management [17]. ♦ While public entities provide incentives, private companies can provide valuable knowledge on [18]: • National and local markets • Business orientation • Vision and creativity • Development and management skills • Risk capital ♦ The public sector achieves its objectives of generating an economic impact and a social benefit and the private sector achieves its desired return on investment [18]. ♦ Incentive for the private sector to deliver the projects on time and within the agreed budget [19]. ♦ Reduce the limitations of public sector capacities in the development of infrastructure [19].	♦ There is no guarantee that the savings are anticipated [17]. ♦ Time is not always saved, however, in general the process is more agile and flexible [17]. ♦ The solvency of private participants is not guaranteed [17]. ♦ Potential inconvenience in the area that corresponds to the government as it tries to change its methods of project management [17]. ♦ PPP projects are very large; therefore, they are not within the reach of contractors or designers of small companies [17]. ♦ There is a possibility that development, bidding and other costs are greater than those of traditional public procurement processes [19]. ♦ Generally, the private sector is likely to have more expertise so after a time have an advantage in the data relating to the project [19]. ♦ These projects require large investment and long time, which involves high-risk [20]. ♦ The complex financing requirements of many PPPs also make them vulnerable to the world equity markets unpredictability [21]. ♦ The difficulty of project requirements represents high participation costs for private sector companies [22].

Table 2: Advantages and disadvantages of PPP model according to different sources.

3. RISK MANAGEMENT IN PPPS

Risk exists at all stages of the project lifecycle [23]. In PPPs, risks arise from different sources like capital budget, construction time, construction cost, operation cost, politics and policies, market conditions, cooperation credibility, and economic environment [24]. When it comes to adequately mitigate and eliminate risk, Serpell, Ferrada, Rubio & Arauzo [26] state that, the risk management process plays an integral part or area of project management. Besides, they highlight

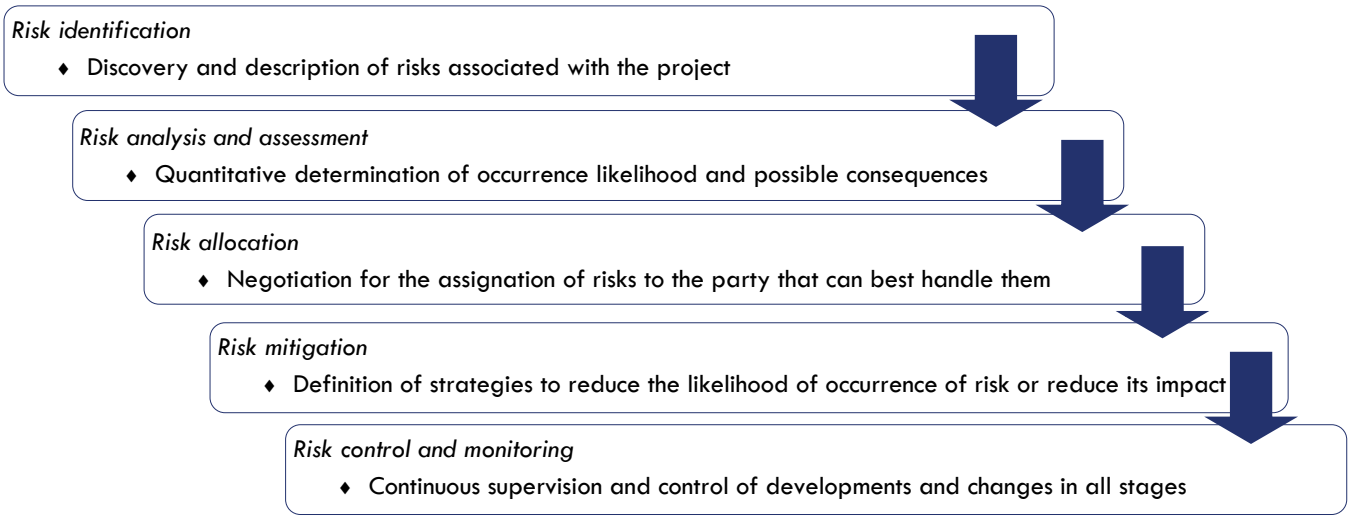

Figure 1: Risk management process in PPPs.

3.1. RISK IDENTIFICATION, ANALYSIS AND ASSESSMENT

3.1.1. RISK IDENTIFICATION

Every real estate project is different and so is its development process. The latter, is always an opportunity to negotiate, debate and reconsider the basic problems of the economy of a company such as: who pays, who benefits, who makes the decisions and who assumes risks [28].

As Yuan, Chan, Xiong, Skibniewski, & Li [29] expose, risk identification is always the first step of the risk management process; in PPPs case, risk identification depends on countries and regions, and the specific project type. Additionally, they argue that government-related risks and financial risks are the most significant risks for ongoing PPP projects, including developed and developing countries.

In real estate projects, Khumpaisal, Ross & Abdulai [30] identified that there are risks that derive from social, technological, environmental, economic and political (STEEP) factors, which affect real estate project development processes in terms of schedule delay, cost overrun and quality of products, and affect the progress of the projects at all stages of their lifecycles. These authors identified as well, that most real estate developers found project risks to be caused by factors such as policy change, and social or community objections. Considering the above, given that the aforementioned text only performs the risk quantification criteria, in the matrix to be made, the STEEP factors proposed by these authors will be used as initial classes to classify the risks found in this type of projects.

3.1.2. RISK ANALYSIS AND ASSESSMENT

Nowadays, in Colombia, the risk assessment technique used to record and discriminate by type the different risks found in a project is the Risk Assessment Matrix (RAM). This method is characterized because it contains the probability and consequence of each risk and is generally accepted by many decision makers due to its simplicity and facility of understanding of projects at every level [30]. Considering the above, in this document this method will be used, however, no calculation will be made of percentages of occurrence considering that it is not within the scope thereof. Given the purpose of the text, the investigative texts considered to make the risk matrix had some of the following characteristics:

a. Study of risks associated to PPP risk management of social infrastructure, buildings and stadiums
   i. Case Study of the Bird's Nest: Risks and Opportunities in China Implementations in Major Sports Facilities [31].
   ii. Green commercial building projects in Singapore: Critical risk factors and mitigation measures [32].
   iii. Risk allocation in the private provision of public infrastructure [33].
   iv. An Analysis of Risk Management in Social Infrastructure Public Private Partnerships (PPPs) [34], specifically Chapter 5. Case study: Risk issues encountered on the stadium Australia project.

b. Study of risks associated to PPP risk management of social infrastructure, buildings and stadiums
   i. Risk Assessment for Construction Joint Ventures [35].

In the matrix exposed above, the risks found in each of the mentioned sources are shown. These risks were classified into 9 classes: political, legal, economic, operational, technical, market, environmental and social, site and other risks. A brief description of these is shown in Table 3.

3.1.3. QUALITATIVE RISK MATRIX

RISK FACTORS	[18]	[19]	[20]	[21]	[22]	Count
Political risk						
Government intervention	x		x	x	x	4
Nationalization/ Expropriation	x		x			2
Poor public decision-making process	x				x	2
Corruption and bribery	x	x		x	x	4
Political Opposition	x	x			x	3
Unstable government					x	1
Cost increase due to changes of policies			x	x	x	3
Loss incurred due to political changes				x	x	2
War		x				1
Legal risk						
Breach of contracts by other participants		x	x		x	3
Breach of contracts by project partner		x	x		x	3
Lack of enforcement of legal judgment					x	1
Loss due to insufficient law for PPPs					x	1
Uncertainty and unfairness of court justice					x	1
Change in legislation/law	x	x	x	x	x	5
Change in tax regulation	x		x	x	x	4
Change in construction legislation			x			2
Economical risk						
Payment risk	x					1
Loss due to fluctuation of inflation rate	x	x	x	x	x	5
Public Credit	x					1
Loss due to fluctuation of interest rate	x		x	x	x	4
Bankruptcy of project partner					x	1
Difficult convertibility of currency					x	1
Loss due to fluctuation of currency exchange rate	x			x	x	3
Low credibility of stakeholders and lenders					x	1
Financial risk	x			x		2
Operation & Management risk						
Change of organization with partner					x	1
Improper project feasibility		x		x	x	3
Improper project planning, coordination and budgeting	x	x	x		x	4
Improper selection of project location					x	1
Improper selection of project type					x	1
Inadequate choice of project partner		x			x	2
Inadequate project organization structure					x	1
Incompetence of project management team Inability of Concessionaire	x	x			x	3
Incomplete contract terms with partner	x				x	2
Increase in project management overheads					x	1
Poor relation and disputes with partner		x	x		x	3
Poor relation with government departments		x	x		x	3
Problems associated with culture difference		x			x	2
Delay in project approvals and permits	x		x	x	x	4
Operation cost overrun	x		x	x	x	4
Concessionaire Change	x					2
Maintenance			x	x		3
Inadequate insurance		x				2
Complexity of the project				x		2
Technical risk						
Accidents on site		x			x	2
Poor definition and change of scope		x	x			3
Design changes		x	x	x	x	4
Equipment failure					x	1
Errors in design drawings		x			x	2
Hazards of environmental regulations					x	1
Incompetence of transportation infrastructure facilities	x			x	x	3
Industrial disputes			x	x	x	3
Local firm's incompetence and low credibility					x	1
Poor quality of procured accessory facilities/materials		x	x		x	3
Problems due to partners different practice					x	1
Shortage in accessory facilities					x	1
Shortage in skillful workers		x			x	2
Shortage in supply of water, gas, and electricity					x	1
Subcontractors low credibility					x	1
Insured force majeure			x			1
Non-insured force majeure	x		x	x	x	4
Defects in construction		x	x			2
Construction delay/overrun	x			x		2
Unproven Engineering Techniques/ Obsolesce	x	x	x			3
Subjective Project Evaluation Method	x					1
Market risk						
Competition from other similar project	x			x	x	3
Fall short of excepted income from project use				x	x	2
Increase of prices/costs (accessory facilities/materials/labor/ resettlement)	x	x	x	x	x	5
Inadequate forecast about market demand	x	x	x	x	x	5
Unfairness in tendering	x			x	x	3
Loss due to bureaucracy for late approvals					x	1
Natural risk						
Archeological findings				x	x	2
Environmental & Social						
Unforeseen Weather/Geotechnical Conditions	x	x			x	3
Damages caused by 'acts of God'		x				1
Soil contamination				x		1
Air, sound and water pollution		x				1
Public opposition	x	x			x	3
Site risks						
Site conditions			x	x	x	3
Site preparation			x			1
Land use			x	x		2
Land acquisition	x				x	2
Other risks						
Third Party Delay/Violation	x					1
Residual risk	x		x			2
Damages caused by human error		x				1

Table 3: Proposed risk matrix.

3.1.1. POLITICAL RISKS

According to Shen, Wu, & Ng [35], their survey results indicate that the "cost increase due to changes in policies" risk was the most important risk found. To support the previous idea, they argue that variations in policies and regulation can have a significant impact on joint venture businesses. However, once all the sources for this matrix were grouped together, the authors agreed that the government intervention in the project and corruption, are the most relevant factors followed by opposition to the government and cost increase due to changes in policies.

3.1.2. LEGAL RISKS

As the initial authors mentioned expose, legal risk covers the disputes among contracting parties, intellectual property breach, as well as the possible delays in achieving due approval from construction authorities. In this case, it is evident that all the authors find that the change of legislation represents an important risk for the projects. Additionally, the change of regulation in taxes is also recognized as a risk that must be considered. These previous ones, together with the political risks, demonstrate the great effect that the actions of a government have on the development of a construction project.

3.1.3. ECONOMIC RISKS

As the initial authors mentioned expose, legal risk covers the disputes among contracting parties, intellectual property breach, as well as the possible delays in achieving due approval from construction authorities. In this case, it is evident that all the authors find that the change of legislation represents an important risk for the projects. Additionally, the change of regulation in taxes is also recognized as a risk that must be considered. These previous ones, together with the political risks, demonstrate the great effect that the actions of a government have on the development of a construction project.

3.1.4. MANAGEMENT RISKS

The risk of management is mainly associated with relationships and decision making during the execution of the project and its operation. For this matrix, it is evident that the authors give real importance to three factors mainly: planning, coordination and inadequate budgeting, delay in approvals and permits, and cost overruns in the operation stage of the project. On the other hand, it must be considered that the relationship between parties is essential for the proper development of a project and that the feasibility stage must be carried out thoroughly.

3.1.5. TECHNICAL RISKS

As can be seen in the risk matrix, the authors assign most the latter to technical problems of the project related to the design, lack of availability of access transport infrastructure, industrial disputes, non-insured force majeure events and use of unproven engineering techniques. However, even if these are the most common ones, the technical risks depend on the type of project and its magnitude, so the rest of the considerations should not be discarded.

3.1.6. MARKET RISKS

In the case of market risks, it was found that both the increase in prices or costs and the inadequate estimation of the project's demand are factors that all authors consider to be important. This can be explained, given that the first one would generate a significant cost overrun in the project and the second, would cause serious consequences during the operational phase of the project; both scenarios could result in the infeasibility of the project and its maintenance. Additionally, other market factors such as competition must be considered.

3.1.7. ENVIRONMENTAL & SOCIAL RISKS

In the environmental and social aspect, it was found that even if some of the considered authors highlighted the importance of the social aspect in the social infrastructure, there was just one risk assigned to this aspect. On the side of environmental risks, compared to the rest of the risks, it could be said that this is within the classes least considered in the bibliography studied. However, the most outstanding environmental aspect was that of, which illustrates the importance of taking into account the possibility of unexpected climatic conditions and soil characteristics.

3.1.8. SITE RISKS

The site risks, as its name implies, are those location problem factors, which could cause significant delays before and during the execution of the project, among these are: site conditions, site preparation, land use and acquisition.

3.1.9. OTHER RISKS

This section includes those risks that were not able to be classified in any other risk class, including residual risk, damages caused by human error and archaeological findings.

3.2. ACTUAL REAL ESTATE PROJECTS RISK MATRIX IN COLOMBIA

The Colombian study case that will be considered below corresponds to the "Concession for the architectural renovation, technological update, operation and maintenance

[1] SECOP: An instrument to support the contractual management of state entities, which allows the interaction of the contracting entities, the proponents, the contractors, the community and the control bodies.

of the covered coliseum El Campin of the city of Bogota D.C" [36]. The concession contract which can be found on the web page for Public Procurement of Colombia (SECOP[1], by its initials in Spanish), is managed under a scheme of public-private partnership of private initiative and has a deadline of 21 months starting in July 2016.Additionally, it is recognized as the first PPP of the cultural sector in the country. The Table 4 illustrates the risk matrix proposed for this project.

3.2.1. OBSERVATIONS

By observing the current risk matrix for the real estate sector in Colombia, it can be shown that it lacks detail, it is very generic. As a suggestion, this nuance must be specific enough so that each of the parties involved knows the time and costs in which they will have to incur in each of the possible scenarios. On the other hand, having a detailed list of events would help and encourage each sector to prevent them in the initial phase of the project, which is where their actions would have a greater positive impact on the cost of the project.

Initially, in this second matrix, the Colombian one, the property risk is exposed; this includes delays in the availability of properties and cost overruns for acquisition. For its part, the matrix proposed earlier in this document considers a similar risk which is defined as site risk. The latter also considers the risk associated with the acquisition of land, however, the risk of expropriation or nationalization is included within the political risks. On the other hand, the risks associated with land use, condition and preparation are not considered in the Colombian matrix.

In the environmental and social risk, it should be noted that in the case of Colombia, the risk of an extra cost in a socio-environmental compensation is recognized and, in addition, the possibility of unfulfilled work in the environmental part is considered. In contrast, within the found risks proposed by the authors, there is no recognition of these previous ones; This class focuses only on the risks associated with the geotechnical conditions, the damages caused by natural disasters and the pollution caused by the execution of the project.

AREA	*RISK TYPE*
Property	Delays in the availability of properties
	Cost overruns for acquisition (including expropriations and socio-economic compensation)
Environmental & Social	Delays in obtaining licenses and/or permits
	Cost overruns for socio-environmental compensations
	Unforeseen works required by environmental authorities after the issuance of licenses or permits, for reasons not attributable to the concessionaire
	Inversion of the area conceded in an illicit manner
Networks	Cost overruns due to network interference
Design	Cost overruns derived from studies and designs
	Cost overruns in designs and / or delays due to decisions of the concessionaire
Construction	Cost overruns derived from more materials
	Variation of prices of inputs
Operation & Maintenance	Increased quantities of materials / supplies for operation and maintenance activities
	Variation in the prices of inputs for operation and maintenance activities
Commercial	Demand risk, not achieving the estimated occupation
Liquidity risk	Liquidity risk in general
Financial	Not obtaining financial closure
	Alteration of financing conditions and / or liquidity costs resulting from variation in market variables or project conditions
	Insufficient resources for the payment of the audit for reasons not attributable to the concessionaire
Currency	Variations of the peso against other currencies
Regulatory	Change in regulations in general
	Change in regulations (IFRS Standards)
	Change in regulations (Tax or accounting regulations)
Force Majeure	Ideal costs for greater permanence in work that came to be caused by force majeure or fortuitous events, and when risks occur
	Force majeure due to network interference or archaeological and / or anthropological findings
	Force majeure due to delays in prior consultation with communities within a period of more than 360 days for causes not attributable to the concessionaire
	Insurable events
	Non-insurable events

Table 4: Risk matrix for the PPP of the renovation of the covered coliseum El Campin.

In addition, it was possible to identify that the class "technical risks" in the proposed matrix, would correspond to the risks of "design", "construction" and "networks" that are evident in the last table. As in other classes, the risks that are exposed in the second are too generic; in the majority, they deal with cost overruns related to network interference, studies and designs, caused by decision making, among others. However, no risks are specified due to obsolete technology, which may generate delays in the processes; due to shortages of both inputs and labor; due lack of transport infrastructure that allows access to the property or due to problems between parties given their experience in different areas of engineering.

Likewise, the "Economic risk" in the proposed matrix includes the “financial”, “liquidity” and “currency” risk exposed in the second matrix. However, the latter refers to changes in inflation and the interest rate, as a single item arguing the alteration of financing conditions resulting from the variation of market variables; grouping the variables in a single item could be considered as adequate, in case the risks of any market variable are assumed by the same sector. On the other hand, it is understood that the "financial risk" corresponds to the event of not obtaining financial closure for the specific case of Colombia.

The commercial risk can be associated to the "market risk", in which both tables highlight the importance of a good demand projection of the property, however, the matrix in Colombia does not consider other market variables such as competition and associated costs with the unfair bidding process. On the other hand, it is possible to associate the "Regulatory" risk in Colombia with the “Legal” one in the proposed matrix, where the first one talks about regulations in general, while the second one discriminates every possible aspect within this range.

The risk considered as "Management risk" includes the risks of "Operation & Maintenance", which are associated with the administration during the execution of the project and its operation. Additionally, in this aspect are those risks that consider the incompetence of the parties involved, the wrong planning and the cost overruns resulting from the complexity of the project given its innovative character. The latter, are not specified for the case of Colombia real estate risk matrix.

On the other hand, it was found in few of the documents considered that a particular factor was proposed, which is called archeological findings; although it was only found in 2 of the 5 sources considered, it turned out that in Colombia it is also part of one of the risks of Force Majeure given the interference with networks. Finally, it was noticed the lack of consideration of the residual risk in the Colombian case.

In conclusion, the main differences found are associated with a different classification of the same risks, a different level of importance for some risks, a greater detail in the case of the proposed matrix and, in consequence, a greater number of considered risks as well. However, it is necessary to clarify that within the proposed matrix there are several risks that are associated with the condition of the country at the specific moment of the structuring of the project (for example “war" risk), therefore, in case of be necessary, they would not be considered.

3.3. RISK ALLOCATION

Now, following the third risk assessment process step and as in the construction of the risk matrix, in this section sources that have the following characteristics will be taken into account:

a. One or more authors belonging to the real estate department of an educational institution:
   i. Risk Allocation in Public-Private Partnership Infrastructure Projects: Comparative Study [37].
b. Risk allocation associated with the provision of Olympic Games infrastructure:
   ii. Public-private partnership projects in Greece: risk ranking and preferred risk allocation [38].

According to the first source mentioned, the following risks

Public sector	*Private sector*	*Shared*	*No prevailing preference*
- Nationalization/ Expropriation - Poor public decision-making process - Political Opposition - Unstable government - Change in legislation/law - Change in construction legislation - Delay in project approvals and permits - Public opposition	- Loss due to fluctuation of interest rate - Financial risk - Loss due to fluctuation of interest rate - Operation cost overrun - Maintenance - Materials shortage - Shortage in accessory facilities - Shortage in skillful workers - Shortage in supply of water, gas, and electricity - Defects in construction - Construction delay/ overrun - Unproven Engineering Techniques - Fall short of expected income from project use - Environmental risks - Residual risk	- Force majeure - Excessive contract variation - Differences in working method and know-how between partners - Inadequate distribution of responsibilities and risk - Inadequate distribution of authority in partnership - Lack of commitment from either partner - Third party tort liability - Inadequate experience in PPP - Poor financial market - Influential economic events - Organization and coordination risk	- Lack of tradition of private provision of public services - Change in tax regulation - Land acquisition (site availability) - Late design changes - Level of demand for project - Inflation rate volatility

Table 5: Risk allocation in China.

were assigned to each of the parties, those shared and those that would be negotiated in the case of China (Table 5).

In order to illustrate and analyze the previous table, the percentage of risks assumed by each party can be found in the Annexes section: Figure 2.

In this scenario, the public sector assumes all the political risks, a third of the technical and legal risks and assumes also part of the social risks. Regarding legal risks, there is no specific trend since both the public and private sectors assume a part and another is left for negotiation. For its part, the private sector assumes 80% of the risks associated with the management of the project, more specifically those of operation. However, 100% of the project management risks,

Public sector	*Private sector*	*Shared*	*Under negotiation*
- Unstable government - Poor public decision-making process - Political Opposition - Change of legislation - Change in tax regulation - Change in construction legislation - Land acquisition - Level of project demand - Archeological findings	- Lack of private sector experience in PPPs - Financial attraction of project to investors - High finance costs - Design deficiency/ late changes - Application of innovative techniques - Construction cost overrun - Contract variation - Material/labor availability - Poor quality of workmanship - Operation cost overrun - Operational revenues below expectation - Maintenance costs/period higher than expected - Organization and coordination - Inadequate distribution of responsibilities/ risks - Differences between partners - Lack of commitment from either partner	- Poor financial market - Influential economic events - Force majeure - Environment - Public opposition to the project	- Inflation rate volatility -Interest rate volatility - Geotechnical conditions -Weather -Land acquisition -Availability of finance -Residual risks - Delays in project approvals and permits

Table 6: Risk allocation in Greece.

associated with the relationship between parties, are shared. Finally, this source indicates that more than 70% of the environmental and technical risks must be managed and monitored by the private sector. On the other hand, in Greece the allocation of risks according to the second source is shown in the Table 6.

In order to illustrate and analyze the previous table, the percentage of risks assumed by each party can be found in the Annexes section: Figure 3.

In the case of Greece, the public sector assumes 100% both political and legal risks, in addition, manages the risks involved with the site and archaeological encounters. In contrast, the private sector assumes 100% of the risks of project management, both operational and relationship between parties and thus, manages most of the economic risks related to financing and technical. On the other hand, macroeconomic risks can be either shared or negotiated as well as environmental risks.

4. CONCLUSIONS

Considering the current situation in Colombia, where real estate projects are gaining strength in the field of PPPs, both an identification of the possible risks that will be incurred and an allocation of those responsible are necessary for the implementation of these projects.

In this document, it was possible to identify those risks, classifying them into 10 variables: political, legal, economic, operational and management, technical, market, environmental and social, site, natural and others. According to the amount of risks found, it is concluded that the technical risks are the most numerous, followed by operational and management risk, which indicates that a high percentage of effort should be concentrated in those two aspects.

On the other hand, when comparing the existing matrix for projects of this type in Colombia with the proposed matrix, it can be highlighted that one of the main differences is the level of detail in which the risks are specified in the second one, thus allowing a greater knowledge of these on the part of both sectors. Additionally, it was found that within the risks of the matrix in Colombia there is no consideration of the effect that the relationship between parties has and the importance of their experience in previous projects that managed the PPP model.

Likewise, the previous one does not specify political risks such as political opposition, government instability or any type of intervention that the latter decides to make about the project. Finally, another relevant difference of the comparison made is that in the Colombian matrix the residual risk is not identified and, therefore, there is no one responsible for its mitigation and prevention.

Regarding risk allocation and given that one of the purposes of PPPs is the transfer of risks from the public to the private sector, in order to make a viable project, it is not surprising that in both cases the private sector must assume most of the risks, however, as previously mentioned, assuming a high percentage of risks leads to high profitability. According to the patterns of allocation of risks found, it can be concluded that both sources agree that all political risks must be assumed by the public entity as well as at least a high percentage of

legal risks.

Likewise, the project management risks involved with the operation and the technical ones, involved with the construction, should be assumed, if not totally, mostly by the private sector, as well as the management risks associated with the relationship between involved parties. The environmental risks can be shared or assumed preferably by the private and the market risk is also submerged by the latter. Finally, social risks do not show a trend, so it is considered that according to the type of project they must be assigned under negotiation.

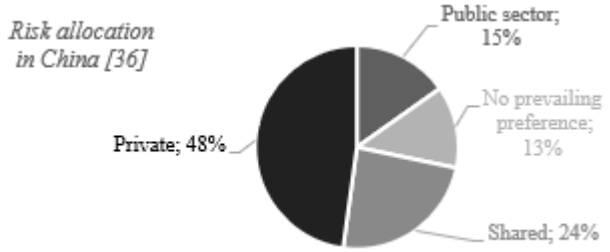

Figure 2. Risk allocation percentages in China.

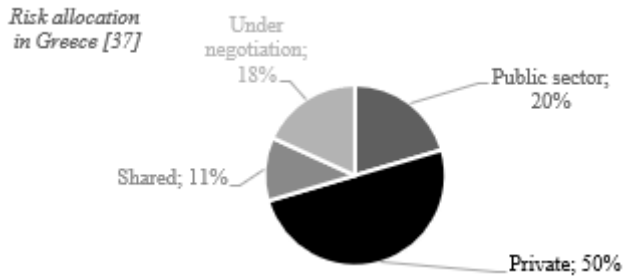

Figure 3. Risk allocation percentages in Greece.

In conclusion, it could be found that although the risks associated with different types of infrastructure, economic and social (the latter being very similar to real estate projects), have much in common, this document will contribute as a guide to new real estate projects managed under the figure of PPP in Colombia, thus promoting the growth of this sector.

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